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U.S. Nuclear Regulatory Commission
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Point Beach Nuclear Plant, Units 1 and 2
Dockets 50-266 and 50-301
License Nos. DPR-24 and DPR-27
Emergency Plan Implementing Procedures Manual and Emergency Plan Manual
Revisions

Enclosed are copies of revised procedures to the Point Beach Nuclear Plant Emergency Plan Implementing Procedures Manual and the Emergency Plan Manual. The revised procedures are dated January 16, 2004 and should be filed in your copy of the manual.

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Site Vice-President, Point Beach Nuclear Plant
Nuclear Management Company, LLC

Enclosures

cc: Incident Response Center, Region III (cd rom only)
Resident Inspector - Point Beach Nuclear Plant, USNRC (w/o/e)

A045

EPIP 1.2

EMERGENCY CLASSIFICATION

DOCUMENT TYPE: Technical

CLASSIFICATION: NNSR

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1.0 PURPOSE

This procedure provides instructions to classify off-normal occurrences at PBNP into one of four standardized emergency classes.

2.0 PREREQUISITES

2.1 Responsibilities

2.1.1 This procedure is intended for immediate use by the Shift Manager (SM). Following the activation of the Emergency Operations Facility (EOF) the overall responsibility for classification is assumed by the Emergency Director. He is supported in this effort by Control Room, TSC, and EOF personnel.

2.1.2 When relieved of Emergency Director duties by the Emergency Director, the Shift Manager shall no longer be responsible for performance of actions specified in this procedure, however as an NRC licensee the SM shall bring to the attention of the Emergency Director changing plant conditions which may affect the emergency classification.

2.1.3 Upon activation of the TSC, the Operations Coordinator shall monitor plant conditions and provide event classification recommendations to the Emergency Director.

2.2 Equipment

None

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Notifications to state and local authorities must be made within 15 minutes of the declaration of an emergency. Notifications to the NRC must be made immediately following these, not to exceed one hour from declaration.

3.2 Category 8 EALs (Judgment) provide the ability to classify any set of plant conditions based on the Emergency Class definitions, derived from NUREG-0654.

3.3 Certain conditions or occurrences, while not meeting the threshold for classification as an emergency, may nonetheless be reportable to the NRC per 10 CFR 50.72. (Guidance on interpretation of the 10 CFR 50.72 criteria may be found in NUREG-1022.)

3.4 Continuously reference both plant conditions and the EALs in this procedure for potential re-classification.

3.5 When Emergency conditions exist on both Units due to separate events then each Unit should be classified according to the plant conditions and EALS. Units are independent of each other unless the event affects both units. If an event affects both units a single Emergency Classification is adequate.

4.0 INITIAL CONDITIONS

EPIP 1.1 has been initiated by the Control Room because an off-normal occurrence exists (or has existed) at PBNP.

5.0 PROCEDURE

5.1 Classifying an Emergency

5.1.1 Record the time this procedure is entered in the station log (Emergency Director should log subsequent use in his log).

NOTE: A large version of Attachment A is available in the Control Room, TSC, and EOF.

5.1.2 Determine the category (or categories) of the event. (Column 1 of Attachment A). The categories are:

1. Fission Product Barriers
2. System Malfunction
3. Electrical Power
4. Radiological
5. Internal Events
6. External Events
7. Fuel Handling/ISFSI Events
8. Emergency Director Judgment

5.1.3 Make an initial EAL selection from Attachment A.

If the EAL relates to Category 1 (Fission Product Barriers), Attachment C provides additional information on the CHALLENGE and LOSS criteria.

NOTE: Do not "anticipate" challenge or loss of a barrier unless the trend is rapid, and the values are close to the threshold/criteria.

5.1.4 Reference the individual EAL page(s) in Attachment B for the EAL(s) selected. Read all fields on the page to determine/confirm that the EAL applies.

5.1.5 Also reference the individual EAL pages for the next higher and lower emergency class – in that category- (if such EALs exist). This should further confirm the initial selection and specific EAL.

NOTE: **Classifications are to be made consistent with the goal of 15 minutes once plant parameters reach an Emergency Action Level (EAL), are first indicated in the Control Room.**

5.1.6 IF an event has been categorized on Attachment A, and the threshold of the EAL and surrounding conditions verified to have been met or exceeded (Attachments B and C),
THEN declare the emergency.

a. Record the time of declaration, the emergency classification, and the EAL number on EPIP 2.1, Attachment B.

b. Make an announcement to your facility of the emergency and that you are assuming the duties of Emergency Director. (NA for the Control Room)

NOTE: **IF this procedure is being implemented from the EOF, THEN verify Control Room is assisting with Gai-tronics announcements.**

c. Return to EPIP 1.1, Step 5.6 to ensure all appropriate actions are taken and coordinated with actions of the other ERFs if activated.

5.1.7 IF it is determined that no EAL is met,
THEN review plant conditions against the criteria of 10 CFR 50.72 for one-hour and four-hour notifications to the NRC (Ref. NUREG-1022).
AND THEN return to EPIP 1.1, Step 5.18.

5.2 Terminating an Emergency

IF conditions have improved where an EAL is no longer met, and it is believed that the plant is stable, i.e., an EAL is not anticipated to be exceeded again,
THEN the emergency may be terminated per EPIP 12.1, WITH THE FOLLOWING CAVEATS:

5.2.1 IF Emergency Response Facilities have been activated, or personnel have been called to activate these facilities,
THEN the event shall **NOT** be terminated until the TSC and EOF have been activated, and the TSC Manager concurs with the assessment of plant conditions.

5.2.2 IF any General Emergency has been declared, or any Protective Action Recommendation made to or by off-site authorities,
THEN the emergency shall **NOT** be terminated until the NRC (for any General Emergency) and/or off-site authorities (for Protective Action Recommendations) concur.

5.3 Missed Classifications

A missed classification is defined as a set of circumstances or events, which although no longer existing, if recognized at the time of their existence would have resulted in an emergency classification (i.e., met or exceeded an EAL of this procedure). This definition does not include conditions described in EALs which are based on expected plant response which does not occur, but where operator action was successful- such as failure of RPS.

NOTE: **In ALL cases, the SM is vested with unilateral authority to classify an emergency and initiate any actions deemed appropriate to place the plant in a safe condition (per NUREG-0654, II.A.1.d, II.B.2).**

5.3.1 If the missed classification would have been one classification, but current plant conditions warrant a lower classification, the lower classification shall be declared, but parties notified shall be informed of the temporary higher classification during the notification process.

5.3.2 If NO current plant conditions meeting any EAL exist at the time of discovery of the missed classification, the actual declaration of the emergency is not required; however an NRC notification should be made within one hour of the discovery of the undeclared event. Notify the Emergency Preparedness staff to ensure courtesy calls are made to offsite agencies.

6.0 REFERENCES

6.1 Technical Specifications

6.2 Final Safety Analysis Report (FSAR) Chapter 14, Appendix A

6.3 Point Beach Nuclear Plant Emergency Plan

6.4 Point Beach Design Basis Document (DBDs)

6.5 Abnormal Operating Procedures (AOPs)

6.6 Emergency Operating Procedures (EOPs)

6.7 Emergency Contingency Actions (ECAs)

6.8 Critical Safety Procedures (CSPs)

6.9 Point Beach Setpoint Document (STPT)

6.10 Security and Safeguards Contingency Plan

6.11 WCAP 7525-L, Likelihood and Consequences of Turbine Overspeed at the Point Beach Nuclear Plant.

6.12 Reg Guide 1.115, Protection Against Low-Trajectory Turbine Missiles

6.13 EPRI Document, "Guidelines for Nuclear Plant Response to an Earthquake," dated October, 1989

6.14 Probabilistic Safety Assessment - High Winds, and Others Sec 9, Rev 0, Dated July 1995

6.15 Bechtel Corporation, "Westinghouse Electric Corporation-Wisconsin Michigan Power Company-Point Beach Atomic Power Station-Design Criteria for Nuclear Power Plants Against Tornadoes," March 12, 1970, B-TOP-3.

6.16 SOER 85-5, Internal Flooding of Power Plant Buildings

6.17 NUREG/CR-4982, "Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82"

6.18 NRC Information Notice 90-08, "Kr-85 Hazards from Decayed Fuel"

6.19 NUREG-1022, Rev. 2, Event Reporting Guidelines 10CFR50.72 and 10CFR50.73.

7.0 BASES

B-1 Code of Federal Regulation, 10 CFR 50

B-2 NUREG-0654/FEMA-REP-1, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Plants, Revision 1, published November, 1980.

B-3 NUMARC NESP-007, Methodology for Development of Emergency Actions Levels, Revision 2, January 1992.

B-4 U.S. Regulatory Commission Position Paper, Branch Position on Acceptable Deviations to Appendix 1 to NUREG-0654/FEMA-REP-1, dated July 11, 1994.

ATTACHMENT A
EMERGENCY ACTION LEVEL (EAL) OVERVIEW MATRIX

CATEGORY		UNUSUAL EVENT	ALERT	SITE EMERGENCY	GENERAL EMERGENCY
Fission Product Barriers	See Also Attachment C	**1.1.1.1** Reactor coolant sample activity greater than Technical Specification TS 3.4.16 **1.1.2.1** Fuel monitor [1(2) RE-100] reading greater than 120 mRem/hr, OR 2 of 3 containment high radiation monitors read greater than 1000 R/hr. **1.1.3.1** Primary to secondary leakage greater than Technical Specification Reference TS 3.4.13.d (500 gallons per day in either steam generator). **1.1.4.1** Unisolable primary system leakage greater than Technical Specification Reference TS 3.4.13.c (10 gallons per minute). **1.1.5.1** Excess RCS cooldown OR cold overpressurization of the RCS (ST-4 Integrity Orange path.)	**1.1.1.2** Exceeding the LOSS threshold of either Fuel Clad OR Reactor Coolant System (RCS) barrier based on FPB Matrix (See Attachment C for thresholds). **1.1.2.2** Unisolable steam line break outside containment with greater than 10 gpm, but less than 50 gpm, primary to secondary leakage.	**1.1.1.3** Exceeding the LOSS threshold of any 2 fission product barriers based on FPB Matrix (See Attachment C for thresholds).	**1.1.1.4** Exceeding the LOSS threshold of any 2 fission product barriers AND exceeding the loss or challenge threshold of the 3rd barrier based on FPB Matrix (See Attachment C for thresholds).
System Malfunctions	2.1 Failure to Trip		**2.1.1.2** Failure of the reactor protection system (automatic or manual) to initiate and complete a trip which brings the reactor subcritical.	**2.1.1.3** Failure to rapidly bring the reactor subcritical from the Control Room (ST-1 Subcriticality Red Path).	
	2.2 Technical Specification Requirements	**2.2.1.1** Failure to reach Technical Specification required operating mode *or condition within the specified time limit of the LCO action* statement.			
	2.3 Loss of Indications / Communications	**2.3.1.1** Unplanned loss of most (approximately 75%) safety system annunciators or indications on Control Room Panels for greater than 15 minutes AND increased monitoring is required for safe plant operation. **2.3.2.1** Loss of all communications capability affecting the ability to either: Perform routine operations. OR Notify offsite agencies or personnel.	**2.3.1.2** Unplanned loss of most (approximately 75%) safety system annunciators or indications on Control Room Panels for greater than 15 minutes AND increased monitoring is required for safe plant operation. AND either: A significant plant transient in progress. OR Plant Process Computer is unavailable.	**2.3.1.3** Unplanned loss of most (approximately 75%) safety system annunciators or indications on Control Room Panels. AND Loss of ability to monitor critical safety function status. AND A significant plant transient in progress.	
	2.4 Safety System Performance		**2.4.1.2** Inability to maintain reactor coolant temperature less than or equal to 200°F.	**2.4.1.3** Primary to secondary leakage greater than 400 gpm. AND Inability to power BOTH buses A-05 AND A-06 from offsite sources.	
	2.5 Reactivity Transient	**2.5.1.1** Uncontrolled Rod Withdrawal (FSAR 14.1.1 & 14.1.2)			
	2.6 Feedwater Transient				**2.6.1.4** Transient initiated by loss of feedwater, followed by loss of auxiliary feedwater for > 1 hour. As indicated by ALL of the following: 1. Decreasing SG Levels- "A" SG [LI-461, LI-462, LI-463] "B" SG [LI-471, LI-472, LI-473] 2. No auxiliary feedwater flow- [FI-4002, FI-4007, FI-4014] [FI-4036, FI-4037]
Electrical Power	3.1 Loss of Vital AC Power	**3.1.1.1** Loss of all offsite AC capability to vital buses as indicated by the inability to power BOTH buses A-05 AND A-06 of a given unit from offsite sources for greater than 15 minutes. **3.1.2.1** Loss of all on-site AC power capability to power BOTH buses A-05 AND A-06 of a given unit from onsite sources (GO1 through GO4) for greater than 15 minutes.	**3.1.1.2** Loss of all safeguard bus AC power of a given unit as indicated by the inability to power BOTH buses A-05 AND A-06 OR B-03 AND B-04 AND Loss is for less than 15 minutes.	**3.1.1.3** Loss of all safeguard bus AC power of a given unit as indicated by the inability to power BOTH buses A-05 AND A-06. OR B-03 AND B-04 AND Loss is for greater than 15 minutes.	**3.1.1.4** Loss of all safeguard bus AC power of a given unit as indicated by the inability to power BOTH buses A-05 AND A-06 OR B-03 AND B-04 AND Loss is greater than 15 minutes AND Both narrow range S/G level less than [31%] 29% AND total feedwater flow to S/Gs less than 200 gpm (ST-3 Heat Sink Red Path.)
	3.2 Loss of Vital DC Power		**3.2.1.2** Loss of all vital DC power as indicated by less than 105 vdc on all station battery buses (D01, D02, D03, D04) for less than 15 minutes.	**3.2.1.3** Loss of all vital DC power as indicated by less than 105 vdc on all station battery buses (D01, D02, D03, D04) for greater than 15 minutes.	
Radiological	4.1 Off-site Radiological Release	**4.1.1.1** Vent radiation reading(s) exceed the high alarm setpoints for greater than 60 minutes. OR Liquid release in excess of alarm setpoints which cannot be isolated.	**4.1.1.2** Vent radiation readings exceed ten times the high alarm setpoints for greater than 15 minutes. OR Liquid release in excess of ten times alarm setpoint which cannot be isolated.	**4.1.1.3** a. Effluent monitors detect levels corresponding to either: (1) 0.1 Rem Total Effective Dose Equivalent (TEDE). (2) 0.5 Rem thyroid Committed Dose Equivalent (CDE) at the site boundary under actual meteorological conditions. b. Either of the above doses measured in the environs. c. Either of the above doses projected based on plant parameters.	**4.1.1.4** a. Effluent monitors detect levels corresponding to either: (1) 1 Rem Total Effective Dose Equivalent (TEDE). (2) 5 Rem thyroid Committed Dose Equivalent (CDE) at the site boundary under actual meteorological conditions. b. Either of the above doses measured in the environs. c. Either of the above doses projected based on other plant parameters.
	4.2 In-Plant Radiological Conditions		**4.2.1.2** Loss of control of radioactive material resulting in area radiation exceeding 1000X normal (or expected) levels within the Protected Area. Normal may be determined by trend recorder or other relevant data.		
Internal Events	5.1 Security Threats	**5.1.1.1** Bomb, credible bomb threat, indication of sabotage, or attempted entry into the Protected Area by a hostile force.	**5.1.1.2** Intrusion into the Protected Area by a hostile force.	**5.1.1.3** Intrusion into a plant Vital Area by a hostile force.	**5.1.1.4** A Security Event which results in either: Loss of physical control of the Control Room. OR Loss of remote shutdown capability.
	5.2 Control Room Habitability		**5.2.1.2** Evacuation of the Control Room has been initiated with control of shutdown systems established from local stations.	**5.2.1.3** Evacuation of the Control Room without establishment of plant control from remote shutdown stations within approximately 15 minutes.	
	5.3 Fire / Explosion	**5.3.1.1** Near or on-site explosion as reported to Shift Manager by plant personnel making visual observation. **5.3.2.1** Fire within the Protected Area lasting more than 10 minutes after use of fire extinguishing equipment.	**5.3.1.2** Explosion affecting operability of one (1) train of safety systems. **5.3.2.2** Fire affecting operability of one (1) train of a safety system.	**5.3.1.3** Explosion affecting operability of two (2) trains of safety systems. **5.3.2.3** Fire affecting operability of two (2) trains of safety systems.	
	5.4 Turbine Rotating Component Failures	**5.4.1.1** Visual confirmation of turbine housing penetration by a blade or rotating component.			
External Events	6.1 Natural Destructive Phenomena	**6.1.1.1** Any earthquake felt by Control Room Operators. OR An indicator light on two or more of the following Seismic Event Monitors: SEI-6210 #3 Warehouse. SEI-6211 Unit 1 Façade. SEI-6212 Drum Prep Room. SEI-6213 El. 8' between vital switchgear room and Aux Feedwater tunnel. **6.1.2.1** Any tornado visible from the site.	**6.1.1.2** Valid Seismic Event Monitor readings of an intensity greater than 0.04g vertical or 0.06g horizontal. **6.1.2.2** Indications or observations that a tornado has damaged a vital structure. OR Sustained winds greater than 90 MPH.	**6.1.1.3** Valid Seismic Event Monitor readings of an intensity greater than 0.08g vertical or 0.12g horizontal. **6.1.2.3** Sustained winds greater than 100 MPH AND Reports or indications of damage to vital equipment or structures.	
	6.2 High Lake / Low Forebay Water Level	**6.2.1.1** Less than -11' forebay or pump bay level with one unit's CW pumps off. **6.2.2.1** Any flooding which precludes access to the site or areas of the plant.	**6.2.2.2** Flooding as indicated by greater than 6" of water in the 6" elevation of the Turbine Building.	**6.2.2.3** Greater than 2' of water in vital switchgear room OR Greater than 2' of water in auxiliary feedwater pump room	
	6.3 Toxic / Flammable Gas Intrusion	**6.3.1.1** Near or on-site flammable or toxic gas release as reported to Shift Manager by plant personnel making visual observation.	**6.3.1.2** Entry of toxic or flammable gas into a plant building atmosphere affecting operation or access.	**6.3.1.3** Entry of toxic or flammable gas into a plant vital area affecting operation or personnel safety AND Reactor coolant temperature greater than 200°F.	
	6.4 Vehicle / Missile Impacts	**6.4.1.1** Unusual aircraft activity over facility.	**6.4.1.2** Aircraft crash in protected area (within the fence). **6.4.2.2** Missile impact from any source by visual observation of Operations Supervisor.	**6.4.1.3** Aircraft crash affecting operability of two (2) trains of safety systems. **6.4.2.3** Any missile impact affecting operability of two (2) trains of safety systems.	
Fuel Handling/ISFSI Events	7.1 Fuel Handling Events		**7.1.1.2** Report of possible damage to irradiated fuel combined with an alarm on any of the following radiation monitors: RE-211, Containment air particulate monitor. RE-212 Containment noble gas monitor. RE-221 Drumming Area Vent. Manipulator Area Monitor. Spent Fuel Bridge Area Monitor.		
	7.2 Irradiated Fuel Events		**7.2.1.2** Indications of irradiated fuel uncovered.		
	7.3 ISFSI Events	**7.3.1.1** A loaded spent fuel cask dropped or tipped.	**7.3.1.2** Breach of a loaded spent fuel cask as indicated by a reading greater than 1000 mr/hr at 1 meter.		
Judgment		**8.1.1.1** Any event which in the judgement of the Shift Manager or the Emergency Director could lead to, or has led to, *a potential* degradation of the level of safety of the plant.	**8.1.1.2** Any event which in the judgement of the Shift Manager or the Emergency Director could cause or has caused actual or potential substantial degradation of the level of safety of the plant.	**8.1.1.3** Any event which in the judgement of the Shift Manager or the Emergency Director could indicate actual or likely major failures of plant functions needed to protect the public. Any releases are not expected to result in exposures in excess of EPA PAGs.	**8.1.1.4** Any event which in the judgement of the Shift Manager or the Emergency Director could lead to actual or imminent core damage and the potential for a large release of radioactive material (in excess of EPA PAGs) outside the site boundary.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.1.1

Sub-Category: None

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Reactor coolant sample activity greater than Technical Specification TS 3.4.16.

Basis:

This EAL is related to a Fission Product Barrier challenge. See Attachment C for additional information.

Elevated reactor coolant activity represents a potential degradation in the level of safety of the plant and is a potential precursor of more serious problems. This EAL addresses reactor coolant samples exceeding coolant Technical Specifications (TSAC 3.4.16.B or TSAC 3.4.16.C has been entered).

Technical Specifications allow exceeding normal coolant activities for limited time periods (TSAC 3.4.16.A). This EAL does not apply while operating within these allowances.

Because RCS leakage and coolant activity are considered precursors to more serious events, and because they should be treated alike (each relating to a Fission Product Barrier) declaration shall be upon validation and shall **NOT** be delayed until Technical Specification's actions are taken.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 3b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.1.2

Sub-Category: Loss of One Barrier

Emergency Classification: **ALERT**

Emergency Action Level:

Exceeding the LOSS threshold of either Fuel Clad OR Reactor Coolant System (RCS) barrier based on FPB Matrix (See Attachment C for thresholds).

Basis:

This Fission Product Barrier (FPB) EAL refers to exceeding the LOSS threshold of either the Fuel Cladding or Reactor Coolant System barrier by comparing plant conditions to the thresholds outlined in the FPB Matrix (Attachment C).

The FPB Matrix LOSS criteria indicate values at which either the Fuel Cladding or RCS barrier has been breached to the point that it no longer serves as an effective barrier to the travel of fission products. This value is not intended to represent total loss, however one of these two essential barriers is no longer serving its function. A substantial reduction in the level of safety at the plant exists, therefore an Alert classification is appropriate.

Loss of the Containment barrier (by itself) does not create an immediate transport of fission products as the Containment is designed to be a backup to the cladding and RCS barriers. Therefore, if only the Containment barrier is lost, it will be dealt with by Technical Specification action statements. However, if either the Fuel Cladding or RCS barrier is lost, the Containment barrier will be considered at the same level as these.

References:

NEI 97-03 Rev. 2

NUREG 0654, Appendix 1 Initiating Condition: Alert 1b,1c, 5

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.1.3

Sub-Category: Loss of Two Barriers

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Exceeding the LOSS threshold of any 2 fission product barriers based on FPB Matrix (See Attachment C for thresholds).

Basis:

This Fission Product Barrier (FPB) EAL refers to exceeding the LOSS threshold of any two of the three fission product barriers; fuel cladding, reactor coolant system, or containment by comparing plant conditions to the thresholds outlined in the FPB Matrix (Attachment C).

The third barrier must remain INTACT. If challenged or lost, a General Emergency exists.

The FPB Matrix LOSS criteria indicate values at which barriers have been breached to the point that they no longer serve as effective barriers to the travel of fission products. These values are not intended to represent total loss, however two important barriers are no longer serving their function. This represents a major failure in plant systems needed to protect the public, therefore a Site Emergency classification is appropriate.

References:

NEI 97-03

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 5

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.1.4

Sub-Category: Loss of Three Barriers

Emergency Classification: **GENERAL EMERGENCY**

Emergency Action Level:

Exceeding the LOSS threshold of any 2 fission product barriers AND exceeding the loss OR challenge threshold of the 3rd barrier based on the FPB Matrix (See Attachment C for thresholds).

Basis:

This Fission Product Barrier (FPB) EAL refers to exceeding the LOSS threshold of any TWO of the three fission product barriers; fuel cladding, reactor coolant system, or containment AND also exceeding EITHER the loss OR challenge threshold on the third barrier by comparing plant conditions to the thresholds outlined in the FPB Matrix (Attachment C).

The FPB Matrix LOSS criteria indicate values at which barriers have been breached to the point that they no longer serve as effective barriers to the travel of fission products. These values are not intended to represent total loss, however the barriers are no longer serving their function. The loss of two and a loss or challenge of the third available barrier represents major failures to plant systems needed to protect the public with the actual or potential release of significant amounts of radioactive materials offsite, therefore a General Emergency classification is appropriate.

References:

NEI 97-03 Rev.2

NUREG 0654, Appendix 1 Initiating Condition: General Emergency 2

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.2.1

Sub-Category: None

Emergency Classification : **UNUSUAL EVENT**

Emergency Action Level:

Failed fuel monitor [1(2) RE-109] reading greater than 120 mRem/hr, or 2 of 3 containment high range monitors read greater than 1000 Rem/hr.

Basis:

This EAL is related to a Fission Product Barrier challenge. See Attachment C for additional information.

Other indications should accompany this indication, such as increased radiation on RE-106 or on hand-held instruments.

Elevated reactor coolant activity as indicated by the failed fuel monitor [1(2) RE-109] represents a potential degradation in the level of safety of the plant and is a potential precursor of more serious problems. This EAL addresses failed fuel monitor readings exceeding approximately 0.1% fuel clad failures.

Because RCS leakage and coolant activity are considered precursors to more serious events, and because they should be treated alike (each relating to a Fission Product Barrier) declaration shall be upon validation and shall **NOT** be delayed until Technical Specification's actions are taken.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 3c

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.2.2

Sub-Category: Loss of One Barrier

Emergency Classification: **ALERT**

Emergency Action Level:

Unisolable steam line break outside containment with greater than 10 gpm , but less than 50 gpm, primary to secondary leakage.

Basis:

This EAL reflects a unique Initiating Condition from NUREG-0654. It does not meet the loss of one barrier criteria from Attachment C (Fission Product Barrier matrix), yet will be classified as an Alert.

Because an unisolable steam line break is evaluated under the *Containment* section of the Fission Product Barrier matrix, it would not result in an Alert by itself. Because the primary to secondary leakage rate (10 gpm) is less than the LOSS criteria for RCS, it would not result in an Alert. The 10 gpm *does* meet the CHALLENGE criteria therefore is an Unusual Event. However, there is no logic in the FPB matrix for combinations of LOSS of Containment with CHALLENGE of another barrier.

Due to the unique, specific criteria of NUREG-0654, Appendix 1 criteria, this EAL covers the unique condition of an unisolable steam line break, combined with a small primary to secondary leak.

If the steam line can be isolated, no emergency is warranted. If the steam line cannot be isolated, and the other Fission Product Barriers are INTACT (No leakage, or leakage below 10 gpm) then no emergency is applicable UNLESS the SM determines a potential degradation in the level of safety.

If the steam line cannot be isolated AND primary to secondary leakage is greater than 10 gpm, but less than 50 gpm, then this EAL applies and an Alert must be declared.

If the primary to secondary leak rate exceeds 50 gpm, then the LOSS criteria for RCS Fission Product Barrier has been met. This would constitute LOSS of two barriers, and would be a Site Emergency on EAL 1.1.1.3.

References:

NEI 97-03 Rev. 2

NUREG 0654, Appendix 1 Initiating Condition: Alert 4

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.3.1

Sub-Category: None

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Primary to secondary leakage greater than Technical Specification Reference TS 3.4.13.d (500 gallons per day through any one steam generator).

Basis:

This EAL is related to a Fission Product Barrier challenge. See Attachment C for additional information.

Leakage from the RCS in excess of Technical Specifications is considered by the NRC to be a precursor to more serious events. Therefore, an Unusual Event must be declared even if Technical Specification actions are taken.

Because RCS leakage and coolant activity are considered precursors to more serious events, and because they should be treated alike (each relating to a Fission Product Barrier) declaration shall be upon validation and shall **NOT** be delayed until Technical Specification's actions are taken.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 5

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.4.1

Sub-Category: None

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Unisolable primary system leakage greater than Technical Specification Reference TS 3.4.13.c (10 gallons per minute).

Basis:

This EAL is related to a Fission Product Barrier challenge. See Attachment C for additional information.

Leakage from RCS in excess of Technical Specifications which cannot be isolated is considered by the NRC to be a precursor to more serious events. Therefore, an Unusual Event must be declared even if Technical Specification actions are taken.

Because RCS leakage and coolant activity are considered precursors to more serious events, and because they should be treated alike (each relating to a Fission Product Barrier) declaration shall be upon validation and shall **NOT** be delayed until Technical Specification's actions are taken.

References:

PBNP Technical Specifications

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 5

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fission Product Barriers

EAL 1.1.5.1

Sub-Category: None

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Excess RCS cooldown or cold overpressurization of the RCS (ST-4 Integrity Orange path)

Basis:

The following conditions meet ST-4 Integrity - Orange Path criteria. A challenge to the RCS barrier is present due to excessive cooldown or cold overpressurization as indicated below:

Decrease in temperature in either cold leg greater than 100°F in the last 60 minutes AND temperature in either cold leg less than 315°F.

OR

Temperature in either cold leg less than 315°F and RCS pressure greater than 425 psig.

Any actual loss of RCS barrier warrants declaration of an Alert per the FPB matrix, Attachment C.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 17

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.1.1.2

Sub-Category: Failure to Trip

Emergency Classification: **ALERT**

Emergency Action Level:

Failure of the reactor protection system(automatic or manual) to initiate and complete a trip which brings the reactor subcritical.

Basis:

The reactor protection system may be actuated either by automatic means (exceeding pre-determined thresholds which result in trip signals) or by operator action (manual trip).

The failure of EITHER of these means to cause a trip with subsequent subcriticality meets this EAL (an Alert).

If BOTH these means AND all other means from the Control Room fail, see EAL 2.1.1.3 (a Site Emergency).

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 11

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.1.1.3

Sub-Category: Failure to Trip

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Failure to rapidly bring the reactor subcritical from the Control Room. (ST-1 Subcriticality Red Path)

Basis:

CSFST Subcriticality - RED path is entered based on failure of power range indication (N-41, N-42, N-43, N-44) to decrease below 5% following a reactor trip. This EAL addresses any manual trip or automatic trip signal followed by a manual trip or other Control Room actions which fail to rapidly shut down the reactor.

If any actions must be taken outside the Control Room to effect a reactor trip this EAL is also met.

This condition indicates failure of both the automatic and manual protection systems to trip the reactor, to an extent that emergency boration is required: or actions are needed outside the Control Room to trip the reactor. The failure of both front line and backup protection systems to function in response to a plant transient, along with the continued production of heat, poses a direct threat to fuel clad and RCS integrity and thus warrants declaration of a Site Emergency.

This EAL is synonymous with entry into CSP S-1.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 9

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.2.1.1

Sub-Category: Technical Specification Requirements

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Failure to reach Technical Specification required operating mode or condition within the specified time limit of the LCO action statement.

Basis:

Limiting Conditions of Operation (LCOs) action statements require the plant to be brought to a required condition (often shutdown) when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by the site Technical Specification requires a four hour report under 10 CFR 50.72 (b) non-emergency events. The plant remains within its evaluated safety envelope while changing conditions or being shut down so long as it is accomplished within the completion time for the required action in the Technical Specifications.

An immediate Unusual Event is required when the plant is not brought to the required operating mode or condition within the allowable action statement time of the Technical Specifications. Declaration of an Unusual Event is based on the time at which the LCO-specified action statement time period elapses under the site Technical Specifications and is not related to how long a condition may have existed.

If a Notice of Enforcement Discretion (NOED) is approved by the NRC prior to the LCO action statement time expiration an emergency need not be declared.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 15

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.3.1.1

Sub-Category: Loss of Indications/Communications

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Unplanned loss of most (approximately 75%) safety system annunciators or indications on Control Room Panels for greater than 15 minutes AND increased monitoring is required for safe plant operation.

Basis:

This EAL recognizes the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment. Recognition of the normal availability of computer based indication equipment is considered.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities, which should not disable such large portions of the system(s).

It is not intended that personnel perform a count of the instrumentation or annunciation lost but use the judgment of the SM as the threshold for determining the severity of the plant condition. The increased monitoring portion of this EAL is met if the SM determines that additional personnel are required to provide increased monitoring of system operation to safely operate the plant.

It is recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific safety system indicators should remain a function of that specific system or component operability status, and is addressed by the specific Technical Specifications.

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

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

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 14

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.3.1.2

Sub-Category: Loss of Indications/Communications

Emergency Classification: **ALERT**

Emergency Action Level:

Unplanned loss of most (approximately 75%) safety system annunciators or indications on Control Room Panels for greater than 15 minutes
AND
Increased monitoring is required for safe plant operation
AND either:
A significant plant transient is in progress
OR
PPCS is unavailable.

Basis:

This EAL recognizes the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a transient. Recognition of the normal availability of computer based indication equipment is also considered.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities, which should not disable such large portions of the system(s).

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

It is not intended that personnel perform a count of the instrumentation or annunciation lost but the use the judgment of the SM as the threshold for determining the severity of the plant conditions. The increased monitoring portion of this EAL is met if the SM determines that additional personnel are required to provide increased monitoring of system operation to safely operate the plant.

It is recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status and is addressed by the specific Technical Specifications.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

"Significant transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power ramps of 10% or greater.

If both a major portion of the annunciation system and all computer monitoring is unavailable to the extent that additional personnel are required to monitor indications, the Alert is required. If the operating crew cannot monitor the transient in progress this will be escalated to a Site Emergency.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 14

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.3.1.3

Sub-Category: Loss of Indications/Communications

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Unplanned loss of most (approx. 75%) safety system annunciators or indications on Control Room Panels.
AND
Loss of ability to monitor critical safety function status
AND
A significant plant transient in progress.

Basis:

This EAL recognizes the INABILITY of the Control Room staff to monitor the plant response to a transient. A Site Emergency is considered to exist if the Control Room staff cannot monitor safety functions needed for protection of the public.

"Significant transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power ramps of 10% or greater.

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities, which should not disable such large portions of the system(s).

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 12

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.3.2.1

Sub-Category: Loss of Indications/Communications

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Loss of all communications capability affecting the ability to either:
Perform routine operations
OR
Notify offsite agencies or personnel.

Basis:

The purpose of this EAL is to recognize a loss of communications capability that EITHER defeats the plant operation's or staff's ability to perform routine tasks necessary for plant operations OR the ability to communicate problems with offsite authorities. The loss of offsite communications ability anticipated by this EAL is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

The onsite communications loss must encompass the loss of all means of routine communications (i.e., plant telephone system, Gai-tronics page system, portable radios).

The offsite communications loss must encompass the loss of all means of communications with offsite authorities. This should include Emergency Notification System (ENS) for NRC, Microwave lines, and radio. This EAL is also met when extraordinary means are being utilized to make communications possible (relaying of information from radio transmissions, individuals being sent to offsite locations, etc.).

Procedure DCS 2.1.1 describes lesser communications losses which must be reported to the NRC within eight hours.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 11

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.4.1.2

Sub-Category: Degradation of Safety System Performance

Emergency Classification: **ALERT**

Emergency Action Level:

Inability to maintain reactor coolant temperature less than or equal to 200°F.

Basis:

This EAL addresses complete loss of functions required for core cooling during refueling and cold shutdown modes. Escalation to Site Emergency or General Emergency would be through other EALs.

An uncontrollable reactor coolant temperature increase that approaches or exceeds the cold shutdown technical specification limit warrants declaration of an Alert. The concern of this EAL is the loss of control resulting in the loss of ability to maintain the plant in cold shutdown which is defined by reactor coolant temperature.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 10

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions

EAL 2.4.1.3

Sub-Category: Degradation of Safety System Performance

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Primary to secondary leakage greater than 400 gallons per minute
AND
Inability to power BOTH buses A-05 AND A-06 from offsite sources.

Basis:

400 gpm is also the expected output from a single SI pump @ 1400 psia RCS pressure. (See DBD-09).

Loss of offsite power combined with an RCS leak (from Primary to Secondary) of this magnitude constitute several major challenges to the protection of the public:

1. Operating on diesel generators.

2. Leak (rupture) near the capacity of a single Safety Injection pump.

3. Transport of any fission products from Primary to Secondary.

Therefore, major plant functions needed for the protection of the public have been affected. A Site Emergency is warranted.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 3

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions **EAL 2.5.1.1**

Sub-Category: Reactivity Transient

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Uncontrolled Rod Withdrawal (FSAR 14.1.1 and 14.1.2)

Basis:

A malfunction which results in an uncontrolled withdrawal of control rod(s) is a reactivity transient which indicates a potential degradation of the level of safety of the plant. This condition warrants an Unusual Event Classification.

Uncontrolled is defined as unwarranted rod motion that cannot be prevented by operator action (i.e., going to manual).

The Unusual Event classification is warranted if a reactor trip is required to stop rod motion.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 15.

FSAR 14.1.1, Uncontrolled Rod Withdrawal from Subcritical.

FSAR 14.1.2, Uncontrolled Rod Withdrawal at Power.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: System Malfunctions **EAL 2.6.1.4**

Sub-Category: Feedwater Transient

Emergency Classification: **GENERAL EMERGENCY**

Emergency Action Level:

Transient Initiated By Loss of Feedwater, followed by loss of auxiliary feedwater for greater than 1 hour. As indicated by All of the following:

1. *Decreasing SG Levels -*
   "A" SG [LI-461, LI-462, LI-463]
   "B" SG [LI-471, LI-472, LI-473]
2. *No auxiliary feedwater flow -*
   [FI-4002, FI-4007, FI-4014, FI-4036, FI-4037]

Basis:

This EAL assures that in the event of a prolonged total loss of feedwater, timely recognition of the loss of heat sink occurs.

Therefore, this condition is indicative of actual or imminent substantial core degradation with potential adverse consequences on the public health and safety. A GENERAL EMERGENCY is warranted.

References:

NUREG 0654, Appendix 1 Initiating Condition: General Emergency 5b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Loss of Electrical Power

EAL 3.1.1.1

Sub-Category: Loss of Vital AC Power

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Loss of all offsite AC capability to vital buses as indicated by the inability to power BOTH buses A-05 AND A-06 of a given unit from offsite sources for greater than 15 minutes.

Basis:

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

Therefore, this condition (which is indicative of degraded conditions, but with no adverse consequences on the public health and safety) is classified as an UNUSUAL EVENT.

If primary to secondary leakage also exists, see EAL 2.4.1.3.

References:

FSAR Section 8, Electrical Systems

DBD-22, 4160 VAC System

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 7a

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Loss of Electrical Power

EAL 3.1.1.2

Sub-Category: Loss of Vital AC Power

Emergency Classification: **ALERT**

Emergency Action Level:

Loss of all safeguard bus AC power of a given unit as indicated by the inability to power BOTH buses A-05 AND A-06, OR B-03 AND B-04.
AND
Loss is for less than 15 minutes.

Basis:

Loss of all AC power safeguards buses compromises critical plant safety functions including RHR, ECCS, containment heat removal, and maintaining the ultimate heat sink. Prolonged loss of all AC power safeguards buses may result in uncovering the core and loss of containment integrity, thus this event can escalate to a General Emergency. The site blackout coping analysis assumes that AC power can be restored in one hour.

This condition is entered when there are indications of a total loss of power to the safeguards buses A-05 and A-06 OR B-03 and B-04 from any source (on or off-site) for less than 15 minutes.

This condition is indicative of actual or potential substantial degradation to plant systems with possible adverse consequences on the public health and safety. An ALERT is warranted and must be declared.

This EAL escalates to a SITE EMERGENCY if loss of AC power continues for greater than 15 minutes.

References:

FSAR Section 8, Electrical Systems

DBD-22, 4160 VAC System

NUREG 0654, Appendix 1 Initiating Condition: Alert 7

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Loss of Electrical Power

EAL 3.1.1.3

Sub-Category: Loss of Vital AC Power

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Loss of all safeguard bus AC power of a given unit as indicated by the inability to power BOTH buses A-05 AND A-06, OR B-03 AND B-04.
AND
Loss is for greater than 15 minutes.

Basis:

Loss of all AC power safeguards buses compromises critical plant safety functions including RHR, ECCS, containment heat removal, and maintaining the ultimate heat sink. Prolonged loss of all AC power safeguards buses may result in the uncovering core and loss of containment integrity, thus this event can escalate to a General Emergency. The site blackout coping analysis assumes that AC power can be restored in one hour.

This condition is entered when there are indications of a total loss of power to the safeguards buses A-05 and A-06 OR B-03 and B-04 from any source (on or off-site) for more than 15 minutes.

Therefore, this condition (which is indicative of serious plant system conditions with adverse consequences on the public health and safety) is classified as a SITE EMERGENCY.

References:

FSAR Section 8, Electrical Systems

DBD-22, 4160 VAC System

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 6

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Loss of Electrical Power

EAL 3.1.1.4

Sub-Category: Loss of Vital AC Power

Emergency Classification: **GENERAL EMERGENCY**

Emergency Action Level:

Loss of all safeguard bus AC power of a given unit as indicated by the inability to power BOTH buses A-05 AND A-06, OR B-03 AND B-04.
AND
Loss is greater than 15 minutes.
AND
Both narrow range S/G level less than [51%] 29% AND total feedwater flow to S/Gs less than 200 gpm. (ST-3 Heat Sink Red path)

Basis:

Loss of all AC power safeguards buses compromises critical plant safety functions including RHR, ECCS, containment heat removal, and maintaining the ultimate heat sink. Prolonged loss of all AC power safeguards buses may result in the uncovering core and loss of containment integrity, thus this event can escalate to a General Emergency. The site blackout coping analysis assumes that AC power can be restored in one hour.

This EAL assures that in the event of a prolonged station blackout, timely recognition of the loss of heat sink occurs.

Therefore, this condition is indicative of grave plant conditions with potential adverse consequences on the public health and safety. A GENERAL EMERGENCY is warranted and must be declared.

References:

FSAR Section 8, Electrical Systems

DBD-22, 4160 VAC System

NUREG 0654, Appendix 1 Initiating Condition: General Emergency 5d

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Loss of Electrical Power **EAL 3.1.2.1**

Sub-Category: Loss of Vital AC Power

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Loss of all onsite AC power capability to power BOTH buses A-05 AND A-06 of a given unit from onsite sources (GO1 through GO4) for greater than 15 minutes.

Basis:

Loss of onsite safety related AC power sources reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power (station blackout). Therefore, an Unusual Event is warranted and must be declared. Fifteen minutes was selected as a threshold to exclude transient losses.

This condition is entered when there are indications of the unavailability of all the emergency diesel generators (GO1 through GO4) or that none of these sources can be aligned to either A-05 or A-06 for greater than 15 minutes.

Therefore, this condition (which is indicative of degraded conditions, but with no adverse consequences on the public health and safety) is classified as an Unusual Event.

References:

FSAR Section 8, Electrical Systems

DBD-22, 4160 VAC System

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 7b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Loss of Electrical Power

EAL 3.2.1.2

Sub-Category: Loss of Vital DC Power

Emergency Classification: **ALERT**

Emergency Action Level:

Loss of all vital DC power as indicated by less than 105 vdc on all station battery buses (D01, D02, D03, D04) for less than 15 minutes.

Basis:

Loss of all vital DC power compromises the ability to monitor and control plant safety functions. Prolonged loss of all DC power may result in uncovering the core and loss of containment integrity.

Loss of DC power to any AC bus creates the following conditions:

1. Associated breakers cannot be electrically opened or closed remotely or locally;

2. Electrical protection/interlock tripping of associated breakers is rendered inoperable including undervoltage stripping. The one exception is the 480 V individual breaker overloads which remain operable;

3. All associated breaker positions remain AS IS.

Loss of all vital onsite DC power may also be indicated by an "Annunciator Power Failure" alarm.

This EAL escalates to a SITE EMERGENCY if the power loss continues for greater than 15 minutes.

References:

FSAR Section 8, Electrical Systems

DBD-19, 125 VDC System

NUREG 0654, Appendix 1 Initiating Condition: Alert 8

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Loss of Electrical Power

EAL 3.2.1.3

Sub-Category: Loss of Vital DC Power

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Loss of all vital DC power as indicated by less than 105 vdc on all station battery buses (D01, D02, D03, D04) for greater than 15 minutes.

Basis:

Loss of all vital DC power compromises the ability to monitor and control plant safety functions. Prolonged loss of all DC power may result in uncovering the core and loss of containment integrity.

Loss of DC power to any AC bus creates the following conditions:

1. Associated breakers cannot be electrically opened or closed remotely or locally;

2. Electrical protection/interlock tripping of associated breakers is rendered inoperable including undervoltage stripping. The one exception is the 480 V individual breaker overloads which remain operable.

3. All associated breaker positions remain AS IS.

Loss of all vital onsite DC power may also be indicated by an "Annunciator Power Failure" alarm.

This condition (which is indicative of possible loss of control of the reactor coolant and containment barriers, with possible adverse consequences on the public health and safety) is classified as a SITE EMERGENCY.

References:

FSAR Section 8, Electrical Systems

DBD-19, 125 VDC System

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 7

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Radiological Conditions

EAL 4.1.1.1

Sub-Category: Off-site Radiological Release

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Vent radiation reading(s) exceed the high alarm setpoints for greater than 60 minutes,
OR
Liquid release in excess of high alarm setpoints which cannot be isolated.

Vent Radiation High Alarm Setpoints 9/99		Reference RMSARB for current setpoint values
1 RE 212	2.73 E-4 uCi/cc	if purging, 1.62E-2 if forced vent.
1 RE 215	2.71 E+0 uCi/cc	
RE 214	1.02 E–4 uCi/cc	
RE 221	1.58 E-4 uCi/cc	
RE 224	2.09 E-3 uCi/cc	
RE 225	1.36 E+0 uCi/cc	
2 RE 212	1.78 E-4 uCi/cc	if purging, 1.82E-2 if forced vent.
2 RE 215	2.71 E + 0 uCi/cc	

Liquid Release Limits		
Service Water Discharge 1(2) RE-229 High Alarm AND:		Waste Water Effluent RE-230 High Alarm AND:
1 Circ. Water pump **AND:**	**Release Limit** (uCi/cc):	1 Circ. Water pump **Release Limit** (uCi/cc):
2 Service Water pumps	4.12 E-5	3.70 E-4
3 Service Water pumps	3.27 E-5	
4 Service Water pumps	3.03 E-5	
5 Service Water pumps	2.87 E-5	
6 Service Water pumps	2.78 E-5	
2 Circ. Water pump **AND:**	**Release Limit** (uCi/cc):	2 Circ. Water pump **Release Limit** (uCi/cc):
2 Service Water pumps	7.00 E-5	6.29 E-4
3 Service Water pumps	5.56 E-5	
4 Service Water pumps	5.15 E-5	
5 Service Water pumps	4.88 E-5	
6 Service Water pumps	4.73 E-5	

Reference:
C.H. Onesti to G.J. Maxfield, 11/17/92, RE-229 and RE-230 Alarm Setpoints, NPM 92-1035.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Basis:

Unplanned airborne releases in excess of the site technical specifications, that cannot be reduced to within technical specifications within 60 minutes, represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose (which is very low in the Unusual Event emergency class) is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not controlled to within Technical Specification limits within 60 minutes.

Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 2 times Technical Specifications for 30 minutes, but which is terminated, does not exceed this EAL. However, the SM should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

Likewise, liquid release values (which would result in very low integrated dose) are not the primary concern. Rather, the fact that the release cannot be isolated represents a potential degradation in the level of safety.

References:

STPT 13.4, Effluent Monitors

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 2

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Radiological Conditions

EAL 4.1.1.2

Sub-Category: Off-site Radiological Release

Emergency Classification: **ALERT**

Emergency Action Level:

Vent radiation readings exceed ten times the high alarm setpoints for greater than 15 minutes.
OR
Liquid release in excess of ten times high alarm setpoint which cannot be isolated.

10 times Vent Radiation High Alarm Setpoints 9/99	Reference RMSARB for current setpoint values	
1 RE 212	2.73 E-3 uCi/cc	if purging, 1.62E-1 if forced vent
1 RE 215	2.71 E+1 uCi/cc	
RE 214	1.02 E–3 uCi/cc	
RE 221	1.58 E-3 uCi/cc	
RE 224	2.09 E-2 uCi/cc	
RE 225	1.36 E+1 uCi/cc	
2 RE 212	1.78 E-3 uCi/cc	if purging, 1.82E-1 if forced vent
2 RE 215	2.71 E+1 uCi/cc	

Liquid Release Limits		
Service Water Discharge 1(2) RE-229 High Alarm AND:		Waste Water Effluent RE-230 High Alarm AND:
1 Circ. Water pump AND:	Ten times Release Limit (uCi/cc):	1 Circ. Water pump Ten times Release Limit (uCi/cc):
2 Service Water pumps	4.12 E-4	3.70 E-3
3 Service Water pumps	3.27 E-4	
4 Service Water pumps	3.03 E-4	
5 Service Water pumps	2.87 E-4	
6 Service Water pumps	2.78 E-4	
2 Circ. Water pump **AND:**	**Ten times Release Limit** (uCi/cc):	2 Circ. Water pump **Ten times Release Limit** (uCi/cc):
2 Service Water pumps	7.00 E-4	6.29 E-3
3 Service Water pumps	5.56 E-4	
4 Service Water pumps	5.15 E-4	
5 Service Water pumps	4.88 E-4	
6 Service Water pumps	4.73 E-4	

Reference:
C.H. Onesti to G.J. Maxfield, 11/17/92, RE-229 and RE-230 Alarm Setpoints, NPM 92-1035.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Basis:

Release rates in excess of ten times technical specifications which continue for 15 minutes or longer represent a serious situation. Ideally, most releases will begin small, then increase, hence will progress through the Unusual Event classification, allowing time to stop or mitigate them. Assuming this is the case, significant time has passed during which attempts to reduce or terminate the release have failed. Therefore the required release duration for meeting this EAL was reduced to 15 minutes in recognition of the increased severity.

The final integrated dose (which is still expected to be low at these release rates) is not the primary concern here; it is the degradation in plant control implied by the fact that the release cannot be controlled.

Likewise, liquid release values (which would result in very low integrated dose) are not the primary concern. Rather, the fact that the release cannot be isolated represents a potential degradation in the level of safety.

References:

STPT 13.4, Effluent Monitors

NUREG 0654, Appendix 1 Initiating Condition: Alert 15

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Radiological Conditions

EAL 4.1.1.3

Sub-Category: Off-site Radiological Release

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

a. *Effluent monitors detect levels corresponding to either:*

   (1) 0.1 Rem Total Effective Dose Equivalent (TEDE).

   (2)0.5 Rem thyroid Committed Dose Equivalent (CDE). at the site boundary under actual meteorological conditions.

b. *Either of the above doses measured in the environs.*

c. *Either of the above doses projected based on plant parameters.*

Basis:

The 0.1 Rem TEDE is based on the 10 CFR 20 annual average population exposure. This value also provides a desirable gradient (one order of magnitude) between the Site Emergency and General Emergency classes. It is deemed that exposures less than this limit are not consistent with the Site Emergency class description. The 0.5 Rem CDE thyroid dose was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for whole body to thyroid.

Dose projection can be based on values obtained from effluent monitors, direct measurements taken in the environment, or any other appropriate plant parameters.

Integrated doses are not monitored in real-time but are projected. In establishing the duration used for the projection, care should be exercised to ensure the time estimates are realistic. If no educated guess can be made regarding estimated duration, the default (4 hours) shall be used.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 13a

EPPOS1, EPPOS on Acceptable Deviation from Appendix 1 of NUREG 0654

EPA400, Manual of Protection Action Guides and Protective Actions for Nuclear Incidents

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Radiological Conditions

EAL 4.1.1.4

Sub-Category: Off-site Radiological Release

Emergency Classification: **GENERAL EMERGENCY**

Emergency Action Level:

a. Effluent monitors detect levels corresponding to either:

(1) 1 Rem Total Effective Dose Equivalent (TEDE).

(2) 5 Rem thyroid Committed Dose Equivalent (CDE). at the site boundary under actual meteorological conditions.

b. Either of the above doses measured in the environs.

c. Either of the above doses projected based on other plant parameters.

Basis:

The 1 REM TEDE and the 5 REM CDE thyroid integrated doses are based on the EPA protective action guidance which indicates that public protective actions are indicated. This is consistent with the emergency class description for a General Emergency.

Dose projection can be based on values obtained from effluent monitors, direct measurements taken in the environment, or from any other appropriate plant parameters.

Integrated doses are not monitored in real-time but are projected. In establishing the duration used for the projection, care should be exercised to ensure the time estimates are realistic. If no educated guess can be made regarding estimated duration, the default (4 hours) shall be used.

References:

NUREG 0654, Appendix 1 Initiating Condition: General Emergency 1a

EPPOS1, EPPOS on Acceptable Deviation from Appendix 1 of NUREG 0654

EPA400, Manual of Protection Action Guides and Protective Actions for Nuclear Incidents

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Radiological Conditions

EAL 4.2.1.2

Sub-Category: In-Plant Radiological Conditions

Emergency Classification: **ALERT**

Emergency Action Level:

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

Basis:

By themselves indications of increased levels of radiation would only meet the Unusual Event class description (potential degradation in the level of safety). However, there is no specific Unusual Event EAL on increased radiation. This would be a judgment call by the SM. However, when increased radiation of *this* magnitude (1000x) is *combined* with "loss of control" a higher classification is warranted. Non-essential personnel should be assembled to ensure their safety. Additional manpower or other resources may 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 judgment of those concerned, control has been lost, AND radiation levels increase beyond 1000X normal or expected levels, this EAL is met.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 6

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.1.1.1

Sub-Category: Security Threats

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Bomb, credible bomb threat, indication of sabotage, or attempted entry into the Protected Area by a hostile force.

Basis:

This EAL is based on the PBNP Security Plan/ISFSI Security Plan. An actual bomb, credible bomb threat, act of sabotage, or attempted entry into the Protected area by a hostile force indicates a potential degradation in the level of safety at the plant. Therefore an Unusual Event classification is warranted.

The Protected Area Physical Barrier is defined in the Security Plan/ISFSI Plan.

A bomb discovered in or near a Plant Vital Area which could affect Safety-Related Functions would result in escalation of the emergency classification. An actual explosion (of a bomb or other source) would be classified based on EALs 5.3.1.1 through 5.3.1.3 depending upon its effects.

Security events that do not represent at least a potential degradation in the level of plant safety are reported under either 10 CFR 73.71 or 10 CFR 50.72 and do not require implementation of the Emergency Plan. Accidental, non-hostile entry, although reportable as a security event, does not warrant declaration of an emergency. The operative consideration is 'intent'. If no malicious intent is determined the EAL does not apply.

References:

SSCP - Security and Safeguards Contingency Plan

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 12

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.1.1.2

Sub-Category: Security Threats

Emergency Classification: **ALERT**

Emergency Action Level:

Intrusion into the Protected Area by a hostile force.

Basis:

For the purposes of this EAL, the intrusion into the Protected Area can be considered a significant security threat. An Alert classification is warranted. If entry is attempted, but not gained by a hostile force see the Unusual Event EAL.

The Protected Area Physical Barrier is defined in the Security Plan. Note: The Independent Spent Fuel Storage Installation (ISFSI) is a separate Protected Area.

Intrusion into a Plant Vital Area escalates this event to a Site Emergency.

Security events that do not represent at least a potential degradation in the level of plant safety are reported under either 10 CFR 73.71 or 10 CFR 50.72 and do not require implementation of the Emergency Plan. Accidental, non-hostile entry, although reportable as a security event, does not warrant declaration of an emergency. The operative consideration is 'intent'. If no malicious intent is determined the EAL does not apply.

References:

SSCP - Security and Safeguards Contingency Plan

NUREG 0654, Appendix 1 Initiating Condition: Alert 16

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.1.1.3

Sub-Category: Security Threats

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Intrusion into a plant Vital Area by hostile force.

Basis:

Hostile takeover of Vital Areas could lead to loss of physical control of the plant. Therefore a Site Emergency classification is warranted. The Plant Vital Areas are defined in the Security Plan.

Security events that do not represent at least a potential degradation in the level of plant safety are reported under either 10 CFR 73.71 or 10 CFR 50.72 and do not require implementation of the Emergency Plan. Accidental, non-hostile entry, although reportable as a security event, does not warrant declaration of an emergency. The operative consideration is 'intent'. If no malicious intent is determined the EAL does not apply.

References:

SSCP - Security and Safeguards Contingency Plan

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 14

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.1.1.4

Sub-Category: Security Threats

Emergency Classification: **GENERAL EMERGENCY**

Emergency Action Level:

A Security Event which results in either:

Loss of physical control of the Control Room

OR

Loss of remote shutdown capability.

Basis:

This EAL encompasses conditions under which unauthorized personnel have taken physical control of vital areas required to reach and maintain safe shutdown, with the potential that the intruders can cause a significant event with damage to plant systems, damage to the core, and ultimately a release of large amounts of radioactivity.

References:

SSCP - Security and Safeguards Contingency Plan

AOP-10A, Safe Shutdown - Local Control

NUREG 0654, Appendix 1 Initiating Condition: General Emergency 3

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.2.1.2

Sub-Category: Control Room Habitability

Emergency Classification: **ALERT**

Emergency Action Level:

Evacuation of the Control Room has been initiated with control of shutdown systems established from local stations.

Basis:

AOP-10A directs shutdown activities performed outside the Control Room.

This EAL does not imply that all actions associated with Alternate Shutdown shall be completed in order to avoid the higher EAL pertaining to Control Room evacuation (EAL 5.2.1.3). If the reactor successfully trips, if level, pressure, temperature, etc., are being controlled, and no impediments to the associated Shutdown activities are being encountered, this emergency classification is appropriate. If impediments are being encountered in completing critical Shutdown functions, and more than 15 minutes expire, EAL 5.2.1.3 is met.

Located within the Control Room are the controls, indications, annunciators, and communications equipment necessary for the safe operation of the plant. The ability to assess and control plant conditions and abnormal situations is significantly degraded without access to the Control Room.

With the Control Room evacuated, additional support, monitoring, and direction through the resources of the TSC and/or other emergency facilities is assumed to be necessary - therefore, the declaration of an Alert is appropriate and required.

References:

AOP-10A, Safe Shutdown - Local Control

NUREG 0654, Appendix 1 Initiating Condition: Alert 20

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.2.1.3

Sub-Category: Control Room Habitability

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Evacuation of the Control Room without establishment of plant control from remote shutdown stations within approximately 15 minutes.

Basis:

Located within the Control Room are the controls, indications, annunciators, and communications equipment necessary for the safe operation of the plant. The ability to assess and control plant conditions and abnormal situations is significantly degraded without access to the Control Room.

Once the Control Room is evacuated, if control is not established from remote shutdown stations within a reasonable amount of time (approximately 15 minutes), a significant threat to multiple fission product barriers exists should a plant transient or other emergency condition occur. If plant control cannot be established within this time frame, declaration of a Site Emergency is warranted due to extended lack of control of the plant.

Escalation to a higher classification, if appropriate, will be based on system malfunctions, fission product barrier degradation, radiation levels, or Emergency Director judgment.

References:

AOP-10A, Safe Shutdown - Local Control

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 18

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.3.1.1

Sub-Category: Fire / Explosion

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Near or on-site explosion as reported to Shift Manager by plant personnel making visual observation.

Basis:

No attempt is made in this EAL to assess the magnitude of damage. Reports of any explosion is sufficient for declaration.

On-site is defined as the exclusion area which is the area within the site boundary surrounding PBNP in which the plant personnel have the authority to determine all activities including exclusion or removal of personnel and property from the area. At PBNP the outer boundary of the exclusion area is coincident with the site boundary. (Reference Appendix C of Emergency Plan).

As used here, an explosion is a rapid, violent, unconfined combustion or a catastrophic failure of pressurized equipment imparting significant energy to nearby structures and materials. If the explosion damages Safety Systems the event escalates to an Alert or Site Emergency.

The security aspects of the explosion should be considered.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 14c

SSCP - Security and Safeguards Contingency Plan

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.3.1.2

Sub-Category: Fire / Explosion

Emergency Classification: **ALERT**

Emergency Action Level:

Explosion affecting operability of one (1) train of safety systems.

Basis:

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

Only explosions that actually cause damage to equipment required for safe operation **AND** only damage that renders a single train of a safety system unable to perform its intended safety function meet the threshold of this EAL. A lengthy damage assessment should not be performed. The occurrence of the explosion with evidence of damage likely to prevent one train from performing its intended safety function is sufficient for declaration.

As used here, an explosion is a rapid, violent, unconfined combustion, or catastrophic failure of pressurized equipment that imparts significant energy to nearby structures and equipment.

If the explosion damages more than one train of a Safety System the event escalates to a Site Emergency.

The security aspects of the explosion should be considered.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 18c

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.3.1.3

Sub-Category: Fire / Explosion

Emergency Classification: **Site Emergency**

Emergency Action Level:

Explosion affecting operability of two (2) trains of safety systems.

Basis:

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

Only explosions that actually cause damage to equipment required for safe operation of more than one safety system train **AND** only damage that affects the systems' ability to perform intended functions meet the threshold of this EAL. A lengthy damage assessment should not be performed. An immediate assessment of the probability of damage making multiple trains incapable of performing their safety function is all that is required. The occurrence of the explosion with evidence of damage likely to prevent the equipment in more than one train of a safety system from performing intended safety functions is sufficient for declaration.

As used here, an explosion is a rapid, violent, unconfined combustion, or catastrophic failure of pressurized equipment that imparts significant energy to nearby structures and equipment.

If only one train of a safety system is affected, see ALERT classification EAL.

The security aspects of the explosion should be considered.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 18c

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.3.2.1

Sub-Category: Fire / Explosion

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Fire within the Protected Area lasting more than 10 minutes after use of fire extinguishing equipment.

Basis:

The purpose of this EAL is to address fires which are potentially significant precursors to damage to safety systems. This condition applies to buildings or areas contiguous to plant vital areas or other significant buildings or areas.

Specifically excluded are small fires within administration buildings, wastebasket fires, or fires in areas of no safety consequence.

Escalation to a higher emergency class occurs if the fire affects one or more train(s) of a Safety System(s).

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 10

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.3.2.2

Sub-Category: Fire / Explosion

Emergency Classification: **ALERT**

Emergency Action Level:

Fire affecting operability of one (1) train of a safety system.

Basis:

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

This condition is entered when the Fire Brigade Leader reports a fire affects one train of a safety system or if Control Room Operators become aware of indications of impact to a safety system after a fire has been reported.

Only those fires that actually cause damage to equipment as reported by the Fire Brigade Leader or as noted by Control Room operators meet this EAL.

Escalation to a higher emergency class, if appropriate, is based on further system malfunctions, fission product barrier degradation, abnormal radiation levels, or Emergency Director judgment.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 13

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.3.2.3

Sub-Category: Fire / Explosion

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Fire affecting operability of two (2) trains of safety systems.

Basis:

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

This condition is entered when the Fire Brigade Leader reports a fire that affects more than one train of a safety system or if Control Room Operators become aware of indications of impact on more than one train of a safety system after a fire has been reported.

Only fires that actually cause damage to equipment required for safe operation of more than one safety system train **AND** only damage that affects the systems' ability to perform intended functions meet the threshold of this EAL. A lengthy damage assessment should not be performed. An immediate assessment of the probability of damage making multiple trains incapable of performing their safety function is all that is required. The occurrence of a fire with evidence of damage likely to prevent the equipment in more than one train of a safety system from performing intended safety functions is sufficient for declaration.

This condition is indicative of severe degradation of the level of safety at the plant with possible adverse consequences on the public health and safety. A Site Emergency is warranted.

Escalation to a higher emergency class, if appropriate, will be based on fission product barrier degradation or emergency management judgment.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 11

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Internal Events

EAL 5.4.1.1

Sub-Category: Turbine Rotating Component Failures

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Visual confirmation of turbine housing penetration by a blade or rotating component.

Basis:

This initiation condition addresses the consequences of turbine failure and turbine missile effects.

Analyses documented in the FSAR on the consequences of turbine overspeed indicate that there would be only a low energy missile generated external to the low pressure turbine casing in the event of a turbine overspeed.

The study determined that the following components are subject to the possible effects of a turbine missile: one main steam line, the condensate storage tanks, reactor makeup water storage tanks, the reactor makeup water storage tank pumps, the refueling water storage tank, diesel generator fuel oil line, and the service water pump electrical leads. These components should be evaluated for damage.

Escalation to a higher emergency classification, if appropriate, is based on further missile damage from any source, system malfunctions, fission product barrier degradation, abnormal radiation levels, or emergency management judgment.

References:

WCAP 7525-L, Likelihood and Consequences of Turbine Overspeed at the Point Beach Nuclear Plant.

Reg Guide 1.115, Protection Against Low-Trajectory Turbine Missiles

FSAR 14.1.12, Likelihood of Turbine-Generator Unit Overspeed

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 14e and Alert 18e

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.1.1.1

Sub-Category: Natural Destructive Phenomena

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Any earthquake felt by Control Room Operators.
OR
An indicator light on two or more of the following Seismic Event Monitors
SEI-6210 — *#3 Warehouse*
SEI-6211 — *Unit 1 Facade*
SEI-6212 — *Drum Prep Room*
SEI-6213 — *El. 8' between vital switchgear room and aux feedwater tunnel*

Basis:

As defined in the EPRI sponsored "Guidelines for Nuclear Plant Response to an Earthquake," dated October 1989, a "felt earthquake" is:

An earthquake of sufficient intensity such that: (a) the ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and (b) for plants with operable seismic instrumentation, the seismic detectors of the plant are activated.

The seismic event monitors are set to alarm at 0.01g. Minor damage to some portions of the site may occur at these levels but should not affect the ability to safely operate the plant. Additional inspections may be desired to determine the extent of any damage. Therefore an Unusual Event classification is warranted.

This EAL requires two valid seismic alarms to eliminate classification due to plant operations or maintenance activities, such as heavy equipment moving near the monitor or an accidental impact to a monitor. Further validation may be accomplished by contacting the University of Wisconsin - Milwaukee Seismic Center.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

References:

PBNP FSAR, Appendix A

Setpoint Document STPT 22.1, Seismic Event Monitoring

EPRI Document, "Guidelines for Nuclear Plant Response to an Earthquake," dated October, 1989

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 13a

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.1.1.2

Sub-Category: Natural Destructive Phenomena

Emergency Classification: **ALERT**

Emergency Action Level:

Valid Seismic Event Monitor readings of an intensity greater than 0.04g vertical or 0.06g horizontal.

Basis:

This EAL addresses events that may have resulted in the plant's vital equipment being subjected to forces beyond operational limits. Therefore an Alert classification is warranted. Classification should occur prior to a detailed damage assessment.

Values in this EAL are based on the Operating Basis Earthquake (OBE) limits (ground accelerations of .04g vertical and .06g horizontal) as defined by the FSAR.

Validation of seismic activity would be by severe ground shaking or by contacting University of Wisconsin - Milwaukee Seismic Center (Emergency Telephone Directory).

References:

PBNP FSAR, Appendix A

Setpoint Document STPT 22.1, Seismic Event Monitoring

EPRI Document, "Guidelines for Nuclear Plant Response to an Earthquake," dated October 1989

NUREG 0654, Appendix 1 Initiating Condition: Alert 17a

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.1.1.3

Sub-Category: Natural Destructive Phenomena

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Valid Seismic Event Monitor readings of an intensity greater than 0.08g vertical or 0.12g horizontal.

Basis:

This EAL addresses events that may have resulted in the plant's vital equipment being subject to forces that may prevent safe shutdown and cooldown of the plant. Therefore a Site Emergency classification is warranted. Classification should occur prior to a detailed damage assessment.

Values in this EAL are based on the Safe Shutdown Earthquake (SSE) limits (ground accelerations of .08g vertical and .12g horizontal) as defined by the FSAR.

Validation of seismic activity would be by severe ground shaking or by contacting University of Wisconsin - Milwaukee Seismic Center (Emergency Telephone Directory).

References:

PBNP FSAR, Appendix A

Setpoint Document STPT 22.1, Seismic Event Monitoring

EPRI Document, "Guidelines for Nuclear Plant Response to an Earthquake," dated October 1989

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 15a

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.1.2.1

Sub-Category: Natural Destructive Phenomena

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Any tornado visible from the site.

Basis:

This EAL is based on the assumption that a tornado may potentially damage plant structures or systems. An Unusual Event classification is warranted.

This condition is entered when a tornado is reported to the Shift Manager by plant personnel making visual observation.

Site is defined as the exclusion area which is the area within the site boundary surrounding PBNP in which the plant personnel have the authority to determine all activities including exclusion or removal of personnel and property from the area. At PBNP, the outer boundary of the exclusion area is coincident with site boundary. (Reference Appendix C of Emergency Plan).

If damage to safety-related equipment is confirmed (either by observation or plant instrumentation) the event may be escalated to an Alert. Other EALs should also be considered such as loss of electrical power.

References:

AOP-13C, Severe Weather Conditions

Probabilistic Safety Assessment -- High Winds, and Others Sec 9, Rev 0, Dated July 1995

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 13c

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.1.2.2

Sub-Category: Natural Destructive Phenomena

Emergency Classification: **ALERT**

Emergency Action Level:

Indications or observations that a tornado has damaged a vital structure

OR

Sustained winds greater than 90 MPH.

Basis:

This EAL addresses events that may have resulted in a plant vital area being subjected to forces approaching or beyond design limits. It is assumed that damage may have occurred to plant safety systems. Therefore an Alert classification is warranted. Classification should occur prior to a detailed damage assessment.

The 90 MPH sustained wind speed was chosen as a value approaching the design basis for non-Class 1 metal structures at the plant. Although no damage to permanent plant structures should occur at this level, non-permanent structures (trailers, work shacks, temporary storage, etc.) could have significant damage and impact plant operations. Winds at this level would also impact personnel movement within and to the plant.

References:

AOP-13C, Severe Weather Conditions

FSAR 5.1, Containment System Structure

Probabilistic Safety Assessment -- High Winds, and Others Sec 9, Rev 0, Dated July 1995

Bechtel Corporation, "Westinghouse Electric Corporation--Wisconsin Michigan Power Company--Point Beach Atomic Power Station--Design Criteria for Nuclear Power Plants Against Tornadoes," March 12, 1970, B-TOP-3.

NUREG 0654, Appendix 1 Initiating Condition: Alert 17c

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.1.2.3

Sub-Category: Natural Destructive Phenomena

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Sustained winds greater than 100 MPH

AND

Reports or indications of damage to vital equipment or structures.

Basis:

This EAL addresses events that have resulted in plant areas being subjected to forces beyond design limits. It is assumed that substantial damage has occurred to plant structures with probable damage to safety systems.

It is inferred from Section 5.1 in the FSAR that the design straight wind speed of 108 mph was used in the design of the non-Class 1 metal structures. This is consistent with the Bechtel topical report. 100 mph was used in this EAL due to limitations of available instrumentation.

Therefore, this condition is indicative of serious plant system conditions with possible adverse consequences on the public health and safety. A Site Emergency is warranted.

Emergency classifications under other EALs may also be appropriate due to offsite effects caused by high winds, particularly status of offsite power lines.

References:

AOP-13C, Severe Weather Conditions

FSAR 5.1, Containment System Structure

Probabilistic Safety Assessment -- High Winds, and Others Sec 9, Rev 0, Dated July 1995

Bechtel Corporation, "Westinghouse Electric Corporation--Wisconsin Michigan Power Company--Point Beach Atomic Power Station--Design Criteria for Nuclear Power Plants Against Tornadoes," March 12, 1970, B-TOP-3.

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 15c

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.2.1.1

Sub-Category: High Lake/Low Forebay Water Level

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Less than -11' forebay or pump bay level with one unit's CW pumps off.

Basis:

This condition is considered a potential degradation in the level of safety of the plant due to Circulating Water Pumps and/or Service Water losing suction. Water levels at or below these levels impairs the ability of these pumps to provide water to their loads, and may result in subsequent loss of the safety function of the ultimate heat sink. Therefore, an Unusual Event classification is warranted.

References:

AOP-5A, Loss of Condenser Vacuum

AOP-13A, Circulating Water System Malfunction

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 13b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.2.2.1

Sub-Category: High Lake/Low Forebay Water Level

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Any flooding which precludes access to the site or areas of the plant.

Basis:

This condition is considered to be a potential degradation in the level of safety of the plant due to limited access to the site or potential safety concerns for onsite personnel. Therefore an Unusual Event classification is warranted.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 13b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.2.2.2

Sub-Category: High Lake/Low Forebay Water Level

Emergency Classification: **ALERT**

Emergency Action Level:

Flooding as indicated by greater than 6" of water in the 8 foot elevation of the Turbine Bldg.

Basis:

This EAL addresses an event that may result in a plant vital area being subjected to conditions beyond design limits adversely affecting plant safety systems. Therefore, this condition is indicative of abnormal plant conditions with possible adverse consequences on plant safety and is classified as an Alert.

This condition is entered when there is greater than six inches of water in the turbine hall. Although this EAL is in the category High Lake/Low Forebay, the cause of the flooding is not a factor. A broken Service Water or Circulating Water pipe could also create this condition.

The Turbine Building would flood before other plant areas, therefore it provides a representative indication of other possible problem areas. The feedwater pumps each sit on a base that is eight inches above the floor. The turbine seal oil pumps are approximately ten inches above the floor.

Escalation to a higher emergency class, if appropriate, will be based on Flooding in Vital Equipment Areas.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 17b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.2.2.3

Sub-Category: High Lake/Low Forebay Water Level

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Greater than 2' of water in vital switchgear room

OR

Greater than 2' of water in auxiliary feedwater pump room.

Basis:

This EAL addresses conditions where plant vital equipment may be subjected to conditions beyond design limits, and damage may be assumed to have occurred to plant safety systems. Therefore, this condition is indicative of serious plant system conditions with possible adverse consequences on the public health and safety. A Site Emergency is warranted.

Plant vital area designations are contained in the PBNP Security Plan.

Water levels in excess of two feet in the vital switchgear room severely threaten safe plant operations. Several 125-volt DC station batteries are installed in the vital switchgear room. The bottom and top of these batteries are 6 and 36 inches above the floor, respectively. Numerous electrical cabinets containing electrical components for the safety injection pumps, the station service transformers, and the 4.16 kV electrical system are also located in the room.

Water levels in excess of two feet in the auxiliary feedwater pump room threatens operation of the feedwater system and ultimately the ability to cool the reactor core. The turbine-operated auxiliary feedwater pumps are located approximately 18 inches above the floor and the motor operated auxiliary feedwater pumps are located approximately two feet above the floor. Additionally, the Source Range Output Expansion Control Panel is approximately two feet above the floor.

This EAL used to also contain criteria of greater than three feet of water in both EDG rooms, however this was before G03 and G04 were installed, hence spoke of G01 and G02 only. Due to the electrical arrangement of G03 and G04 as backups to G01 and G02 and the fact that G03 and G04 are at a significantly higher elevation, they have been removed from this EAL.

Emergency classifications under other EALs may be appropriate due to offsite effects caused by severe weather, particularly the status of offsite power lines.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

References:

SOER 85-5, Internal Flooding of Power Plant Buildings

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 15b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.3.1.1

Sub-Category: Toxic/Flammable Gas Intrusion

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Near or on-site flammable or toxic gas release as reported to Shift Manager by plant personnel making visual observation.

Basis:

The release of toxic or flammable gas near or on-site may pose a potential threat to reactor plant and personnel safety. It is the potential threat to normal operation or hazard to personnel which must be evaluated. If no such threat exists, the EAL is not met. If, however, personnel safety or plant operation is threatened, an Unusual Event is warranted.

Flammable gases are typically more limiting than toxic gases. Although an SCBA could protect from toxicity, detonation of a flammable gas could be immediately hazardous to personnel.

On-site is defined as the exclusion area which is the area within the site boundary surrounding PBNP in which the plant personnel have the authority to determine all activities including exclusion or removal of personnel and property from the area. At PBNP, the outer boundary of the exclusion area is coincident with the site boundary. (Reference Appendix C of Emergency Plan).

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 14d

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.3.1.2

Sub-Category: Toxic/Flammable Gas Intrusion

Emergency Classification: **ALERT**

Emergency Action Level:

Entry of toxic or flammable gas into a plant building atmosphere affecting operation or access.

Basis:

The release of toxic or flammable gas significant enough to affect plant operation (i.e., initiate a plant transient or preclude access to plant equipment) warrants declaration of an Alert:

Flammable gases are typically more limiting than toxic gases. Although an SCBA could protect from toxicity, detonation of a flammable gas could be immediately hazardous to personnel. An area where access is not required for plant operation, which could be evacuated, does not warrant an Alert, but may warrant an Unusual Event if the potential exists to affect operation or personnel.

Any affected area normally accessed for plant operation (PAB, Turbine hall, etc.) meets the Alert level. If vital areas are affected, see EAL 6.3.1.3.

The primary flammable gases considered are acetylene, propane and the hydrogen.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 18d

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.3.1.3

Sub-Category: Toxic/Flammable Gas Intrusion

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Entry of toxic or flammable gas into a plant vital area affecting operation or personnel safety

AND

Reactor coolant temperature greater than 200°F.

Basis:

The release of toxic or flammable gas into a plant vital area poses a significant threat to plant safety by precluding access to plant vital equipment which may be needed for Safe Shutdown. Therefore this condition warrants declaration of a Site Emergency.

Flammable gases are typically more limiting than toxic gases. Although an SCBA could protect from toxicity, detonation of a flammable gas could be immediately hazardous to personnel.

This EAL does not apply in cold shutdown or refueling modes due to the significantly reduced probability that the loss of access would result in fuel failure and/or a release.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 16c

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.4.1.1

Sub-Category: Vehicle/Missile Impacts

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Unusual aircraft activity over facility

Basis:

Security will determine unusual aircraft activity and report this information to the Shift Manager (SM). This event may warrant the prompt notification of state and local authorities. This event could pose a potential threat to plant operation or personnel safety and therefore warrants declaration of an Unusual Event.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 14a

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.4.1.2

Sub-Category: Vehicle/Missile Impacts

Emergency Classification: **ALERT**

Emergency Action Level:

Aircraft crash in Protected Area (within the fence)

Basis:

This condition is entered when Control Room Operators become aware of an aircraft crash in the Protected Area (within the fence).

A lengthy damage assessment should not be performed. The occurrence of a crash is sufficient for declaration.

The ISFSI is part of the protected area.

This condition is indicative of abnormal plant system conditions with possible adverse consequences on the public health and safety is classified as an ALERT.

Escalation to a higher emergency class, if appropriate, will be based on further system malfunctions, fission product barrier degradation, abnormal radiation levels, or Emergency Director judgment.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 18a

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.4.1.3

Sub-Category: Vehicle/Missile Impacts

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Aircraft crash affecting operability of two (2) trains of safety systems.

Basis:

This condition is indicative of severe degradation of the level of safety at the plant and with possible adverse consequences on the public health and safety is classified as a Site Emergency.

Only crashes that actually cause damage to equipment required for safe operation of more than one safety system train **AND** only damage that affects the systems' ability to perform intended functions meet the threshold of this EAL. A lengthy damage assessment should not be performed. The occurrence of a crash with evidence of damage likely to prevent the equipment in more than one train of a safety system from performing intended safety functions is sufficient for declaration.

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 16a

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.4.2.2

Sub-Category: Vehicle/Missile Impacts

Emergency Classification: **ALERT**

Emergency Action Level:

Missile impact from any source by visual observation of Operations Supervisor.

Basis:

This condition is entered when Operations Supervision become aware of a missile impact.

A lengthy damage assessment should not be performed. The occurrence of a missile impact is sufficient for declaration.

This condition is indicative of abnormal plant system conditions with possible adverse consequences on the public health and safety is classified as an ALERT.

Escalation to a higher emergency class, if appropriate, will be based on further system malfunctions, fission product barrier degradation, abnormal radiation levels, or emergency management judgment.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 18b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: External Events

EAL 6.4.2.3

Sub-Category: Vehicle/Missile Impacts

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Missile impact affecting operability of two (2) trains of safety systems.

Basis:

Safety systems as used here designates systems with safety-related functions. Attachment D lists safety systems and systems with safety-related functions.

Only missile impacts that actually cause damage to equipment required for safe operation of more than one safety system train **AND** only damage that affects the systems' ability to perform intended functions meet the threshold of this EAL. A lengthy damage assessment should not be performed. An immediate assessment of the probability of damage making multiple trains incapable of performing their safety function is all that is required. The occurrence of a missile impact with evidence of damage likely to prevent the equipment in more than one train of a safety system from performing intended safety functions is sufficient for declaration.

Major losses of plant safety systems, as defined by failure of the ability of two or more of the safety systems to perform their intended function, warrants declaration of a Site Emergency.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 16b

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fuel Handling/ISFSI Events

EAL 7.1.1.2

Sub-Category: Fuel Handling Events

Emergency Classification: **ALERT**

Emergency Action Level:

Report of possible damage to irradiated fuel combined with an alarm on any of the following radiation monitors

RE-211, Containment air particulate monitor

RE-212 Containment noble gas monitor

RE-221 Drumming Area Vent

Manipulator Area Monitor

Spent Fuel Bridge Area Monitor.

Basis:

A report of possible damage to irradiated fuel, combined with an alarm on any of the radiation monitors indicates the probable damage to spent fuel.

NUREG/CR-4982 states that even if no corrective actions are taken, no prompt fatalities are predicted and the risk of injury is low. In addition, NRC Information Notice No. 90-08 presents the following clarifications:

"In the event of a serious accident involving decayed spent fuel, protective actions would be needed for personnel on site, while offsite doses (assuming an exclusion area radius of one mile from the plant site) would be well below the Environmental Protection Agency's Protective Action Guides. Accordingly, it is important to be able to properly survey and monitor for Kr-85 in the event of an accident with decayed spent fuel."

An Alert classification is appropriate for this event. Escalation would be based on actual radiological releases and/or SM judgment.

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

References:

NUREG/CR-4982, "Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82"

NRC Information Notice No. 90-08, "Kr-85 Hazards from Decayed Fuel"

AOP-8B, Irradiated Fuel Handling Accident in Containment

AOP-8C, Fuel Handling Accident in Primary Auxiliary Building

NUREG 0654, Appendix 1 Initiating Condition: Alert 12

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fuel Handling/ISFSI Events

EAL 7.2.1.2

Sub-Category: Irradiated Fuel Events

Emergency Classification: **ALERT**

Emergency Action Level:

Indications of irradiated fuel uncovered.

Basis:

This EAL applies to any area where irradiated fuel is located; reactor cavity, reactor vessel, or the spent fuel pool.

Any releases caused by uncovering the fuel are not generally the primary concern. The primary concern of this EAL is two-fold. First, is the evident loss of control of inventory. The second is the immediate, life threatening dose which could be present in the area due to loss of shielding.

An Alert classification is appropriate for this event. Escalation, if required, would be based on actual radiological releases or Emergency Director judgment.

This EAL applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage.

References:

NUREG/CR-4982, "Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82"

NRC Information Notice No. 90-08, "Kr-85 Hazards from Decayed Fuel"

AOP-8F, Loss of Spent Fuel Pool Cooling

NUREG 0654, Appendix 1 Initiating Condition: Alert 12

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fuel Handling/ISFSI Events

EAL 7.3.1.1

Sub-Category: ISFSI Events

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

A loaded spent fuel cask dropped or tipped.

Basis:

The Independent Spent Fuel Storage Installation (ISFSI) stores spent fuel in vertical casks outside the main Protected Area. Engineering safeguards and procedures insure these casks are not dropped or tipped for the duration of their expected lifetimes. If they should be dropped or tipped it is appropriate to declare an Unusual Event until the situation is analyzed and corrected.

References:

NUREG/CR-4982, "Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82"

NRC Information Notice No. 90-08, "Kr-85 Hazards from Decayed Fuel"

AOP-8G, Ventilated Storage Cask (VSC) Drop or Tipover

NUREG 0654, Appendix 1 Initiating Condition: Alert 12

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Fuel Handling/ISFSI Events

EAL 7.3.1.2

Sub-Category: ISFSI Events

Emergency Classification: **ALERT**

Emergency Action Level:

Breach of a loaded spent fuel cask as indicated by a reading of greater than 1000 mRem/hr at 1 meter.

Basis:

The Independent Spent Fuel Storage Installation (ISFSI) stores spent fuel bundles in vertical cask in an area outside the main Protected Area. Engineering safeguards and procedures are in place to insure these casks are not subjected to forces that could breach their integrity. If a cask is breached it is appropriate to declare an Alert due to the potential threat to site personnel.

References:

NUREG/CR-4982, "Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82"

NRC Information Notice No. 90-08, "Kr-85 Hazards from Decayed Fuel"

NUREG 0654, Appendix 1 Initiating Condition: Alert 12

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Emergency Management Judgment

EAL 8.1.1.1

Sub-Category: None

Emergency Classification: **UNUSUAL EVENT**

Emergency Action Level:

Any event which in the judgment of the Shift Manager or the Emergency Director could lead to, or has led to, a potential degradation of the level of safety of the plant.

Basis:

This EAL would pertain to conditions not explicitly addressed elsewhere in the EALs, but which warrant the declaration of an emergency due to the potential degradation of the level of safety of the plant. The Shift Manager or Emergency Director makes this determination.

References:

NUREG 0654, Appendix 1 Initiating Condition: Unusual Event 15

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Emergency Management Judgment

EAL 8.1.1.2

Sub-Category: None

Emergency Classification: **ALERT**

Emergency Action Level:

Any event which in the judgment of the Shift Manager or the Emergency Director could cause or has caused actual or potential substantial degradation of the level of safety of the plant.

Basis:

This EAL would pertain to conditions not explicitly addressed elsewhere in the EALs, but which warrant the declaration of an emergency due to the actual or substantial potential degradation of the level of safety of the plant. The Shift Manager or Emergency Director makes this determination.

In keeping with other EALs, generally events which challenge single (RCS or Fuel Cladding) barriers, or affect only single safety systems or functions fall in this category.

References:

NUREG 0654, Appendix 1 Initiating Condition: Alert 19

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Emergency Management Judgment **EAL 8.1.1.3**

Sub-Category: None

Emergency Classification: **SITE EMERGENCY**

Emergency Action Level:

Any event which in the judgment of the Shift Manager or the Emergency Director could indicate actual or likely major failures of plant functions needed to protect the public. Any releases are not expected to result in exposures in excess of EPA PAGs.

Basis:

This EAL would pertain to conditions not explicitly addressed elsewhere in the EALs, but which warrant the declaration of an emergency due to the actual or likely failure of major plant functions needed for the protection of the public. The Shift Manager or Emergency Director makes this determination.

In keeping with other EALs, generally events which challenge two barriers (but not three), or affect more than one safety system or safety function, fall into this category.

References:

NUREG 0654, Appendix 1 Initiating Condition: Site Emergency 17

ATTACHMENT B
EMERGENCY ACTION LEVELS (EALs)

Category: Emergency Management Judgment

EAL 8.1.1.4

Sub-Category: None

Emergency Classification: **GENERAL EMERGENCY**

Emergency Action Level:

Any event which in the judgment of the Shift Manager or the Emergency Director could lead to actual or imminent core damage and the potential for a large release of radioactive material (in excess of EPA PAGs) outside the site boundary.

Basis:

This EAL pertains to conditions not explicitly addressed elsewhere in the EALs but which warrant declaration of an emergency due to actual or imminent core damage and the potential exists for a release of large amounts of radioactive material. The Shift Manager or Emergency Director makes this determination.

In keeping with other EALs, generally events which challenge all three barriers, indicate the potential for core damage, or which reflect possible large releases fall into this category.

References:

NUREG 0654, Appendix 1 Initiating Condition: General Emergency 4 and 7

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

This attachment is used to determine the status of the three primary Fission Product Barriers as they relate to classification. Wherever possible existing well-known parameters have been selected as thresholds for determining the status of the barriers. This is to integrate setpoints and thresholds already in existence in EOPs and Critical Safety Status Trees into the classification process. The intended purpose is to minimize the number of separate limits and values.

NOTE: Do not "anticipate" challenge or loss of a barrier unless the trend is rapid, and the values are close to the threshold/criteria.

The table on the following page may be used to 'check off' the status of the three Fission Product Barriers. Next to each code (FC-1, RL-2, etc.) is an empty box. If the plant conditions meet the conditions in the box, the associated box may be checked, either in the Challenged or Loss column.

The number and status of Fission Product Barriers may then be compared to the EALs that specifically address Fission Product Barrier status (category 1 of Attachment A).

- Generally, one barrier LOST is an Alert (unless the barrier is Containment alone),
- two barriers LOST is a Site Emergency, and
- two barriers LOST, with a CHALLENGE or LOSS of the third barrier is a General Emergency.

The codes (FC-1, RL-2, etc.) may be used to obtain further explanation as to the basis of their development. Each initial code letter; 'F' for Fuel Cladding, 'R' for Reactor Coolant System, or 'C' for Containment is followed by either 'C' for Challenge or 'L' for Loss. (For example FL-# indicates a parameter for Fuel Cladding LOSS, RC-# indicates a parameter for Reactor Coolant System Challenge.) The bases are on the pages following the Table, arranged by barrier, Challenge then Loss.

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

	FUEL CLAD CHALLENGE			FUEL CLAD LOSS	
	FC-1	ST-2 (Core Cooling) Orange Path. **Degraded** core cooling as indicated by ANY of the following: • CET <700°F AND reactor <25' NR • CET >700°F AND reactor >25' NR • Reactor vessel <[120]110' WR with 2 RCPs OR <[60]50' with 1 RCP.		FL-1	ST-2 (Core Cooling) Red Path. **Inadequate** core cooling as indicated by EITHER: • CETs >1200°F Also SAMG entry. • CETs > 700°F and reactor vessel level <25' NR
	FC-2	Failed fuel monitor (RE-109) reading greater than 120 mRem/hr. **Unusual Event (1.1.2.1)**		FL-2	Failed fuel monitor (RE-109) reading greater than 600 mRem/hr.
	FC-3	2 of 3 containment high range monitors reading greater than 1000 Rem/hr. **Unusual Event (1.1.2.1)**		FL-3	2 of 3 containment high range monitors reading greater than 6000 Rem/hr.
	FC-4	Coolant activity greater than Technical Specification TS 3.4.16 (TSAC 3.4.16.B or 3.4.16.C entered) **Unusual Event (1.1.1.1)**		FL-4	Coolant activity greater than 250 µCi/gram equivalent of I-131
	FC-5	Any condition which in the judgment of the Emergency Director is indicative of a challenge to the Fuel Cladding barrier.		FL-5	Any condition which in the judgment of the Emergency Director is indicative of a loss of the Fuel Cladding barrier.
	RCS CHALLENGE			**RCS LOSS**	
	RC-1	RCS leak greater than 10 gpm or 500 gallons per day in either steam generator (Technical Specifications). **Unusual Event (1.1.3.1, 1.1.4.1)**		RL-1	RCS leak greater than 50 gpm. If greater than 400 gpm, see also EAL 2.4.1.3
	RC-2	ST-4 (Integrity) Orange Path. Excess RCS cooldown or cold overpressurization of the RCS **Unusual Event (1.1.5.1)**		RL-2	ST-4 (Integrity) Red Path. Temperature in either cold leg <285°F and cooldown >100°F in the last 60 minutes.
	RC-3	Any condition which in the judgment of the Emergency Director is indicative of a challenge to the Reactor Coolant System barrier.		RL-3	Any condition which in the judgment of the Emergency Director is indicative of a loss of the Reactor Coolant System barrier.
	CONTAINMENT CHALLENGE			**CONTAINMENT LOSS**	
	CC-1	ST-5 (Containment) Orange Path. Containment pressure >25 psig and increasing following actuation of containment spray OR Sump 'B' >74"		CL-1	ST-5 (Containment) Red Path. Pressure >60 psig
	CC-2	Hydrogen concentration greater than 2%.		CL-2	Hydrogen concentration greater than 4%.
	CC-3	Atmospheric dump(s) or reliefs open and greater than 10 gpm Primary to Secondary leakage exists		CL-3	Unisolable steam line break outside containment. If primary to secondary leakage >10 gpm exists, see also EAL 1.1.2.2. If >50 gpm, see RL-1.
	CC-4	Any condition which in the judgment of the Emergency Director is indicative of a challenge to Containment barrier.		CL-4	Inability to isolate Containment.
				CL-5	Any condition which in the judgment of the Emergency Director is indicative of a loss of the Containment barrier.

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

Fuel Cladding - CHALLENGE

FC-1
ST-2 (Core Cooling) Orange Path indicates that RCS subcooling has been lost as well as loss of RCS inventory. RCS subcooling and reactor vessel level are fundamental indications of the assurance of adequate core cooling. These conditions indicate a challenge to the fuel cladding barrier due to **degraded** core cooling. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
FC-2
The function of the failed fuel monitor is to monitor coolant activity. As the fuel cladding barrier degrades increasing amounts of activity are present in the coolant, and seen by this monitor. The value selected is approximately Technical Specifications, hence an Unusual Event must also be declared at this value, if this is the only fission product barrier affected. (1.1.2.1) For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
FC-3
In-containment high radiation monitors monitor activity in the coolant. As the fuel cladding barrier degrades increasing amounts of activity are present in the coolant, and seen by these monitors. This parameter may be the first indication of cladding degradation due to the location of the failed fuel monitor and possible containment isolation. The value is not correlated to a specific percentage of clad damage. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
FC-4
Coolant activity greater than Technical Specifications is considered a precursor to loss of the fuel cladding barrier. (TSAC 3.4.16.B or 3.4.16.C has been entered). For purposes of emergency classification, the barrier is to be considered CHALLENGED.
FC-5
It is unlikely that any classification scheme can anticipate every circumstance. Therefore this 'threshold' criteria is based on an ad hoc judgment call. If the Emergency Director has reason to believe the integrity of this barrier is being challenged, he may declare it so. He should have objective reason to believe the barrier is challenged. Simply not knowing (for example loss of indications) should <u>not</u> be used as a basis for declaring a barrier challenged or lost. If the barrier is subsequently determined not to have been challenged, it may be declared intact. If it is determined that the barrier was challenged, but is no longer challenged, the barrier must remain as challenged, until the Recovery phase of the emergency. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

Fuel Cladding – LOSS

FL-1
ST-2 (Core Cooling) Red Path indicates that RCS subcooling has been lost as well as significant loss of RCS inventory. RCS subcooling and reactor vessel level are fundamental indications of the assurance of adequate core cooling. These conditions indicate the fuel cladding barrier has been subjected to conditions which may cause its failure due to **inadequate** core cooling.. For the purposes of emergency classification, the barrier is to be considered LOST. Core exit thermocouple reading in excess of 1200°F is also an entry condition for Severe Accident Management Guidelines (SAMGs).
FL-2
The function of the failed fuel monitor is to monitor coolant activity. As the fuel cladding barrier degrades increasing amounts of activity are present in the coolant, and seen by this monitor. The value is not correlated to a specific percentage of clad damage, but is beyond Technical Specifications. For the purposes of emergency classification, the barrier is to be considered LOST.
FL-3
In-containment high radiation monitors monitor activity in the coolant. As the fuel cladding barrier degrades increasing amounts of activity are present in the coolant, and seen by these monitors. This parameter may be the first indication of cladding degradation due to the location of the failed fuel monitor and possible containment isolation. The value is not correlated to a specific percentage of clad damage, but is beyond Technical Specifications. For the purposes of emergency classification, the barrier is to be considered LOST.
FL-4
Coolant activity greater than this level is not correlated to a specific percentage of clad damage, but is beyond Technical Specifications. For the purposes of emergency classification, the barrier is to be considered LOST.
FL-5
It is unlikely that any classification scheme can anticipate every circumstance. Therefore this 'threshold' criteria is based on an ad hoc judgment call. If the Emergency Director has reason to believe the integrity of this barrier is lost, he may declare it so. He should have objective reason to believe the barrier is lost. Simply not knowing (for example loss of indications) should <u>not</u> be used as a basis for declaring a barrier challenged or lost. If the barrier is subsequently determined not to have been lost, it may be declared intact, or challenged, as appropriate. If it is determined that the barrier was lost, but is no longer lost, the barrier must remain as lost, until the Recovery phase of the emergency. For the purposes of emergency classification, the barrier is to be considered LOST.

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

Reactor Coolant System - CHALLENGE

RC-1
These conditions represent minor leakage from the RCS. Because the source of the leak may not be known, and leaks can become worse, these conditions are considered precursors to more serious events. As such, an Unusual Event must be declared on these conditions, if the RCS is the only barrier affected. (1.1.3.1, 1.1.4.1) For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
RC-2
Conditions of ST-4 (Integrity) Orange Path reflect an excessive cooldown of the vessel or cold overpressurization of the RCS. These conditions represent a challenge to the RCS barrier. An Unusual Event must be declared. (1.1.5.1) For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
RC-3
It is unlikely that any classification scheme can anticipate every circumstance. Therefore this 'threshold' criteria is based on an ad hoc judgment call. If the Emergency Director has reason to believe the integrity of this barrier is being challenged, he may declare it so. He should have objective reason to believe the barrier is challenged. Simply not knowing (for example loss of indications) should not be used as a basis for declaring a barrier challenged or lost. If the barrier is subsequently determined not to have been challenged, it may be declared intact. If it is determined that the barrier was challenged, but is no longer challenged, the barrier must remain as challenged, until the Recovery phase of the emergency. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

Reactor Coolant System – LOSS

RL-1
This value is derived from NUREG-0654, Appendix 1. Although 50 gpm is well within the capacity of available pumps, this leak can be either into Containment or from Primary to Secondary systems. Thus, the RCS barrier is no longer serving its function of preventing the transport of fission products. For the purposes of emergency classification, the barrier is to be considered LOST.
RL-2
Conditions of ST-4 (Integrity) Red Path reflect an excessive cooldown of the vessel. These conditions indicate the RCS barrier has been subjected to conditions which may cause its failure For the purposes of emergency classification, the barrier is to be considered LOST.
RL-3
It is unlikely that any classification scheme can anticipate every circumstance. Therefore this 'threshold' criteria is based on an ad hoc judgment call. If the Emergency Director has reason to believe the integrity of this barrier is lost, he may declare it so. He should have objective reason to believe the barrier is lost. Simply not knowing (for example loss of indications) should not be used as a basis for declaring a barrier challenged or lost. If the barrier is subsequently determined not to have been lost, it may be declared intact, or challenged, as appropriate. If it is determined that the barrier was lost, but is no longer lost, the barrier must remain as lost, until the Recovery phase of the emergency. For the purposes of emergency classification, the barrier is to be considered LOST.

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

Containment - CHALLENGE

CC-1
ST-5 (Containment) Orange Path represent conditions beyond normal operating parameters due to either pressure or sump "B" level. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
CC-2
Existence of hydrogen at these concentrations does not yet represent an explosive mixture, however, there are limited means to reduce hydrogen in containment, especially during an emergency. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
CC-3
This challenge threshold is designed to ensure that if Fuel Cladding **AND** RCS barriers are LOST, a General Emergency would be declared if the atmospheric dump valves or relief valves on the affected steam generator open (or are opened) and greater than 10 gpm Primary to Secondary leakage exists. If the Primary to Secondary leakage is less than 10 gpm the RCS barrier may be considered intact. This threshold is included to address NUREG-0654, Appendix 1 Initiating Condition A4. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.
CC-4
It is unlikely that any classification scheme can anticipate every circumstance. Therefore this 'threshold' criteria is based on an ad hoc judgment call. If the Emergency Director has reason to believe the integrity of this barrier is being challenged, he may declare it so. He should have objective reason to believe the barrier is challenged. Simply not knowing (for example loss of indications) should not be used as a basis for declaring a barrier challenged or lost. If the barrier is subsequently determined not to have been challenged, it may be declared intact. If it is determined that the barrier was challenged, but is no longer challenged, the barrier must remain as challenged, until the Recovery phase of the emergency. For the purposes of emergency classification, the barrier is to be considered CHALLENGED.

ATTACHMENT C
FISSION PRODUCT BARRIER (FPB) MATRIX

Containment - LOSS

CL-1
ST-5 (Containment) Red Path represent conditions indicate the containment barrier has been subjected to conditions which may cause its failure. For the purposes of emergency classification, the barrier is to be considered LOST.
CL-2
Hydrogen at these concentrations may detonate. This would create an explosion in Containment. For the purposes of emergency classification, the barrier is to be considered LOST.
CL-3
Main steam line piping outside containment, up to and including the isolation valves may be considered a part of the Containment barrier. The inability to isolate assumes it is desired and has been attempted. This attempt includes only actions which may be taken from the Control Room. If actions must be taken outside the Control Room to isolate, the barrier must be considered lost. For the purposes of emergency classification, the barrier is to be considered LOST.
CL-4
This criteria includes all isolation paths, including access hatches. Only one valve or door in a given path need be closed. A physical loss of integrity (crack or hole) also meets this criteria. For the purposes of emergency classification, the barrier is to be considered LOST.
CL-5
It is unlikely that any classification scheme can anticipate every circumstance. Therefore this 'threshold' criteria is based on an ad hoc judgment call. If the Emergency Director has reason to believe the integrity of this barrier is lost, he may declare it so. He should have objective reason to believe the barrier is lost. Simply not knowing (for example loss of indications) should not be used as a basis for declaring a barrier challenged or lost. If the barrier is subsequently determined not to have been lost, it may be declared intact, or challenged, as appropriate. If it is determined that the barrier was lost, but is no longer lost, the barrier must remain as lost, until the Recovery phase of the emergency. For the purposes of emergency classification, the barrier is to be considered LOST.

ATTACHMENT D
SAFETY AND SAFETY-RELATED SYSTEMS

Designator	System	Safety-Related Functions
AF	Auxiliary Feedwater	Feedwater supply
AMSAC	ATWS Mitigation System Actuation Circuitry	Non-safety-related isolation
BS	Boron Recycle	Supports Safety Injection
CC	Component Cooling Water	Cools safety-related equipment
CI	Containment Integrity	Containment integrity
COMP	Computers	Monitoring
CONT	Containment Structures	Containment integrity
CP	Containment Penetrations	Containment integrity
CS	Condensate and Feedwater	Core Cooling
CV	Chemical and Volume Control	Emergency cooling, containment integrity
DA	Diesel Starting Air	Diesel start
DG	Diesel Generator	Emergency power supply
ESF	Engineered Safety Features (Safeguards)	Core Cooling and Integrity
FH	Fuel Handling	Fuel integrity
FM	In core Flux Mapping	Fuel integrity
FO	Fuel Oil	Power supply
FP	Fire Protection	Fire Protection
FW	Feedwater (I&C only)	Non-safety-related isolation
HV	Auxiliary Steam, Heating Steam & Condensate, Chilled & Hot Water	Containment cooling and integrity

ATTACHMENT D
SAFETY AND SAFETY-RELATED SYSTEMS

Designator	System	Safety-Related Functions
IA	Instrument Air	Containment isolation and integrity
IST	Inservice Test Equipment (i.e., steam generator nozzle dams)	Reactor coolant system integrity
MRR	Metering, Relaying, & Regulation	Monitoring
MS	Main, Extraction, Gland Seal & Reheat Steam	Containment integrity, heat removal
NG	Nitrogen Gas	Monitoring
NI	Nuclear Instrumentation	Reactor protection
PACV	Post-Accident Vent, Drains, etc.	Containment integrity, containment hydrogen control
PPCS	Plant Process Computer System	Monitoring
RC	Reactor Coolant	Reactor coolant system integrity, reactor protection, containment integrity
RDC	Rod Drive Control	Reactor coolant system integrity, reactor protection
RH	Residual Heat Removal (LPSI)	Containment integrity, emergency cooling
RM	Radiation Monitoring	Monitoring, RCS and containment integrity
RP	Reactor Protection	Reactor protection, monitoring,
RS	Radwaste Steam	Non-safety-related isolation
S	Structures	Safety-related equipment safety
SA	Service Air	Containment integrity
SF	Spent Fuel Cooling and Filtration	Heat removal and containment integrity
SC	Primary Sampling	Containment and RCS integrity
SI	Safety Injection (HPSI)	Emergency cooling, heat removal, containment integrity

ATTACHMENT D
SAFETY AND SAFETY-RELATED SYSTEMS

Designator	System	Safety-Related Functions
SW	Service Water	Feedwater supply, heat removal, containment integrity
VNBI	PAB Battery & Inverter Room H&V	Heat removal, battery room hydrogen control
VNCC	Containment Accident Fans H&V	Heat removal
VNDG	Diesel Generator Room H&V	Support Diesel operation
VNPSE	Containment Purge Supply & Exhaust H&V	Containment integrity
VNRC	Reactor Cavity Cooling H&V	Containment integrity
WG	Waste Gas	Containment integrity
WL	Waste Liquid	Containment integrity
Y	Vital Instrument Bus 120 VAC	Power supply
4.16KV	4160V Electrical	Power supply
480V	480V Electrical	Power supply
125V	125VDC Electrical	Power supply

EPIP 1.3

DOSE ASSESSMENT AND PROTECTIVE ACTION RECOMMENDATIONS

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1.0 PURPOSE

This procedure provides several methods to project offsite dose due to a release of radioactive material. These projections will be used to provide Protective Action Recommendations (PARs) to the State and Counties.

2.0 PREREQUISITES

2.1 Responsibilities

2.1.1 The Shift Manager (SM) is responsible for the radiological dose assessment and protective action recommendations using WEDAP, prior to TSC/EOF activation and formal transfer of responsibilities to the Emergency Director. If available, the SM may assign this task to the Operating Supervisor(s) (from unaffected unit) or the Shift Technical Advisor (STA). RMS-SS is used in the absence of WEDAP and Field Monitoring Team data is used in the absence of RMS-SS.

2.1.2 The Emergency Director may delegate the performance of radiological release evaluation portion of this procedure to the Dose/PAR Coordinator. The Dose/PAR Coordinator will advise the Emergency Director of the need to escalate the emergency classification or change protective action recommendations based upon radiological conditions.

2.1.3 The Dose/PAR Coordinator is responsible for the continuing dose assessment and Protective Action Recommendations to the Emergency Director using WEDAP, Field Monitoring Team data, RMS-SS, and/or manual calculations.

2.1.4 **IF** the Dose/PAR Coordinator is unable to perform radiological release evaluations,
THEN the Rad/Chem Coordinator in the TSC will assume this responsibility.

2.2 Equipment

2.2.1 Wisconsin Electric Dose Assessment Program (WEDAP)

2.2.2 Radiation Monitoring System-System Server (RMS-SS)

2.2.3 Plant Process Computer System (PPCS)

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Complete this procedure regardless of changing plant conditions.

3.2 PARs are made to the Sate and Counties by the Shift Manager or the Emergency Director, depending on the status of emergency facility activation. The Dose/PAR Coordinator (or the Rad Chem Coordinator if the EOF is not activated), performs dose projections and monitors offsite radiological conditions, develops the associated PAR and provides the PAR and basis to the Emergency Director.

3.3 PARs are developed from current rather than forecasted weather conditions. PARs are revised due to actual weather condition changes (e.g. wind shift occurs or atmospheric stability class changes) only when a revised dose projection or offsite radiological condition results in a change in PAR.

3.4 Use a realistic estimate of release duration in these calculations whenever possible.
IF the duration of the radiological release can **NOT** be determined from the current plant conditions,
THEN, assume a duration of four hours.

3.5 **IF** the meteorological data can **NOT** be obtained from the PPCS or the control room instruments,
THEN obtain the data from any of the following sources: (Reference ETD 02, Offsite Agency Call List):

3.5.1 National Weather Service in Green Bay

3.5.2 Kewaunee Nuclear Power Plant

3.5.3 Two Rivers Coast Guard Station

4.0 INITIAL CONDITIONS

4.1 EPIP 1.1, Course of Actions, in progress.

4.2 RMS or plant conditions suggest that a release is in progress or anticipated.

5.0 PROCEDURE

5.1 Protective Action Recommendations (PARs)

NOTE 1: PARs are made to the State and Counties by the Shift Manager or the Emergency Director, depending on the status of emergency facility activation. The Dose/PAR Coordinator (or the Rad Chem Coordinator if the EOF is not activated), performs dose projections and monitors offsite radiological conditions, develops the associated PAR and provides the PAR and basis to the Emergency Director.

NOTE 2: PARs are developed from current rather than forecasted weather conditions. PARs are revised due to actual weather condition changes (e.g. wind shift occurs or atmospheric stability class changes) only when a revised dose projection or offsite radiological condition results in a change in PAR.

NOTE 3: In some cases (e.g., short-duration puff release, inclement weather), sheltering may be an appropriate recommendation. This should be discussed with the state and/or counties, if appropriate.

NOTE 4: Lake breeze conditions exist if the difference between actual wind direction values for inland an near shore meteorological towers is greater than 90°.

5.1.1 IF the event is a General Emergency
AND ALL the following criteria are met,
THEN implement expanded PARS of evacuation for 0-5 miles all sectors and 5-10 miles downwind sectors. [EOF] (Ref Step 6.15)

a. Substantial core damage in progress or projected (>20%) (> 30,000 R/hr in containment high radiation monitors)

b. Large fission product in inventory in containment (more than GAP) (LOSS criteria for RCS barrier in EPIP 1.2, Attachment C, exceeded)

c. Imminent projected containment failure or release underway (LOSS criteria for containment barrier in EPIP 1.2, Attachment C, exceeded)

5.1.2 IF a General Emergency is declared AND there is indication of a lake breeze or low wind speed (<3mph),
THEN the PAR for the condition is evacuation 0-5 miles (all sectors).

5.1.3 IF a General Emergency is declared AND the conditions stated in step 5.1.1 and 5.1.2 DO NOT exist,
THEN the default PAR is evacuation 0-2 miles (all sectors) and 2-5 miles (3 or 4 downwind sectors centered on the average wind direction).

NOTE: Emergency Classifications and PARs shall be made to the State and Counties within 15 minutes of the emergency classification being declared or identification of a change in the required PAR.

5.1.4 PARs shall be documented on EPIP Form 2.1 and sent to the State and Counties.

5.1.5 There are no PARs required for Site Emergency, Alert, or Unusual Event emergency classifications.

5.1.6 IF a release is occurring or is imminent,
THEN radiological release evaluation and dose projection shall be completed using steps 5.2-5.5 as applicable to determine or revise the emergency classification and/or PAR.

a. WEDAP (section 5.2)

b. RMS-SS (section 5.3)

c. Offsite Field Measurements (section 5.4)

d. Manual Calculations (section 5.5)

NOTE: Review section 3.0 prior to revising the PAR.

5.2 Wisconsin Electric Dose Assessment Program (WEDAP)

NOTE: The "Source Term" and "Release Path" categories will have drop-down menus to determine the severity of the event and should be opened to select the appropriate category for the event. When opened, each drop-down menu has been organized to list the options from the least severe to the most severe.

**NOTE: IF WEDAP is NOT available in the Control Room,
THEN go to Step 5.3 for assessment by using RMS-SS,
OR, IF WEDAP is NOT available in the EOF (TSC if backup),
THEN go to Attachment C, "Reinstallation of WEDAP Software".**

5.2.1 Power up the designated personal computer (PC) using the master power switch to "boot up" into Windows NT, selecting "stand-alone" if presented with a selection of configurations during bootup.

5.2.2 Log on to the PC using the PC number (label affixed to PC) as both the identification number and password, entering it in lower case.

5.2.3 Launch WEDAP by selecting "Business Applications – WEDAP" or the "WEDAP icon".

5.2.4 Select "Start" when prompted at WEDAP introduction screen.

5.2.5 Enter a "Title" for this dose assessment case to provide retrievability if the case is saved.

5.2.6 Click on "Data" on the toolbar and select the option "Case Basis".

5.2.7 Click on the appropriate "Accident Type" for the event.

5.2.8 Update **all** the data fields in the "Source Term" section.

5.2.9 Update **all** the data fields in the "Release Path" section.

5.2.10 Click "OK" to return to the summary page.

5.2.11 Verify details in the "Accident Data" section are based upon the data selected in Steps 5.2.5 - 5.2.9, returning to "Data" and "Case Basis" to make corrections if necessary.

5.2.12 Update "Reactor Shutdown Time" data field with the correct data if applicable.

5.2.13 Update "Release Start" by entering the time the release to environment began.

5.2.14 Update "Release End" by entering the correct data for an estimated time the release to environment will terminate.
IF release duration is unknown,
THEN use four hours as a default value.

5.2.15 Update the "Meteorological Data" section categories by clicking on each data field and selecting the correct data:

a. Met Date

b. Stability Class (automatically updates "Building Wake" check box)

c. Sigma Theta (Only key-in value from PPCS if stability class unavailable and >3 mph wind speeds)

d. Lapse Rate (Only key-in value from PPCS if stability class is unavailable and <3 mph wind speeds)

e. Precipitation

f. Lake Breeze

g. Wind Speed

h. Wind Direction

5.2.16 Verify the data on the WEDAP main screen and make corrections if appropriate.

5.2.17 Click on the "Calculate" icon to perform the final dose assessment calculations, which automatically updates the dose assessment data fields.

5.2.18 Review the dose assessment result tabs (a single click for simple data OR double-click for expanded data).

a. Dose

b. Dose Rate

c. Event Class

d. PAR's

5.2.19 Compare the results of 5.2.18 against the current classification and PARs.

a. IF lake breeze present, do NOT use WEDAP for PAR recommendations. Use the following:

NOTE: **In some cases (e.g., short-duration puff release, inclement weather), sheltering may be an appropriate recommendation. This should be discussed with the state and/or counties, if appropriate.**

INTEGRATED PROJECTED DOSE	PROTECTIVE ACTION	MILES	SECTORS
Lake Breeze AND ≥1 rem TEDE at 1 mile OR ≥5 rem CDE at 1 mile	Evacuate	0-5 Miles	All (360°)
Lake Breeze AND ≥1 rem TEDE at 5 mile OR ≥5 rem CDE at 5 mile	Evacuate	0-10 Miles	All (360°)

b. IF in the Control Room AND the result of this assessment is an escalation of classification and/or PARs,
THEN go to EPIP 1.1, Step 5.6,
OR exit this procedure if NOT an escalation.

c. IF in the EOF (TSC if backup) AND the result of this assessment is an escalation of classification and/or PARs,
THEN immediately inform the Emergency Director and assist with EPIP 2.1 for initiating notifications,
OR proceed to the next step for a continuous dose assessment if NOT an escalation:

NOTE: **The "View" icon on the toolbar is to access additional tables and maps available for reference use.**

NOTE: **To save the data from a series of case assessments, click on "File," "Save Scenario File," and then reclick on "File" and "Restart WEDAP" to start a new scenario with new cases.**

5.2.20 Click on the "Print Case" icon to create a hard copy of the current case.
IF the printer connection is not established,
THEN go to EPIP 1.3, Attachment C, Step 2.0.

5.2.21 Click on the "Add Case" or "Insert Case" icon as appropriate to run the next dose assessment.

a. Determine if this case is to be based upon a cumulative dose and change the field as appropriate.

b. Repeat Steps 5.2.5 - 5.2.19

c. **IF** time permits to run a more detailed dose assessment case, **THEN** implement the following steps:

- Click on "Data," select the option "Equipment Status," enter the Unit affected, and update all the data fields in the "Equipment Status" section.

- Click on "Data," select the option "Measured Data," and select one of the following options for entering values from **actual** data sources:

  (a) "RMS Data - Manual Input" and update the field with the RMS monitors and readings in high alarm status.

  (b) "Offsite Measurements - Isotopic Data" and update the fields with the correct data, including selecting the nuclides involved.

  (c) "Offsite Measurements - Survey Reading" and update the fields with the correct data.

  (d) "Isotopic Release Rate" and select the nuclides involved, updating with the correct data.

NOTE: Cases can be generated on actual event data or "what-if" scenarios.

d. **IF** the case was built on a "what-if" scenario, **THEN** repeat Step 5.2.17, Step 5.2.18, and Step 5.2.20, **THEN** click on the "Delete Case" icon, **AND** repeat Step 5.2.21.

e. **IF** the case was built on the actual events in progress, **THEN** repeat Steps 5.2.17 - 5.2.19

Performed By:	
_____	_____/_____
Performer (Print and Sign)	Date / Time

5.3 Radiation Monitoring System-System Server (RMS-SS)

5.3.1 **IF** WEDAP
AND RMS-SS are unavailable,
THEN declare an ALERT to activate the Emergency Response Facilities (ERFs) so dose assessment can be performed using field data,
AND go to EPIP 1.1, Step 5.6,
AND Step 5.4 of this procedure, performing both simultaneously.

5.3.2 Verify RMS-SS is available:

a. The letters "M" (master) and "S" (slave) are intermittently displayed in the upper right hand corner of the SS monitor. The time is also correct and moving forward. This indicates BOTH SSs are operating.

OR

b. An "X" appears in the upper right hand corner of the SS monitor and the time is correct and moving forward. This indicates that a single SS is operating.

5.3.3 Estimate Release Rate Using Data From RMS-SS

NOTE: Using the "ESC" key returns the SS to the main menu screen

a. Obtain a list of monitors in high alarm by performing the following:

- From the Main Menu Screen (MMS), highlight (using arrow keys) "Display Status", press "Enter"
- Highlight "Status", press "Enter"
- Highlight item "20" (high alarm), press "enter" and all channels in high alarm will be listed

b. Call up data (microcuries/cc) on the RMS-SS for each monitor in high alarm by performing the following and log on Table 1:

- From the MMS, highlight "Data", press "Enter".
- Highlight "Ten Minute History" (or other interval as needed), press "Enter".
- Enter the DAM or SPING address (DAM1 to DAM8, SPING21 to SPING24), press "Enter".

- Enter channel number (1 to 9), press "Enter".
- Press "Enter" to toggle between available screens

c. Data may be printed by highlighting "Print" on the relevant screen and pressing "Enter".

TABLE 1
RELEASE MONITORS ALARMING

DAM	CHANNEL	RMS #	MONITOR	READING (µCi/cc)
1	3	1RE-212	U1 Cont. Purge	_____
2	3	2RE-212	U2 Cont. Purge	_____
3	9	1RE-231	SG 1A	_____
4	9	2RE-231	SG 2A	_____
5	2	1RE-232	SG 1B	_____
5	7	RE-221	Drum Area Vent	_____
5	8	RE-226	Comb A. E. High Range Steam Line	_____
6	6	RE-224	Gas Stripper Building	_____
6	2	2RE-232	SG2B	_____
7	1	RE-225	Comb A. E. Low Range	_____
7	4	RE-214	Aux Building Vent	_____
21	5	1RE-305	Low Range Gas, U1 Purge	_____
21	7	1RE-307	Medium Range Gas, U1 Purge	_____
21	9	1RE-309	High Range Gas, U1 Purge	_____
22	5	2RE-305	Low Range Gas, U2 Purge	_____
22	7	2RE-307	Medium Range Gas, U2 Purge	_____
22	9	2RE-309	High Range Gas, U2 Purge	_____
23	5	RE-315	Low Range Gas, Aux Bldg Vent	_____
23	7	RE-317	Medium Range Gas, Aux Bldg Vent	_____
23	9	RE-319	High Range Gas, Aux Bldg Vent	_____
24	5	RE-325	Low Range Gas, Drumming Area Vent	_____
24	7	RE-327	Medium Range Gas, Drumming Area Vent	_____

5.3.4 **IF** the release path monitor(s) is/(are) failed high and the associated SPING(s) is/(are) out of service,
THEN declare an ALERT to activate the Emergency Response Facilities (ERFs) so dose assessment can be performed using field data and/or WEDAP,
AND go to EPIP 1.1, Step 5.6,
AND Step 5.4 of this procedure, performing both simultaneously.

5.3.5 Record the highest in-range (**NOT** failed) alarming RMS channel readings (μCi/cc) for each release path on Table 2 and calculate the release rate.

TABLE 2
RELEASE RATE CALCULATIONS

NOTE: Conversion factors assume nominal flow rates.

RMS #	LOCATION	READING (µCi/cc)	CONVERSION (cc-Ci/sec-µCI)	RELEASE RATE (Ci/sec)
RE-214 RE-315 RE-317 RE-319	Auxiliary Building Vent	_____	x 33	= _____
RE-221 RE-325 RE-327	Drumming Area Vent	_____	x 20	= _____
1RE-212 1RE-305 1RE-307 1RE-309	U1 Containment Purge (0 or 1 fan) (2 fans)	_____ _____	x 6 x 12	= _____ = _____
2RE-212 2RE-305 2RE-307 2RE-309	U2 Containment Purge (0 or 1 fans) (2 fans)	_____ _____	x 6 x 12	= _____ = _____
RE-224	Gas Stripper Bldg	_____	x 6	= _____
RE-225 RE-226	Combined Air Ejectors	_____	x 0.012	= _____
RE-231 RE-232	A Steam Line Header B Steam Line Header			
	Atmospheric	_____	x 1.5	= _____
	1 Safety	_____	x 4.0	= _____
	2 Safeties	_____	x 8.0	= _____
	3 Safeties	_____	x 12.0	= _____
	4 Safeties	_____	x 16.0	= _____
	Release Rate Total (Ci/sec)			= _____

NOTE: IF desired PPCS points have poor or bad quality, THEN obtain σθ and lapse rate readings from the Control Room indications, AND THEN reference Table 4 to determine stability class.

5.3.6 Calculate the Dispersion Factor (X/Q) at the Site.

a. Obtain the wind speed and stability class from the PPCS "Release/MET Summary" screen. Record wind speed in Step 5.3.6.c equation.

b. Select the appropriate Xu/Q factor value from the table below based upon the stability class. Record the X/Q factor value in Step 5.3.6.c equation.

Stability Class	Xu/Q
A	9.92E-07
B	1.18E-05
C	4.28E-05
D	1.34E-04
E	2.55E-04
F	5.38E-04
G	1.04E-03

c. Calculate the dispersion factor:

$$\frac{\qquad}{\text{(step b above)}}\ \text{Xu/Q (mph/m}^3\text{/s)} \div \frac{\qquad}{\text{wind speed (mph)}} = \frac{\qquad}{}\ \text{X/Q (s/m}^3\text{)}$$

5.3.7 Determine the Estimated Duration (ERD) in hours, of release. Use four hours as a default if the ERD is unknown.

5.3.8 Estimate the Projected Whole Body Dose (TEDE) at the Site Boundary.

$$3280\ \frac{\text{rem - m}^3}{\text{Ci - hr}} \times \frac{\qquad}{\text{(Table 2 Total)}} \times \frac{\qquad}{\text{(Step 5.3.6.c)}} \times \frac{\qquad}{\text{(ERD)}} = \frac{\qquad}{\text{[PROJ. W. B. DOSE (TEDE)]}}\ \text{Rem}$$

5.3.9 Calculate Projected Thyroid Dose (CDE) at the Site Boundary.

NOTE: Choose LOCA accident type unknown				
ACCIDENT TYPE	PROJECTED WHOLE BODY DOSE (TEDE) (Rem) (From Step 5.3.8)	CONVERSION FACTOR		PROJECTED THYROID DOSE (CDE) (Rem)
LOCA	_____	x 15	=	_____
Gap Activity	_____	x 3	=	_____
Fuel Handling	_____	x 20	=	_____
SG Tube Rupture	_____	x 12	=	_____

5.3.10 **IF** the event meets the following criteria for a GENERAL EMERGENCY, **THEN** go to Step 5.3.14 and determine PARs.

a. Projected Whole Body Dose (TEDE) at Site Boundary is ≥1 Rem.

OR

b. Projected Thyroid Dose (CDE) at Site Boundary is ≥5 Rem.

5.3.11 **IF** the event meets the following criteria for a SITE EMERGENCY, **THEN** go to Step 5.3.15.

a. Projected Whole Body Dose (TEDE) at Site is ≥0.1 Rem.

OR

b. Projected Thyroid Dose (CDE) at Site Boundary is ≥0.5 Rem.

5.3.12 **IF** the event meets the following criteria for an ALERT, **THEN** go to Step 5.3.15.

One of more effluent radiation alarming monitor readings is >10 times high alarm setpoint for >15 minutes [Radiation Monitoring System Alarm Setpoint & Response Book (RMSASRB)].

5.3.13 **IF** the event meets the following criteria for an UNUSUAL EVENT, **THEN** go to Step 5.3.15.

One or more effluent radiation alarming monitor readings is >high alarm setpoint for >60 minutes [(Radiation Monitoring System Alarm Setpoint & Response Book (RMSASRB)].

5.3.14 Determine Protective Action Recommendations

NOTE: Lake breeze conditions exist if the difference between actual wind direction values for inland an near shore meteorological towers is greater than 90°.

a. To determine protective action recommendations compare values from Step 5.3.9 and the values in the "Integrated Projected Dose" column below.

NOTE: In some cases (e.g., short-duration puff release, inclement weather) sheltering may be an appropriate recommendation. This should be discussed with the state and/or counties, if appropriate.

INTEGRATED PROJECTED DOSE	PROTECTIVE ACTION	MILES	SECTORS
<1 rem TEDE **AND** <5 rem CDE	None Required	N/A	N/A
≥1 rem TEDE **OR** ≥5 rem CDE	Evacuate Evacuate	0-2 miles 2-5 miles	All (360°) Downwind Sectors
<3 mph Wind Speed **OR** Lake Breeze **AND** ≥1 rem TEDE **OR** ≥5 rem CDE	Evacuate	0-5 Miles	All (360°)

b. Select downwind sectors using Attachment A.

5.3.15 Compare the results against the current classification and PARS.

a. **IF** in the Control Room and the results of this assessment is an escalation of classification and/or PARS,
THEN go to EPIP 1.1, Step 5.6,
OR exit this procedure if **NOT** an escalation.

b. **IF** in the EOF (TSC if backup) **AND** the result of this assessment is an escalation of classification and/or PARs,
THEN immediately inform the Emergency Director and assist with EPIP 2.1 for initiating notifications,
OR proceed to the next step for a continuous dose assessment if **NOT** an escalation:

Performed By:	
_____ Performer (Print and Sign)	_____/_____ Date / Time

5.4 Offsite Field Measurements

5.4.1 Check if Plume Impacts Terrestrial Areas

a. Wind Direction > 305°

OR

b. Wind Direction < 210°

5.4.2 Direct Offsite Radiation Protection Facility Coordinator and Field Monitoring Team(s) to measure gamma dose rates (closed window) and estimate thyroid dose rates at the Site Boundary (SB). Enter results in Step 5.4.3 below.

5.4.3 Estimate Whole Body Dose (TEDE) and Thyroid dose (CDE) at the SB as follows:

Whole Body Dose (TEDE) = _____ (SB gamma dose rate (R/hr)) x _____ (Estimated release duration (hrs)) = _____ Rem

Thyroid Dose (CDE) = _____ (SB Thyroid dose rate (R/hr)) x _____ (Estimated release duration (hrs)) = _____ Rem

5.4.4 **IF** the event meets the following criteria for a GENERAL EMERGENCY, **THEN** go to Step 5.4.6 and determine PARs.

a. Projected Whole Body Dose (TEDE) at Site Boundary is ≥1 Rem.

OR

b. Projected Thyroid Dose (CDE) at Site Boundary is ≥5 Rem.

5.4.5 **IF** the event meets the following criteria for a SITE EMERGENCY, **THEN** go to Step 5.4.7.

a. Projected Whole Body Dose (TEDE) at Site is ≥0.1 Rem.

OR

b. Projected Thyroid Dose (CDE) at Site Boundary is ≥0.5 Rem.

5.4.6 Determine Protective Action Recommendations

NOTE: Lake breeze conditions exist if the difference between actual wind direction values for inland an near shore meteorological towers is greater than 90°.

a. To determine protective action recommendations compare values from Step 5.4.3 and the values in the "Integrated Projected Dose" column below.

NOTE: In some cases (e.g., short-duration puff release, inclement weather) sheltering may be an appropriate recommendation. This should be discussed with the state and/or counties, if appropriate.

INTEGRATED PROJECTED DOSE	PROTECTIVE ACTION	MILES	SECTORS
<1 rem TEDE **AND** <5 rem CDE	None Required	N/A	N/A
≥1 rem TEDE **OR** ≥5 rem CDE	Evacuate Evacuate	0-2 miles 2-5 miles	All (360°) Downwind Sectors
<3 mph Wind Speed **OR** Lake Breeze **AND** ≥1 rem TEDE **OR** ≥5 rem CDE	Evacuate	0-5 Miles	All (360°)

b. Select downwind sectors using Attachment A.

5.4.7 Compare the results against the current classification and PARs.

a. **IF** in the Control Room and the results of this assessment is an escalation of classification and/or PARs,
THEN go to EPIP 1.1, Step 5.6,
OR exit this procedure if **NOT** an escalation.

b. **IF** in the EOF (TSC if backup) **AND** the result of this assessment is an escalation of classification and/or PARs,
THEN immediately inform the Emergency Director and assist with EPIP 2.1 for initiating notifications,
OR continue with ongoing dose assessment if **NOT** an escalation:

Performed By:	
_____	_____/_____
Performer (Print and Sign)	Date / Time

5.5 Manual Calculations

5.5.1 Manual Calculation of Release Rates (Source Terms)

a. Airborne effluents may be discharged from PBNP through the following vent stacks and their associated monitors:

- Auxiliary building vent (ABVNT)

  RE-214, RE-315, RE-317, and RE-319

- Drumming area vent (DAVNT)

  RE-221, RE-325, and RE-327

- Unit 1 containment purge vent (Cont. 1)

  1RE-212, 1RE-305, 1RE-307, and 1RE-309

- Unit 2 containment purge vent (Cont. 2)

  2RE-212, 2RE-305, 2RE-307, and 2RE-309

- Gas stripper building vent (GSBVNT)

  RE-224

NOTE: This CAE pathway vents to the Auxiliary Building Vent Stack.

- Combined air ejector decay duct (CAE)

  1(2)RE-215, RE-225, RE-226

- Main steam safety valves and atmospheric dump valves

  1(2)RE-231 "A" Steam Generator

  1(2)RE-232 "B" Steam Generator

b. The release rates may be estimated using any of the following monitoring systems:

   - PPCS

   - Radiation monitoring system (which is designed to monitor low and high level releases)

NOTE: The contact reading method is used when the other monitoring systems are inoperable.

   - Contact readings using a hand-held survey meter. It is assumed that the direct contact readings are determined using an RO-2A, Teletector, or equivalent survey meter.

NOTE: The actual number of main steam safety valves and atmospheric dump valves open should be obtained from the Shift Manager to estimate the release rate.

c. Record above normal monitor reading(s) in the "Reading" column in Section A of Worksheet 1. Enter a comment for any monitor reading that is off-scale or inoperable.

d. Multiply the reading by the conversion factor and entering the result in the "Release Rate" column on Section A of Worksheet 1.

e. IF monitor readings are available for all release paths, THEN go to Step 5.5.1.j.

NOTE: The direct contact survey is accomplished under the direction of the Rad/Chem Coordinator. It must be approved by the TSC Manager and the Shift Manager.

f. Do **NOT** perform direct contact readings using a hand-held survey meter until the following actions have been done:

   - Evaluate the radiological conditions prior to entering the Auxiliary Building or the Containment Building facade.
   - Choose the proper survey meter and the most direct and desirable route to the stack, pipe, or vent.

g. Perform direct contact readings using a hand-held survey meter when RMS readings are **NOT** available. Enter direct contact readings in the "Meter Reading" column of Section B of Worksheet 1.

   To take the survey of the main steam safety valves and the atmospheric dump valves place the meter probe in contact with the centerline of the main steam header, three feet from the main steam line.

   - Shield the survey probe with a minimum of ¼ inch of lead on the main steam line/containment building side of the probe.
   - Obtain the probe shield from the Radiation Protection supply locker in the Operations Support Center (OSC).

h. For each direct contact reading in any area, enter the conversion factor from Table 3 in the "Conversion Factor" column on Worksheet 1. Conversion factors are accident type dependent.

i. Multiply the direct contact reading by the conversion factor to calculate the release rate. Enter the release rate in the "Release Rate" column of Section B of Worksheet 1.

j. **IF** actual flow rates vary significantly from the assumed flow rates listed on Worksheet 1,
   THEN adjust the flow rates using Section C of Worksheet 1.

k. Enter all calculated release rates in the appropriate spaces in Section D of Worksheet 1. Total all release rates to calculate the gross release rate.

l. Sign and date Worksheet 1 and fax upon completion to the Dose/PAR Coordinator.

TABLE 3
RELEASE RATE CONVERSION FACTORS - SURVEY METER METHOD

Units of expression are Ci-h/s-rem.

	ACCIDENT TYPE					
		Gap Accident[4]			Steam Generator Tube Rupture[2]	
Vent Pathway	LOCA[1]	0-12 hours	> 12 hours	FHA[1]	No condenser	Condenser
Aux. Building	9.40	12.6	79.0	373	-	-
Drumming Area	6.00	8.00	41.1	104	-	-
Cont. Purge	2.60	3.50	20.0	74.0	-	-
Gas Stripper	2.48	3.31	20.0	83.0	-	-
Air Ejector	-	-	-	-	1.40	1.40E+04
Steam Line						
Atmospheric	-	-	-	-	164	-
Safety, 1	-	-	-	-	410	-
Steam Driven AFWP	-	-	-	-	0.235	

Note: (1) The accident type acronyms are: LOCA - Loss of Coolant Accident and FHA - Fuel Handling Accident

(2) No condenser means that the vent pathway is **NOT** through the condenser. Condenser means the vent pathway is through the condenser.

(3) The release rate conversion factors were calculated using the following flow rates:

Vent Pathway	Flow Rate (ft^3/min)
Auxiliary Building	70000
Drumming Area	43100
Containment Purge	12500
Gas Stripper	13000
Air Ejector	25
Atmospheric Vent	3200
Safety, 1	8000
Steam Driven AFWP	4.2

(4) The time intervals referred to in the Gap Accident are for the time periods 0 to 12 hours and greater than 12 hours after reactor shutdown

WORKSHEET 1
RELEASE RATE CALCULATIONS
Page 1 of 3

A. OPERATIONAL LOW-RANGE RELEASE MONITOR READOUTS
(Assumed flow rates are in parentheses)

Monitor	Reading (µCi/cc)	Conversion Factor (cc-Ci/s-µCi)	Release Rate (Ci/s)
Auxiliary Building Vent (70,000 cfm) (RE-214, RE-315, RE-317, or RE-319)	_____	33	_____
Drumming Area Vent (43,100 cfm) (RE-221, RE-325, or RE-327)	_____	20	_____
Unit 1 Containment Purge (RE-212, RE-305, RE-307, or RE-309)			
(0 or 1 fan - 12,500 cfm)	_____	6	_____
(2 fans - 25,000 cfm)	_____	12	_____
Unit 2 Containment Purge (RE-212, RE-305, RE-307, or RE-309)			
(0 or 1 fan - 12,500 cfm)	_____	6	_____
(2 fans - 25,000 cfm)	_____	12	_____
Gas Stripper Building Vent (13,000 cfm) (RE-224)	_____	6	_____
Combined Air Ejector (25 cfm) (RE-215, RE-225, and RE-226)	_____	0.01	_____
Steam Driven Aux FW Pump [1(2)P-29] (4.2 cfm ea) (RE-219, RE-231, RE-232, or measured conc.)			
1 pump	_____	0.002	_____
2 pumps	_____	0.004	_____
Steam Line Vent (RE-231 and RE-232)			
Atmospheric (3200 cfm)	_____	1.5	_____
1 Safety (8000 cfm)	_____	4	_____
2 Safeties (16000 cfm)	_____	8	_____
3 Safeties (24000 cfm)	_____	12	_____
4 Safeties (32000 cfm)	_____	16	_____

WORKSHEET 1
RELEASE RATE CALCULATIONS
Page 2 of 3

B. PLANT EFFLUENT VENT STACK CONTACT READINGS
(Assumed flow rates are in parentheses)

Accident type : LOCA Gap Activity Fuel Handling S/G Tube Rupture Other

Monitor	Meter Reading (R/hr)	Conversion Factor (Ci-h/s-rem) (Table 3)	Release Rate (Ci/s)
Auxiliary Building Vent (70,000 cfm)	_____	_____	_____
Drumming Area Vent (43,100 cfm)	_____	_____	_____
Unit 1 Containment Purge			
(0 or 1 fan - 12,500 cfm)	_____	_____	_____
(2 fans - 25,000 cfm)	_____	_____	_____
Unit 2 Containment Purge			
(0 or 1 fan - 12,500 cfm)	_____	_____	_____
(2 fans - 25,000 cfm)	_____	_____	_____
Gas Stripper Building Vent (13,000 cfm)	_____	_____	_____
Combined Air Ejector (25 cfm)	_____	_____	_____
Steam Driven AFWP	_____	_____	_____
Steam Line Vent			
Atmospheric (3200 cfm)	_____	_____	_____
1 Safety (8000 cfm)	_____	_____	_____
2 Safeties (16000 cfm)	_____	_____	_____
3 Safeties (24000 cfm)	_____	_____	_____
4 Safeties (32000 cfm)	_____	_____	_____

WORKSHEET 1
RELEASE RATE CALCULATIONS
Page 3 of 3

C. ACTUAL VERSUS CONVERSION CURVE FLOW RATE RATIO

$$\frac{\text{Actual Flow Rate, cfm}}{\text{Assumed Flow Rate, cfm}} \times \text{Release Rate} = \text{Corrected Release Rate}$$

$$\frac{(\quad\text{cfm})}{(\quad\text{cfm})} \times \frac{\quad\text{Ci}}{\text{s}} = \frac{\quad\text{Ci}}{\text{s}}$$

D. ESTIMATE OF GROSS RELEASE RATE

NOTE: The combined air ejector decay duct exhausts through the auxiliary building vent. Should a release occur through the combined air ejector duct, do NOT include its monitor reading in the gross release rate calculations because it will be reflected in the auxiliary building vent monitor reading.

	Vent	Release Rate (curies/s)
1.	Auxiliary Building	_____
2.	Drumming Area	_____
3.	Gas Stripper Building	_____
4.	Combined Air Ejector Duct	_____
5.	Main Steam Line Vent	_____
6.	Unit 1 Containment Purge	_____
7.	Unit 2 Containment Purge	_____
8.	Steam Driven AFW Pump	_____
9.	Total	_____

Completed By:_____ **Date/Time**_____/_____

Route to Dose/PAR Coordinator upon completion.

5.5.2 Determination of χ/Q, Atmospheric Dispersion Factor (Worksheet 2)

a. Obtain the following information from the indicated source and enter this in the appropriate space on Worksheet 2.

Data	Source
• Wind speed (mph, 15-minute average)	PPCS or Control Room Instrumentation
• Wind direction (degrees, 15-minute average)	PPCS or Control Room Instrumentation
• Wind direction fluctuation (σ_θ, degrees)	PPCS or Control Room Instrumentation
• Temperature lapse rate ($\Delta T/\Delta H$, °F/35 m)	PPCS or Control Room Instrumentation
• Time of reactor shutdown	Operations Coordinator
• Time of RCS breach	Operations Coordinator
• Time of release from the plant	Operations Coordinator

NOTE: Realistic estimates of the duration of the release should be made whenever possible, with input from the Reactor/Core Physics Engineer. If the duration of the release is unknown, assume four hours.

• Estimated or actual duration of the release (hours)	Operations Coordinator or projected estimate
• Gross release rate (curies/second)	Worksheet 1

WORKSHEET 2
X/Q DETERMINATION

Complete this form every two hours during a release or whenever changing radiological or meteorological conditions.

1. Wind speed, 15 minute average, mph _____
2. Wind direction, 15 minute average, degrees _____
3. Wind direction fluctuation, σ_θ, degrees _____
4. Temperature lapse rate, $\Delta T/\Delta H$, °F/35 m _____
5. Time of reactor shutdown _____
6. Time of RCS breach _____
7. Time of release from plant _____

NOTE: Realistic estimates should be used whenever possible. If the duration release is unknown, assume four hours.

8. Estimated or actual duration of release, hours _____
9. Gross release rate, curies per second _____
10. Pasquill category _____
11. Centerline Xu/Q from Table 6:

Site Boundary	Two Miles	Five Miles	Ten Miles	Other

$$\frac{\chi}{Q}\left(\frac{sec}{m^3}\right) = 2.24\left(\frac{sec - mi}{hr - m}\right) \times \frac{\chi u}{Q}\left(\frac{1}{m^2}\right) \times \frac{1}{\text{wind speed}}\left(\frac{hr}{mi}\right)$$

12. Centerline X/Q:

Site Boundary	Two Miles	Five Miles	Ten Miles	Other

Completed By:_____ **Date/Time**_____/_____

Route to Dose/PAR Coordinator upon completion.

NOTE: Do NOT use σ_θ to determine the stability class when the wind speed is less than three miles per hour.

b. Determine the stability class (Pasquill category) using the σ_θ or $\Delta T/\Delta H$ chart recorder values in the Control Room and Table 4. Enter the stability class on Worksheet 2.

TABLE 4
CLASSIFICATION OF ATMOSPHERIC STABILITY BY SIGMA THETA AND $\Delta T/\Delta H$

NOTE: When wind speed is less than three miles per hour, do NOT use σ_θ to determine the stability class.

Stability Classification	Pasquill Class	Wind Direction Fluctuation (σ_θ, degrees)*	Temperature Lapse Rate ($\Delta T/\Delta H$, °F/35 m)
Extremely unstable	A	$\sigma_\theta \geq 22.5°$	$\Delta T/\Delta H \leq -1.2$
Moderately unstable	B	$22.5° > \sigma_\theta \geq 17.5°$	$-1.2 < \Delta T/\Delta H \leq -1.1$
Slightly unstable	C	$17.5° > \sigma_\theta \geq 12.5°$	$-1.1 < \Delta T/\Delta H \leq -0.9$
Neutral	D	$12.5° > \sigma_\theta \geq 7.5°$	$-0.9 < \Delta T/\Delta H \leq -0.3$
Slightly stable	E	$7.5° > \sigma_\theta \geq 3.8°$	$-0.3 < \Delta T/\Delta H \leq 0.9$
Moderately stable	F	$3.8° > \sigma_\theta \geq 2.1°$	$0.9 < \Delta T/\Delta H \leq 2.5$
Extremely stable	G	$2.1° > \sigma_\theta$	$2.5 < \Delta T/\Delta H$

* Determined for a 15-minute to one-hour period for horizontal diffusion.

c. **IF** necessary to determine the backup stability class determination, **THEN** visually check the cloud cover and the incoming solar radiation. Using this visual information and Table 5, enter the stability class on Worksheet 2.

TABLE 5
BACKUP DETERMINATION OF ATMOSPHERIC STABILITY CLASS

Surface Wind Speed (U mph @ 50 meter height)	DAY Incoming Solar Radiation			NIGHT Thinly Overcast	
	Strong	Moderate	Slight	> ½ low	< ½ cloud
U < 4	A	A-B	B	F	G
4 ≤ U < 7	A-B	B	C	E	F
7 ≤ U < 11	B	B-C	C	D	E
11 ≤ U < 13	C	C-D	D	D	D
13 ≤ U	C	D	D	D	D

The neutral class D should be assumed for overcast conditions, day or night.

"Strong" incoming solar radiation corresponds to a solar altitude greater than 60° with clear skies. "Slight" incoming solar radiation corresponds to a solar altitude of 15° to 35° with clear skies. Cloudiness will decrease incoming solar radiation and should be considered along with the solar altitude when determining the incoming solar radiation status. Incoming solar radiation that would be strong with clear skies can be expected to reduce to moderate with broken middle clouds (cloud cover of 5/8 to 7/8) and to slight with broken low clouds. Night refers to the period one hour before sunset to one hour after sunrise.

For "thinly overcast" conditions, the "> ½ low and < ½ cloud" refers to the percentage of cloud or sky overcast.

NOTE: To determine if there is lake effect wind, compare the wind direction at the inland tower to the wind direction at the main or backup tower. If the wind direction at the main or backup tower is easterly and the wind direction at the inland tower is westerly, the wind at the plant may be a lake effect breeze. If a lake breeze is suspected, the field monitoring teams must be advised to pay close attention to the wind direction.

d. Enter the Xu/Q values for the site boundary, two miles, five miles, and ten miles from the site on Worksheet 2. The Xu/Q values can be taken from Table 6.

TABLE 6
TABLE OF CENTERLINE Xu/Q VALUES VERSUS DISTANCE FROM THE SITE

(Units are m^{-2})

NOTE: To calculate the atmospheric dispersion factor, the centerline Xu/Q value is divided by the wind speed (in meters per second).

Stability Class	Distance From the Site (miles)									
	Site Boundary	2	3	4	5	6	7	8	9	10
A	4.43E-07	5.53E-08	3.93E-08	3.07E-08	2.54E-08	2.17E-08	1.90E-08	1.69E-08	1.53E-08	1.40E-08
B	4.99E-06	7.83E-07	1.92E-07	6.93E-08	3.21E-08	2.76E-08	2.42E-08	2.17E-08	1.96E-08	1.80E-08
C	1.91E-05	5.81E-06	2.94E-06	1.77E-06	1.21E-06	8.82E-07	6.90E-07	5.66E-07	4.72E-07	3.95E-07
D	5.99E-05	2.14E-05	1.17E-05	7.61E-06	5.48E-06	4.22E-06	3.39E-06	2.80E-06	2.37E-06	2.05E-06
E	1.14E-04	4.32E-05	2.47E-05	1.67E-05	1.24E-05	9.64E-06	7.79E-06	6.54E-06	5.70E-06	5.06E-06
F	2.40E-04	9.86E-05	5.91E-05	4.12E-05	3.12E-05	2.49E-05	2.08E-05	1.78E-05	1.55E-05	1.37E-05
G	4.65E-04	2.21E-04	1.36E-04	9.56E-05	7.30E-05	5.89E-05	4.94E-05	4.24E-05	3.72E-05	3.31E-05
Lake Breeze	4.54E-05	2.35E-05	1.31E-05	1.02E-05	8.37E-06	7.07E-06	6.33E-06	5.74E-06	5.11E-06	4.75E-06

e. **IF** a possible location other than the standard specified location is wanted, **THEN** enter the Xu/Q value for that distance from Table 6 on Worksheet 2.

Example:

The Xu/Q value for Class C stability @ 5 miles is 1.21E-06 m^{-2}. Calculate the X/Q values by dividing the Xu/Q value by the wind speed (in meters per second). This can be represented by the equation:

$$\frac{\chi}{Q}\left(\frac{sec}{m^3}\right) = 2.24\left(\frac{sec\text{-}mile}{hr\text{-}m}\right) \times \frac{\chi u/Q\ (m^{-2})}{\text{Wind Speed (miles/hr)}}$$

Enter the X/Q values on Worksheet 2.

f. Sign and date Worksheet 2 and fax upon completion to the Dose/PAR Coordinator.

5.5.3 Whole Body Estimate (Worksheet 3)

a. Enter the accident type on Worksheet 3. If the accident type is unknown, assume the accident type is a LOCA.

b. Enter the gross release rate from Worksheet 2, Item 9, on Worksheet 3.

NOTE: **The activity fractions are dependent on the accident type, the time from shutdown, whether containment spray was used, and, for steam generator tube rupture accidents, whether the release was through the condenser. Select only those activity fractions that are bolded.**

c. Enter the activity fractions on Worksheet 3 for the selected accident type. Activity fractions are listed in Table 7.

d. Enter the X/Q value for the desired distance from Worksheet 2, Item 12, on Worksheet 3.

WORKSHEET 3
ESTIMATED WHOLE BODY DOSE

Complete this form every two hours during a release or whenever changing radiological or meteorological conditions.

Accident type : LOCA Gap Activity Fuel Handling SG Tube Rupture Other

Calculate the projected whole body dose using the equation:

$$Dose_i = Q \times F_i \times \frac{\chi}{Q} \times DCF_i \times ERD$$

SECTOR _____

DISTANCE _____ miles

TIME _____

where: $Dose_i$ is the whole body dose due to radionuclide i, rem;
Q is the gross release rate, curies/s.
F_i is the activity fraction for radionuclide i, dimensionless. Activity fractions for radionuclides released in the LOCA, Gap Activity, Fuel Handling, and Steam Generator Tube Rupture accident types are listed in Table 7. The activity fractions for those radionuclides that contribute more than 90 percent of the total dose are printed in **bold** type. Those radionuclides that are **NOT** printed in bold type need **NOT** be included in the dose calculations.
X/Q is the atmospheric dispersion factor, s/m^3;
DCF_i is the whole body dose conversion factor for the radionuclide i, $rem\text{-}m^3/Ci\text{-}hr$;
ERD is the estimated duration of the release, hours. (If unknown, assume 4 hours.)

Nuclide	Q	F_i	X/Q	DCF_i	ERD	$Dose_i$
I-131				5.3E+04		
I-132				4.9E+04		
I-133				1.5E+04		
I-134				3.1E+04		
I-135				8.1E+03		
Kr-85				1.3E+00		
Kr-85m				9.3E+01		
Kr-87				5.1E+02		
Kr-88				1.3E+03		
Rb-88				5.2E+02		
Cs-138				1.6E+03		
Xe-131m				4.9E+00		
Xe-133				2.0E+01		
Xe-133m				1.7E+01		
Xe-135				1.4E+02		
Xe-135m				2.5E+02		
Xe-138				7.2E+02		
Total Dose						

NOTE: Dose at other distances can be calculated by ratioing the X/Q values and multiplying by the dose calculated above.

Completed By: _____ **Date/Time** _____ / _____

Route to Dose/PAR Coordinator upon completion.

e. Enter the estimated release duration (ERD), in hours, from Worksheet 2, Item 8, on Worksheet 3.

f. Calculate the projected whole body (WB) dose on Worksheet 3 using the equation:

$$Dose_{i,\ whole\ body} = Q \times F_i \times \frac{\chi}{Q} \times DCF_i \times ERD$$

where:

$Dose_{i,\ whole\ body}$ = whole body dose, rem;

F_I = activity fraction for radionuclide i, dimensionless. Activity fractions for radionuclides released in the LOCA, Gap Activity, Fuel Handling, and Steam Generator Tube Rupture accident types for various time periods post accident are listed in Table 7. The activity fractions for those radionuclides that contribute more than 90 percent of the total dose are bolded. Those radionuclides that are **NOT** bolded need **NOT** be included in the dose calculations.

Q = gross release rate, curies per second;

X/Q = atmospheric dispersion factor, seconds per m^3;

DCF_I = whole body dose conversion factor for nuclide i, rem-m^3/Ci-hr;

ERD = estimated duration of the release, hours.

g. Sum the calculated doses and enter it on Worksheet 3.

h. Sign and date Worksheet 3 and fax to the Dose/PAR Coordinator.

5.5.4 Thyroid Dose Estimate (Worksheet 4)

NOTE: If the type of accident is unknown, then assume the accident type is a LOCA.

a. Enter the accident type on Worksheet 4.

WORKSHEET 4
ESTIMATED THYROID DOSE

Complete this form every two hours during a release or whenever changing radiological or meteorological conditions.

Accident type : LOCA Gap Activity Fuel Handling SG Tube Rupture Other

Calculate the projected whole body dose using the equation:

$$Dose_i = Q \times F_i \times \frac{\chi}{Q} \times DCF_i \times ERD$$

SECTOR _____

DISTANCE _____ miles

TIME _____

where: $Dose_i$ is the thyroid dose due to radionuclide i, rem;
Q is the gross release rate, curies/s.
F_i is the activity fraction for radionuclide i, dimensionless. Activity fractions for radionuclides released in the LOCA, Gap Activity, Fuel Handling, and Steam Generator Tube Rupture accident types are listed in Table 7. The activity fractions for those radionuclides that contribute more than 90 percent of the total dose are underlined. Those radionuclides that are **NOT** underlined need **NOT** be included in the dose calculations.
X/Q is the atmospheric dispersion factor, s/m^3;
DCF_i is the whole body dose conversion factor for the radionuclide i, $rem\text{-}m^3/Ci\text{-}hr$;
ERD is the estimated duration of the release, hours. (If unknown, assume 4 hours.)

Nuclide	Q	F_i	X/Q	DCF_i	ERD	$Dose_I$
I-131				1.3E+06		
I-132				7.7E+03		
I-133				2.2E+05		
I-134				1.3E+03		
I-135				3.8E+04		

Total Dose _____

NOTE: Dose at other distances can be calculated by ratioing the X/Q values and multiplying by the dose calculated above.

Completed By: _____ **Date/Time** _____ / _____

Route to Dose/PAR Coordinator upon completion.

b. Enter the gross release rate from Worksheet 2, Item 9, on Worksheet 4.

NOTE: **The activity fractions are dependent on the accident type, the time from shutdown, whether containment spray was used, and, for steam generator tube rupture accidents, whether the release was through the condenser. Select only those activity fractions that are underlined.**

c. Enter the activity fractions on Worksheet 4 for the selected accident type. Activity fractions are listed in Table 7.

d. Enter the X/Q value for the desired distance from Worksheet 2, Item 12, on Worksheet 4.

e. Enter the estimated duration of the release (ERD), in hours, from Worksheet 2, Item 8, on Worksheet 4.

f. Calculate the projected thyroid dose on Worksheet 4 using the equation:

$$Dose_{i,\,thyroid} = Q \times F_i \times \frac{\chi}{Q} \times DCF_i \times ERD$$

where:

$Dose_{i,\,thyroid}$	=	thyroid dose, rem;
Q	=	release rate for nuclide i, curies per second;
F_I		activity fraction for radionuclide i, dimensionless. Activity fractions for radionuclides released in the LOCA, Gap Activity, Fuel Handling, and Steam Generator Tube Rupture accident types for various time periods post accident are listed in Table 7. The activity fractions for those radionuclides that contribute more than 90 percent of the total dose are underlined. Those radionuclides that are **NOT** underlined need **NOT** be included in the dose calculations.
X/Q	=	atmospheric dispersion factor, seconds per m^3;
DCF_I	=	thyroid dose conversion factor for nuclide i, rem-m^3/Ci-hr;
ERD	=	estimated duration of the release, hours.

g. Sum the calculated doses and enter it on Worksheet 4.

h. Sign and date Worksheet 4 and fax to Dose/PAR Coordinator.

5.5.5 Radionuclide Ground Deposition Estimation (Worksheet 5)

NOTE: If the type of accident is unknown, then assume the accident type is a LOCA.

a. Enter the accident type on Worksheet 5.

b. Enter the gross release rate from Worksheet 2, Item 9, on Worksheet 5.

NOTE: The activity fractions are dependent on the accident type, the time from shutdown, whether containment spray was used, and, for steam generator tube rupture accidents, whether the release was through the condenser. Select only those activity fractions that are <u>bolded</u>.

c. Enter the activity fractions on Worksheet 5 for the selected accident type. Activity fractions are listed in Table 7.

d. Enter the X/Q value from Worksheet 2, Item 12, for the desired distance on Worksheet 5.

e. Enter the estimated release duration (ERD), in hours, from Worksheet 2, Item 8, on Worksheet 5.

WORKSHEET 5
ESTIMATED GROUND DEPOSITION

Complete this form every six hours during a release or whenever changing radiological or meteorological conditions.

Accident type : LOCA Gap Activity Fuel Handling SG Tube Rupture Other

Calculate the projected ground deposition using the equation:

SECTOR _____

DISTANCE _____ miles

$$Dep_i = Q \times F_i \times \frac{\chi}{Q} \times Vel_i \times ERD \times 3600$$

TIME _____

where: Dep_i is the deposition of radionuclide i, curies/m^2;
Q is the gross release rate, curies/s.
F_i is the activity fraction for radionuclide i, dimensionless. Activity fractions for radionuclides released in the LOCA, Gap Activity, Fuel Handling, and Steam Generator Tube Rupture accident types are listed in Table 7.
X/Q is the atmospheric dispersion factor, s/m^3;
Vel_i is the deposition velocity for radionuclide i, m/s;
ERD is the estimated duration of the release, hours. (If unknown, assume 4 hours.)
3600 is the factor to convert hours to seconds.

Nuclide	Q	F_i	X/Q	Vel_i	ERD	Dep_i
I-131				0.01		
I-132				0.01		
I-133				0.01		
I-134				0.01		
I-135				0.01		
Rb-88				0.001		
Cs-138				0.001		

Total Dose _____

NOTE: Deposition at other distances can be calculated by ratioing the X/Q values and multiplying by the deposition calculated above.

Completed By: _____ **Date/Time** _____ / _____

Route to Dose/PAR Coordinator upon completion.

f. Calculate the ground deposition values using the equation:

$$Dep_i = Q \times F_i \times \frac{\chi}{Q} \times Vel_i \times ERD \times 3600$$

where:

Dep_I	=	deposition of radionuclide i, curies per meter^2;
Q	=	gross release rate, curies per second;
F_I	=	activity fraction for radionuclide i, dimensionless. Activity fractions for radionuclides released in the LOCA, Gap Activity, Fuel Handling, and Steam Generator Tube Rupture accident types for various time periods post accident are listed in Table 7.
X/Q	=	atmospheric dispersion factor, seconds per m^3;
Vel_I	=	deposition velocity of radionuclide i, 0.01 m/s for radioiodines and 0.001 m/s for all other radionuclides;
ERD	=	estimated duration of the release, hours;
3600	=	factor to convert hours to seconds.

g. Sum the calculated depositions and enter it on Worksheet 5.

h. Sign and date Worksheet 5 and fax to the Dose/PAR Coordinator.

5.5.6 Population Exposure (Worksheet 6)

a. Calculate the projected population dose by using Worksheet 6.

b. Enter the centerline whole body dose from Worksheet 3, on Worksheet 6.

c. Enter the population figures. Use the population numbers for the sector and distance categories used in the dose calculations.

WORKSHEET 6
ESTIMATED POPULATION DOSE

Complete this form using the calculation from Worksheet 3.

Complete this form every six hours during a release or whenever changing radiological or meteorological conditions.

Calculated Population Dose

Population dose (in person-rem) = Dose (in rem) X Population

Sector	Distance (miles)	Population	Dose (rem)	Population Dose (person-rem)
_____	2	_____	_____	_____
_____	5	_____	_____	_____
_____	10	_____	_____	_____
			Total Dose	_____

Population Figures
(By Sector and Distance)

Sector	Distance 0 to 2 miles	2 to 5 miles	5 to 10 miles
A	0	20	231
H	33	45	0
J	19	231	6036
K	22	131	4866
L	15	606	879
M	32	980	632
N	39	403	695
P	29	345	450
Q	41	286	416
R	22	87	435

NOTE: All other sectors have zero population.

Completed By:_____ **Date/Time**_____ **/** _____

Route to Dose/PAR Coordinator upon completion.

d. Sum the population doses calculated for each radius to calculate the total population dose.

e. Sign and date Worksheet 6 and fax to the Dose/PAR Coordinator.

5.5.7 Determine Protective Action Recommendations

NOTE: Lake breeze conditions exist if the difference between actual wind direction values for inland and near shore meteorological towers is greater than 90°.

a. To determine protective action recommendations, evaluate the calculation results with the values in the "Integrated Projected Dose" column below.

NOTE: In some cases (e.g., short-duration puff release, inclement weather), sheltering may be an appropriate recommendation. This should be discussed with the state and/or counties, if appropriate.

INTEGRATED PROJECTED DOSE	PROTECTIVE ACTION	MILES	SECTORS
<1 rem TEDE **AND** <5 rem CDE at 1 mile	None Required	N/A	N/A
≥1 rem TEDE at 1 mile **OR** ≥5 rem CDE at 1 mile	Evacuate Evacuate	0-2 Miles 2-5 Miles	All (360°) Downwind Sectors
<3 mph Wind Speed **OR** Lake Breeze **AND** ≥1 rem TEDE at 1 mile **OR** ≥5 rem CDE at 1 mile	Evacuate	0-5 Miles	All (360°)
≥1 rem TEDE at 5 miles **OR** ≥5 rem CDE at 5 miles	Evacuate Evacuate	0-5 Miles 5-10 Miles	All (360°) Downwind Sectors
<3 mph Wind Speed **OR** Lake Breeze **AND** ≥1 rem TEDE at 5 miles **OR** ≥5 rem CDE at 5 miles	Evacuate	0-10 Miles	All (360°)

b. Select downwind sectors using Attachment A.

5.5.8 **IF** a General Emergency,
THEN evaluate Attachment B for the potential need to issue expanded PARs.

5.5.9 Compare the results against the current classification and PARs.
IF the results of this assessment is an escalation of classification and/or PARS,
THEN immediately inform the Emergency Director and assist with EPIP 2.1 for initiating notifications.

Performed By:	
_____	_____/_____
Performer (Print and Sign)	Date / Time

TABLE 7
LOCA SOURCE TERM ACTIVITY FRACTIONS - CONTAINMENT SPRAY NOT USED
Page 1 of 8

Time	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m	Kr-87	Kr-88	Rb-88	Cs-138
0.0	2.46E-02	3.52E-02	5.51E-02	6.42E-02	5.10E-02	0.001	0.043	0.083	0.117	0.000	0.000
0.5	2.75E-02	3.40E-02	6.07E-02	4.82E-02	5.43E-02	0.001	0.044	0.071	0.116	0.084	0.057
1.0	3.08E-02	3.25E-02	6.70E-02	3.61E-02	5.79E-02	0.001	0.046	0.061	0.115	0.113	0.053
1.5	3.40E-02	3.09E-02	7.27E-02	2.69E-02	6.08E-02	0.001	0.047	0.051	0.112	0.120	0.037
2.0	3.69E-02	2.88E-02	7.80E-02	1.96E-02	6.27E-02	0.001	0.047	0.042	0.108	0.119	0.024
2.5	3.96E-02	2.66E-02	8.24E-02	1.41E-02	6.39E-02	0.001	0.047	0.035	0.103	0.114	0.014
3.0	4.20E-02	2.42E-02	8.58E-02	1.01E-02	6.43E-02	0.001	0.046	0.028	0.097	0.108	0.008
4.0	4.63E-02	1.97E-02	9.19E-02	4.99E-03	6.42E-02	0.001	0.043	0.018	0.083	0.093	0.003
5.0	5.00E-02	1.57E-02	9.64E-02	2.44E-03	6.27E-02	0.002	0.040	0.011	0.070	0.079	0.001
6.0	5.33E-02	1.24E-02	9.97E-02	1.17E-03	6.07E-02	0.002	0.037	0.007	0.059	0.066	0.000
7.0	5.62E-02	9.65E-03	1.02E-01	5.58E-04	5.79E-02	0.002	0.033	0.004	0.049	0.054	0.000
8.0	5.90E-02	7.47E-03	1.03E-01	2.64E-04	5.49E-02	0.002	0.030	0.003	0.040	0.045	0.000
9.0	6.13E-02	5.73E-03	1.05E-01	1.24E-04	5.16E-02	0.002	0.027	0.002	0.033	0.036	0.000
10.0	6.35E-02	4.39E-03	1.05E-01	5.80E-05	4.84E-02	0.002	0.024	0.001	0.026	0.030	0.000
12.0	6.74E-02	2.54E-03	1.04E-01	1.25E-05	4.20E-02	0.002	0.018	0.000	0.017	0.019	0.000
18.0	7.60E-02	4.64E-04	9.81E-02	1.19E-07	2.59E-02	0.003	0.008	0.000	0.004	0.005	0.000
24.0	8.19E-02	8.11E-05	8.82E-02	1.08E-09	1.53E-02	0.003	0.004	0.000	0.001	0.001	0.000
30.0	8.65E-02	1.39E-05	7.76E-02	0.000	8.88E-03	0.003	0.001	0.000	0.000	0.000	0.000
36.0	9.02E-02	2.36E-06	6.73E-02	0.000	5.08E-03	0.003	0.001	0.000	0.000	0.000	0.000
42.0	9.34E-02	3.96E-07	5.81E-02	0.000	2.88E-03	0.003	0.000	0.000	0.000	0.000	0.000
48.0	9.60E-02	6.60E-08	4.97E-02	0.000	1.62E-03	0.004	0.000	0.000	0.000	0.000	0.000
72.0	1.04E-01	0.000	2.58E-02	0.000	1.59E-04	0.004	0.000	0.000	0.000	0.000	0.000
96.0	1.10E-01	0.000	1.31E-02	0.000	1.51E-05	0.005	0.000	0.000	0.000	0.000	0.000
120.0	1.15E-01	0.000	6.58E-03	0.000	1.43E-06	0.005	0.000	0.000	0.000	0.000	0.000
144.0	1.20E-01	0.000	3.30E-03	0.000	1.35E-07	0.006	0.000	0.000	0.000	0.000	0.000
168.0	1.25E-01	0.000	1.65E-03	0.000	1.27E-08	0.007	0.000	0.000	0.000	0.000	0.000
336.0	1.63E-01	0.000	1.28E-05	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000
504.0	2.06E-01	0.000	9.49E-08	0.000	0.000	0.039	0.000	0.000	0.000	0.000	0.000
672.0	2.49E-01	0.000	0.000	0.000	0.000	0.086	0.000	0.000	0.000	0.000	0.000
720.0	2.60E-01	0.000	0.000	0.000	0.000	0.106	0.000	0.000	0.000	0.000	0.000

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

TABLE 7
LOCA SOURCE TERM ACTIVITY FRACTIONS - CONTAINMENT SPRAY USED
Page 2 of 8

Time	I-131	I-133	Kr-87	Kr-88	Xe-133	Xe-135	Xe-135m	Xe-138	Rb-88	Cs-138
0.0	3.19E-06	7.16E-06	1.08E-01	1.52E-01	2.85E-01	6.08E-02	7.73E-02	2.52E-01	0.00	0.00
0.5	3.55E-06	7.82E-06	9.17E-02	1.50E-01	3.17E-01	6.92E-02	3.86E-02	8.57E-02	1.09E-01	7.34E-02
1.0	3.97E-06	8.64E-06	7.84E-02	1.48E-01	3.55E-01	7.80E-02	2.81E-02	2.93E-02	1.46E-01	6.84E-02
1.5	4.39E-06	9.38E-06	6.60E-02	1.45E-01	3.92E-01	8.64E-02	2.59E-02	9.90E-03	1.55E-01	4.83E-02
2.0	4.77E-06	1.01E-05	5.47E-02	1.40E-01	4.26E-01	9.36E-02	2.57E-02	3.30E-03	1.54E-01	3.04E-02
2.5	5.12E-06	1.07E-05	4.48E-02	1.33E-01	4.57E-01	1.00E-01	2.59E-02	1.08E-03	1.47E-01	1.80E-02
3.0	5.43E-06	1.11E-05	3.62E-02	1.25E-01	4.85E-01	1.06E-01	2.60E-02	3.51E-04	1.39E-01	1.03E-02
4.0	5.99E-06	1.19E-05	2.32E-02	1.07E-01	5.34E-01	1.15E-01	2.60E-02	3.61E-05	1.20E-01	3.24E-03
5.0	6.47E-06	1.25E-05	1.46E-02	9.08E-02	5.77E-01	1.22E-01	2.54E-02	3.65E-06	1.02E-01	9.70E-04
6.0	6.89E-06	1.29E-05	9.04E-03	7.63E-02	6.14E-01	1.27E-01	2.45E-02	3.63E-07	8.52E-02	2.87E-04
7.0	7.26E-06	1.32E-05	5.54E-03	6.26E-02	6.47E-01	1.30E-01	2.33E-02	0.00	7.03E-02	8.39E-05
8.0	7.61E-06	1.34E-05	3.37E-03	5.15E-02	6.77E-01	1.32E-01	2.21E-02	0.00	5.76E-02	2.41E-05
9.0	7.90E-06	1.35E-05	2.03E-03	4.19E-02	7.02E-01	1.33E-01	2.08E-02	0.00	4.69E-02	6.93E-06
10.0	8.16E-06	1.34E-05	1.22E-03	3.39E-02	7.25E-01	1.33E-01	1.94E-02	0.00	3.79E-02	1.98E-06
12.0	8.60E-06	1.33E-05	4.36E-04	2.19E-02	7.63E-01	1.30E-01	1.67E-02	0.00	2.46E-02	1.59E-07
18.0	9.50E-06	1.23E-05	1.86E-05	5.61E-03	8.37E-01	1.09E-01	1.01E-02	0.00	6.27E-03	0.00
24.0	1.01E-05	1.08E-05	7.60E-07	1.37E-03	8.81E-01	8.41E-02	5.88E-03	0.00	1.53E-03	0.00
30.0	1.05E-05	9.38E-06	3.05E-08	3.31E-04	9.10E-01	6.22E-02	3.35E-03	0.00	3.70E-04	0.00
36.0	1.08E-05	8.04E-06	0.00	7.89E-05	9.30E-01	4.45E-02	1.90E-03	0.00	8.81E-05	0.00
42.0	1.10E-05	6.87E-06	0.00	1.87E-05	9.45E-01	3.14E-02	1.06E-03	0.00	2.10E-05	0.00
48.0	1.13E-05	5.83E-06	0.00	4.41E-06	9.56E-01	2.17E-02	5.94E-04	0.00	4.93E-06	0.00
72.0	1.20E-05	2.96E-06	0.00	1.34E-06	9.75E-01	4.53E-03	5.70E-05	0.00	0.00	0.00
96.0	1.25E-05	1.49E-06	0.00	0.00	9.80E-01	8.84E-04	5.38E-06	0.00	0.00	0.00
120.0	1.31E-05	7.49E-07	0.00	0.00	9.82E-01	1.67E-04	5.08E-07	0.00	0.00	0.00
144.0	1.37E-05	3.77E-07	0.00	0.00	9.83E-01	3.14E-05	0.00	0.00	0.00	0.00
168.0	1.43E-05	0.00	0.00	0.00	9.83E-01	5.84E-06	0.00	0.00	0.00	0.00
336.0	1.95E-05	0.00	0.00	0.00	9.75E-01	0.00	0.00	0.00	0.00	0.00
504.0	2.59E-05	0.00	0.00	0.00	9.46E-01	0.00	0.00	0.00	0.00	0.00
672.0	3.32E-05	0.00	0.00	0.00	8.78E-01	0.00	0.00	0.00	0.00	0.00
720.0	3.51E-05	0.00	0.00	0.00	8.48E-01	0.00	0.00	0.00	0.00	0.00

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

TABLE 7
GAP ACTIVITY RELEASE SOURCE TERM ACTIVITY FRACTIONS - CONTAINMENT SPRAY NOT USED
Page 3 of 8

Time	I-131	I-133	I-135	Kr-85m	Kr-87	Kr-88	Xe-133	Xe-135	Xe-138	Rb-88	Cs-138
0.0	6.34E-04	1.42E-03	1.31E-03	0.055	0.108	0.151	0.284	0.060	0.250	0.000	0.000
0.5	7.18E-04	1.58E-03	1.41E-03	0.057	0.093	0.151	0.322	0.067	0.086	0.110	0.074
1.0	8.11E-04	1.76E-03	1.51E-03	0.060	0.080	0.151	0.361	0.074	0.030	0.148	0.069
1.5	9.01E-04	1.92E-03	1.60E-03	0.062	0.068	0.149	0.402	0.080	0.010	0.159	0.049
2.0	9.82E-04	2.07E-03	1.66E-03	0.062	0.056	0.144	0.439	0.084	3.38E-03	0.158	0.031
2.5	1.06E-03	2.20E-03	1.71E-03	0.062	0.046	0.137	0.471	0.088	1.12E-03	0.153	0.019
3.0	1.13E-03	2.31E-03	1.73E-03	0.062	0.038	0.129	0.502	0.090	3.63E-04	0.144	0.011
4.0	1.25E-03	2.48E-03	1.73E-03	0.058	0.024	0.112	0.558	0.093	3.75E-05	0.125	0.003
5.0	1.36E-03	2.62E-03	1.70E-03	0.055	0.015	0.096	0.605	0.094	3.82E-06	0.107	0.001
6.0	1.46E-03	2.73E-03	1.66E-03	0.050	0.010	0.081	0.646	0.094	3.84E-07	0.090	0.000
7.0	1.55E-03	2.79E-03	1.58E-03	0.045	0.006	0.067	0.685	0.093	0.000	0.075	0.000
8.0	1.63E-03	2.85E-03	1.50E-03	0.041	0.004	0.055	0.717	0.091	0.000	0.062	0.000
9.0	1.69E-03	2.87E-03	1.41E-03	0.037	0.002	0.045	0.747	0.088	0.000	0.050	0.000
10.0	1.75E-03	2.89E-03	1.33E-03	0.033	0.001	0.036	0.772	0.085	0.000	0.041	0.000
12.0	1.85E-03	2.87E-03	1.15E-03	0.025	0.000	0.024	0.813	0.078	0.000	0.026	0.000
18.0	2.05E-03	2.65E-03	6.96E-04	0.011	0.000	0.006	0.885	0.056	0.000	0.007	0.000
24.0	2.15E-03	2.31E-03	3.99E-04	0.005	0.000	0.001	0.919	0.038	0.000	0.002	0.000
30.0	2.21E-03	1.97E-03	2.26E-04	0.002	0.000	0.000	0.937	0.026	0.000	0.000	0.000
36.0	2.26E-03	1.69E-03	1.27E-04	0.001	0.000	0.000	0.948	0.017	0.000	0.000	0.000
42.0	2.30E-03	1.42E-03	7.06E-05	0.000	0.000	0.000	0.955	0.011	0.000	0.000	0.000
48.0	2.33E-03	1.21E-03	3.94E-05	0.000	0.000	0.000	0.959	7.47E-03	0.000	0.000	0.000
72.0	2.46E-03	6.09E-04	3.75E-06	0.000	0.000	0.000	0.967	1.40E-03	0.000	0.000	0.000
96.0	2.56E-03	3.07E-04	3.53E-07	0.000	0.000	0.000	0.968	2.59E-04	0.000	0.000	0.000
120.0	2.68E-03	1.54E-04	3.34E-08	0.000	0.000	0.000	0.968	4.81E-05	0.000	0.000	0.000
144.0	2.80E-03	7.72E-05	3.14E-09	0.000	0.000	0.000	0.967	8.85E-06	0.000	0.000	0.000
168.0	2.93E-03	3.86E-05	0.000	0.000	0.000	0.000	0.965	1.63E-06	0.000	0.000	0.000
336.0	3.89E-03	3.03E-07	0.000	0.000	0.000	0.000	0.933	1.16E-11	0.000	0.000	0.000
504.0	4.91E-03	2.26E-09	0.000	0.000	0.000	0.000	0.854	0.000	0.000	0.000	0.000
672.0	5.57E-03	0.000	0.000	0.000	0.000	0.000	0.704	0.000	0.000	0.000	0.000
720.0	5.62E-03	0.000	0.000	0.000	0.000	0.000	0.649	0.000	0.000	0.000	0.000

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

TABLE 7
GAP ACTIVITY RELEASE SOURCE TERM ACTIVITY FRACTIONS - CONTAINMENT SPRAY USED
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Time	I-131	I-133	Kr-87	Kr-88	Xe-133	Xe-135	Xe-138	Rb-88	Cs-138
0.0	6.38E-08	1.43E-07	1.08E-01	1.52E-01	2.86E-01	6.06E-02	2.51E-01	0.00	0.00
0.5	7.22E-08	1.59E-07	9.31E-02	1.52E-01	3.24E-01	6.78E-02	8.67E-02	1.10E-01	7.45E-02
1.0	8.15E-08	1.77E-07	8.03E-02	1.52E-01	3.63E-01	7.46E-02	3.00E-02	1.49E-01	6.98E-02
1.5	9.06E-08	1.94E-07	6.81E-02	1.50E-01	4.04E-01	8.01E-02	1.02E-02	1.60E-01	4.95E-02
2.0	9.87E-08	2.08E-07	5.65E-02	1.44E-01	4.42E-04	8.45E-02	3.40E-03	1.59E-01	3.13E-02
2.5	1.07E-07	2.22E-07	4.66E-02	1.38E-01	4.74E-01	8.81E-02	1.12E-03	1.54E-01	1.87E-02
3.0	1.13E-07	2.32E-07	3.78E-02	1.30E-01	5.05E-01	9.04E-02	3.65E-04	1.45E-01	1.08E-02
4.0	1.26E-07	2.49E-07	2.44E-02	1.13E-01	5.61E-01	9.36E-02	3.78E-05	1.26E-01	3.38E-03
5.0	1.37E-07	2.63E-07	1.55E-02	9.64E-02	6.08E-01	9.48E-02	3.84E-06	1.08E-01	1.03E-03
6.0	1.47E-07	2.75E-07	9.64E-03	8.13E-02	6.50E-01	9.46E-02	0.00	9.06E-02	3.05E-04
7.0	1.56E-07	2.81E-07	5.92E-03	6.70E-02	6.89E-01	9.35E-02	0.00	7.50E-02	8.92E-05
8.0	1.64E-07	2.87E-07	3.62E-03	5.54E-02	7.21E-01	9.16E-02	0.00	6.19E-02	2.59E-05
9.0	1.70E-07	2.89E-07	2.19E-03	4.50E-02	7.51E-01	8.87E-02	0.00	5.04E-02	7.45E-06
10.0	1.76E-07	2.91E-07	1.32E-03	3.66E-02	7.76E-01	8.54E-02	0.00	4.10E-02	2.12E-06
12.0	1.86E-07	2.89E-07	4.71E-04	2.37E-02	8.18E-01	7.81E-02	0.00	2.66E-02	0.00
18.0	2.06E-07	2.66E-07	2.02E-05	6.07E-03	8.90E-01	5.65E-02	0.00	6.79E-03	0.00
24.0	2.16E-07	2.32E-07	0.00	1.47E-03	9.24E-01	3.85E-02	0.00	1.64E-03	0.00
30.0	2.22E-07	1.98E-07	0.00	3.50E-04	9.42E-01	2.58E-02	0.00	3.92E-04	0.00
36.0	2.27E-07	1.69E-07	0.00	8.29E-05	9.52E-01	1.71E-02	0.00	9.26E-05	0.00
42.0	2.31E-07	1.43E-07	0.00	1.95E-05	9.59E-01	1.14E-02	0.00	2.18E-05	0.00
48.0	2.34E-07	1.21E-07	0.00	4.58E-06	9.63E-01	7.50E-03	0.00	5.13E-06	0.00
72.0	2.46E-07	6.11E-08	0.00	0.00	9.70E-01	1.40E-03	0.00	0.00	0.00
96.0	2.57E-07	3.08E-08	0.00	0.00	9.71E-01	2.60E-04	0.00	0.00	0.00
120.0	2.69E-07	1.54E-08	0.00	0.00	9.71E-01	4.82E-05	0.00	0.00	0.00
144.0	2.81E-07	0.00	0.00	0.00	9.70E-01	8.88E-06	0.00	0.00	0.00
168.0	2.94E-07	0.00	0.00	0.00	9.68E-01	1.64E-06	0.00	0.00	0.00
336.0	3.90E-07	0.00	0.00	0.00	9.37E-01	0.00	0.00	0.00	0.00
504.0	4.93E-07	0.00	0.00	0.00	8.58E-01	0.00	0.00	0.00	0.00
672.0	5.60E-07	0.00	0.00	0.00	7.08E-01	0.00	0.00	0.00	0.00
720.0	5.65E-07	0.00	0.00	0.00	6.52E-01	0.00	0.00	0.00	0.00

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

TABLE 7
FUEL HANDLING ACCIDENT SOURCE TERM ACTIVITY FRACTIONS - CONTAINMENT SPRAY NOT USED
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Time	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m	Kr-87	Xe-133	Rb-88	Cs-138
0.0	2.17E-03	0.000	2.59E-04	0.000	3.03E-07	0.014	0.000	0.000	0.963	0.000	0.000
0.5	2.17E-03	0.000	2.55E-04	0.000	2.88E-07	0.014	0.000	0.000	0.964	0.000	0.000
1.0	2.17E-03	0.000	2.52E-04	0.000	2.75E-07	0.014	0.000	0.000	0.964	0.000	0.000
1.5	2.17E-03	0.000	2.48E-04	0.000	2.62E-07	0.014	0.000	0.000	0.964	0.000	0.000
2.0	2.18E-03	0.000	2.45E-04	0.000	2.50E-07	0.014	0.000	0.000	0.964	0.000	0.000
2.5	2.18E-03	0.000	2.41E-04	0.000	2.37E-07	0.014	0.000	0.000	0.964	0.000	0.000
3.0	2.18E-03	0.000	2.38E-04	0.000	2.25E-07	0.015	0.000	0.000	0.964	0.000	0.000
4.0	2.18E-03	0.000	2.30E-04	0.000	2.05E-07	0.015	0.000	0.000	0.964	0.000	0.000
5.0	2.19E-03	0.000	2.24E-04	0.000	1.86E-07	0.015	0.000	0.000	0.964	0.000	0.000
6.0	2.19E-03	0.000	2.18E-04	0.000	1.69E-07	0.015	0.000	0.000	0.964	0.000	0.000
7.0	2.21E-03	0.000	2.12E-04	0.000	1.52E-07	0.015	0.000	0.000	0.964	0.000	0.000
8.0	2.21E-03	0.000	2.05E-04	0.000	1.38E-07	0.015	0.000	0.000	0.965	0.000	0.000
9.0	2.20E-03	0.000	2.00E-04	0.000	1.25E-07	0.015	0.000	0.000	0.965	0.000	0.000
10.0	2.22E-03	0.000	1.95E-04	0.000	1.13E-07	0.015	0.000	0.000	0.965	0.000	0.000
12.0	2.22E-03	0.000	1.83E-04	0.000	9.33E-08	0.015	0.000	0.000	0.965	0.000	0.000
18.0	2.25E-03	0.000	1.55E-04	0.000	5.18E-08	0.016	0.000	0.000	0.966	0.000	0.000
24.0	2.27E-03	0.000	1.30E-04	0.000	2.87E-08	0.016	0.000	0.000	0.966	0.000	0.000
30.0	2.31E-03	0.000	1.10E-04	0.000	1.60E-08	0.017	0.000	0.000	0.966	0.000	0.000
36.0	2.32E-03	0.000	9.24E-05	0.000	8.83E-09	0.017	0.000	0.000	0.966	0.000	0.000
42.0	2.35E-03	0.000	7.77E-05	0.000	4.89E-09	0.018	0.000	0.000	0.966	0.000	0.000
48.0	2.37E-03	0.000	6.53E-05	0.000	2.71E-09	0.019	0.000	0.000	0.966	0.000	0.000
72.0	2.48E-03	0.000	3.28E-05	0.000	0.000	0.021	0.000	0.000	0.965	0.000	0.000
96.0	2.59E-03	0.000	1.64E-05	0.000	0.000	0.024	0.000	0.000	0.963	0.000	0.000
120.0	2.71E-03	0.000	8.24E-06	0.000	0.000	0.027	0.000	0.000	0.961	0.000	0.000
144.0	2.82E-03	0.000	4.13E-06	0.000	0.000	0.031	0.000	0.000	0.958	0.000	0.000
168.0	2.94E-03	0.000	2.07E-06	0.000	0.000	0.035	0.000	0.000	0.955	0.000	0.000
336.0	3.84E-03	0.000	1.59E-08	0.000	0.000	0.084	0.000	0.000	0.907	0.000	0.000
504.0	4.66E-03	0.000	0.000	0.000	0.000	0.187	0.000	0.000	0.802	0.000	0.000
672.0	5.00E-03	0.000	0.000	0.000	0.000	0.364	0.000	0.000	0.623	0.000	0.000
720.0	4.92E-03	0.000	0.000	0.000	0.000	0.427	0.000	0.000	0.560	0.000	0.000

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

TABLE 7
FUEL HANDLING ACCIDENT SOURCE TERM ACTIVITY FRACTIONS - CONTAINMENT SPRAY USED
Page 6 of 8

Time	I-131	Xe-133
0.0	2.17E-07	9.66E-01
0.5	2.18E-07	9.66E-01
1.0	2.17E-07	9.66E-01
1.5	2.18E-07	9.66E-01
2.0	2.19E-07	9.66E-01
2.5	2.18E-07	9.66E-01
3.0	2.19E-07	9.66E-01
4.0	2.20E-07	9.67E-01
5.0	2.20E-07	9.67E-01
6.0	2.20E-07	9.67E-01
7.0	2.21E-07	9.67E-01
8.0	2.21E-07	9.67E-01
9.0	2.21E-07	9.67E-01
10.0	2.22E-07	9.67E-01
12.0	2.22E-07	9.67E-01
18.0	2.26E-07	9.68E-01
24.0	2.28E-07	9.68E-01
30.0	2.31E-07	9.68E-01
36.0	2.33E-07	9.68E-01
42.0	2.36E-07	9.68E-01
48.0	2.37E-07	9.68E-01
72.0	2.49E-07	9.68E-01
96.0	2.59E-07	9.66E-01
120.0	2.71E-07	9.64E-01
144.0	2.83E-07	9.61E-01
168.0	2.94E-07	9.58E-01
336.0	3.85E-07	9.10E-01
504.0	4.68E-07	8.06E-01
672.0	5.02E-07	6.26E-01
720.0	4.94E-07	5.63E-01

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

TABLE 7
STEAM GENERATOR TUBE RUPTURE SOURCE TERM - - RELEASE MODE - THROUGH THE CONDENSER - ACTIVITY FRACTIONS
Page 7 of 8

Time	I-131	I-133	I-135	Kr-85	Kr-85m	Kr-88	Xe-133	Xe-135	Xe-138	Rb-88	Cs-138
0.0	3.92E-08	3.05E-08	3.16E-08	0.933	0.030	0.008	0.011	4.03E-03	0.013	0.000	0.000
0.5	3.93E-08	3.00E-08	3.02E-08	0.937	0.028	0.007	0.011	3.90E-03	0.004	4.90E-03	3.43E-03
1.0	3.94E-08	2.98E-08	2.88E-08	0.943	0.026	0.006	0.011	3.77E-03	1.24E-03	5.89E-03	2.87E-03
1.5	3.95E-08	2.94E-08	2.75E-08	0.947	0.024	0.005	0.011	3.65E-03	3.78E-04	5.71E-03	1.84E-03
2.0	3.96E-08	2.90E-08	2.61E-08	0.952	0.023	0.005	0.011	3.53E-03	1.16E-04	5.22E-03	1.06E-03
2.5	3.98E-08	2.86E-08	2.50E-08	0.955	0.021	0.004	0.011	3.41E-03	3.55E-05	4.67E-03	5.92E-04
3.0	3.97E-08	2.81E-08	2.37E-08	0.955	0.019	0.004	0.011	3.28E-03	1.08E-05	4.14E-03	3.20E-04
4.0	3.99E-08	2.74E-08	2.15E-08	0.963	0.017	0.003	0.011	3.08E-03	1.02E-06	3.27E-03	9.06E-05
5.0	3.99E-08	2.66E-08	1.95E-08	0.967	0.014	0.002	0.011	2.86E-03	9.51E-08	2.56E-03	2.54E-05
6.0	3.98E-08	2.58E-08	1.76E-08	0.970	0.012	0.002	0.011	2.66E-03	8.89E-09	2.01E-03	7.02E-06
7.0	3.99E-08	2.50E-08	1.59E-08	0.973	0.011	0.001	0.011	2.47E-03	0.00	1.57E-03	1.94E-06
8.0	3.98E-08	2.42E-08	1.44E-08	0.976	0.009	0.001	0.011	2.30E-03	0.00	1.23E-03	0.00
9.0	3.97E-08	2.35E-08	1.30E-08	0.978	0.008	0.001	0.010	2.14E-03	0.00	9.61E-04	0.00
10.0	3.96E-08	2.27E-08	1.18E-08	0.979	0.007	0.001	0.010	1.98E-03	0.00	7.53E-04	0.00
12.0	3.95E-08	2.13E-08	9.57E-09	0.982	0.005	0.00	0.010	1.71E-03	0.00	4.60E-04	0.00
18.0	3.89E-08	1.74E-08	5.17E-09	0.987	0.002	0.00	0.010	1.09E-03	0.00	1.04E-04	0.00
24.0	3.81E-08	1.42E-08	2.78E-09	0.989	0.001	0.00	9.80E-03	6.92E-04	0.00	2.38E-05	0.00
30.0	3.73E-08	1.16E-08	1.49E-09	0.990	0.00	0.00	9.48E-03	4.39E-04	0.00	5.38E-06	0.00
36.0	3.65E-08	9.48E-09	8.01E-10	0.990	0.00	0.00	9.24E-03	2.79E-04	0.00	1.22E-06	0.00
42.0	3.58E-08	7.72E-09	4.30E-10	0.991	0.00	0.00	8.91E-03	1.77E-04	0.00	0.00	0.00
48.0	3.51E-08	6.29E-09	0.00	0.991	0.00	0.00	8.66E-03	1.12E-04	0.00	0.00	0.00
72.0	3.22E-08	2.78E-09	0.00	0.992	0.00	0.00	7.57E-03	1.83E-05	0.00	0.00	0.00
96.0	2.95E-08	1.23E-09	0.00	0.993	0.00	0.00	6.64E-03	2.96E-06	0.00	0.00	0.00
120.0	2.71E-08	5.40E-10	0.00	0.994	0.00	0.00	5.83E-03	0.00	0.00	0.00	0.00
144.0	2.49E-08	2.38E-10	0.00	0.995	0.00	0.00	5.11E-03	0.00	0.00	0.00	0.00
168.0	2.28E-08	1.05E-10	0.00	0.996	0.00	0.00	4.48E-03	0.00	0.00	0.00	0.00
336.0	1.26E-08	3.40E-13	0.00	0.998	0.00	0.00	1.79E-03	0.00	0.00	0.00	0.00
504.0	6.87E-09	0.00	0.00	0.999	0.00	0.00	7.09E-04	0.00	0.00	0.00	0.00
672.0	3.80E-09	0.00	0.00	1.000	0.00	0.00	2.84E-04	0.00	0.00	0.00	0.00
720.0	3.19E-09	0.00	0.00	1.000	0.00	0.00	2.18E-04	0.00	0.00	0.00	0.00

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

TABLE 7
STEAM GENERATOR TUBE RUPTURE SOURCE TERM - - RELEASE MODE - NOT THROUGH THE CONDENSER - ACTIVITY FRACTIONS
Page 8 of 8

Time	I-131	I-133	I-135	Kr-85	Kr-85m	Kr-88	Xe-133	Xe-135	Xe-138	Rb-88	Cs-138
0.0	3.92E-04	3.05E-04	3.16E-04	0.933	0.030	0.008	0.011	4.03E-03	0.013	0.00	0.00
0.5	3.93E-04	3.00E-04	3.01E-04	0.937	0.028	0.007	0.011	3.90E-03	0.004	4.89E-03	3.43E-03
1.0	3.94E-04	2.98E-04	2.87E-04	0.943	0.026	0.006	0.011	3.77E-03	1.24E-03	5.89E-03	2.86E-03
1.5	3.95E-04	2.94E-04	2.74E-04	0.947	0.024	0.005	0.011	3.65E-03	3.78E-04	5.70E-03	1.84E-03
2.0	3.96E-04	2.90E-04	2.61E-04	0.952	0.023	0.005	0.011	3.53E-03	1.16E-04	5.22E-03	1.06E-03
2.5	3.98E-04	2.86E-04	2.49E-04	0.955	0.021	0.004	0.011	3.41E-03	3.55E-05	4.67E-03	5.91E-04
3.0	3.97E-04	2.81E-04	2.37E-04	0.955	0.019	0.004	0.011	3.28E-03	1.08E-05	4.14E-03	3.19E-03
4.0	3.99E-04	2.74E-04	2.15E-04	0.963	0.017	0.003	0.011	3.08E-03	1.02E-06	3.27E-03	9.05E-05
5.0	3.99E-04	2.66E-04	1.95E-04	0.967	0.014	0.002	0.011	2.86E-03	9.51E-08	2.56E-03	2.53E-05
6.0	3.98E-04	2.58E-04	1.76E-04	0.970	0.012	0.002	0.011	2.66E-03	8.89E-09	2.00E-03	7.01E-06
7.0	3.99E-04	2.50E-04	1.59E-04	0.973	0.011	0.001	0.011	2.47E-03	0.00	1.57E-03	1.94E-06
8.0	3.98E-04	2.42E-04	1.44E-04	0.976	0.009	0.001	0.011	2.30E-03	0.00	1.23E-03	0.00
9.0	3.97E-04	2.35E-04	1.30E-04	0.978	0.008	0.001	0.010	2.14E-03	0.00	9.60E-04	0.00
10.0	3.96E-04	2.27E-04	1.18E-04	0.979	0.007	0.001	0.010	1.98E-03	0.00	7.52E-04	0.00
12.0	3.95E-04	2.13E-04	9.57E-05	0.982	0.005	0.00	0.010	1.71E-03	0.00	4.59E-04	0.00
18.0	3.89E-04	1.74E-04	5.16E-05	0.987	0.002	0.00	0.010	1.09E-03	0.00	1.04E-04	0.00
24.0	3.81E-04	1.42E-04	2.77E-05	0.989	0.001	0.00	9.80E-03	6.92E-04	0.00	2.37E-05	0.00
30.0	3.73E-04	1.16E-04	1.49E-05	0.990	0.00	0.00	9.48E-03	4.39E-04	0.00	5.38E-06	0.00
36.0	3.65E-04	9.48E-05	8.00E-06	0.990	0.00	0.00	9.24E-03	2.79E-04	0.00	1.22E-06	0.00
42.0	3.58E-04	7.72E-05	4.29E-06	0.991	0.00	0.00	8.91E-03	1.77E-04	0.00	0.00	0.00
48.0	3.51E-04	6.29E-05	2.31E-06	0.991	0.00	0.00	8.66E-03	1.12E-04	0.00	0.00	0.00
72.0	3.22E-04	2.78E-05	0.00	0.992	0.00	0.00	7.57E-03	1.83E-05	0.00	0.00	0.00
96.0	2.95E-04	1.23E-05	0.00	0.993	0.00	0.00	6.64E-03	2.96E-06	0.00	0.00	0.00
120.0	2.71E-04	5.40E-06	0.00	0.994	0.00	0.00	5.83E-03	0.00	0.00	0.00	0.00
144.0	2.49E-04	2.38E-06	0.00	0.995	0.00	0.00	5.11E-03	0.00	0.00	0.00	0.00
168.0	2.28E-04	1.05E-06	0.00	0.996	0.00	0.00	4.48E-03	0.00	0.00	0.00	0.00
336.0	1.26E-04	3.40E-09	0.00	0.998	0.00	0.00	1.79E-03	0.00	0.00	0.00	0.00
504.0	6.87E-05	0.00	0.00	0.999	0.00	0.00	7.09E-04	0.00	0.00	0.00	0.00
672.0	3.80E-05	0.00	0.00	1.000	0.00	0.00	2.84E-04	0.00	0.00	0.00	0.00
720.0	3.19E-05	0.00	0.00	1.000	0.00	0.00	2.18E-04	0.00	0.00	0.00	0.00

Notes:
1. The activity fractions that are NOT highlighted contribute less than ten percent of the whole body dose.
2. The activity fractions that are NOT underlined contribute less than ten percent of the thyroid dose.
3. Radionuclides that do NOT appear in the table contribute less than ten percent of the whole body and thyroid dose totals.

6.0 REFERENCES

6.1 EDS Report to Wisconsin Electric Power Company concerning NUREG-0578, March 7, 1980.

6.2 EPIP 1.1, Course of Actions

6.3 EPIP 2.1, Notifications - ERO, State & Counties, and NRC

6.4 ETD 02, Offsite Agency Call List.

6.5 NUREG/BR-0150, Volume 1, Revision 4, RTM-96, Response Technical Manual, Figures A-5 and A-6, March 1996.

6.6 Radiation Monitoring System Alarm Setpoint & Response Book

6.7 Radiological Engineer to Plant Manager/EP Coordinator memo dated June 13, 1988.

6.8 Reactor Engineer to Plant Manager memo dated April 6, 1984.

6.9 TID 14844, Calculation of Distance Factors for Power and Test Reactor Sites, March 23, 1962.

6.10 U. S. NRC Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Release of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Revision 1, October 1977.

6.11 U. S. NRC Regulatory Guide 1.4, Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of Coolant Accident for Pressurized Water Reactors, Revision 2, June 1976.

7.0 BASES

B-1 NUREG-0654, Revision 1, Supp. 3, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, July, 1996.

B-2 Point Beach Nuclear Plant, Emergency Plan, Appendix J, Evacuation Time Estimates for the Area Surrounding the Point Beach Nuclear Plant.

B-3 IE Information Notice No. 83-28, Criteria for Protective Action Recommendations for General Emergencies.

B-4 EPA 400-R-92-001, Manual of Protective Action Guidelines for Nuclear Incidents, May, 1992.

ATTACHMENT A
AFFECTED SECTORS BASED ON WIND DIRECTION

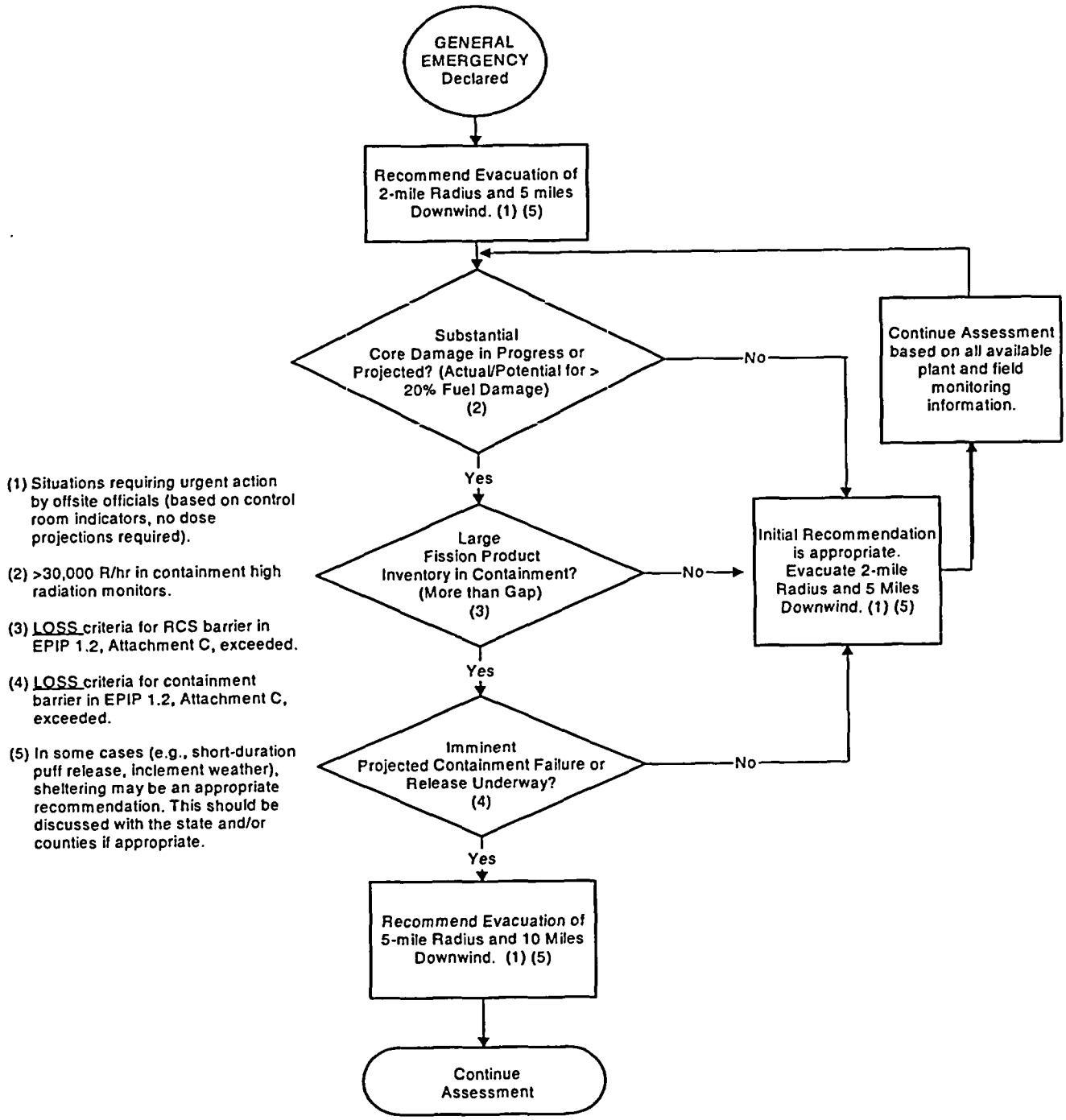
NOTE: If wind speed is less than three (3) mph or lake breeze conditions exist, then recommend protective actions for all sectors (360°) 0-5 miles. Lake breeze conditions exist if the difference between actual wind direction values for inland and near shore meteorological towers is greater than 90°.

Wind Direction* (Degrees From)	Affected Downwind Sectors
>351 - 9 (>351 - 369**)	H, J, K
>9 - 13 (>369 - 373**)	H, J, K, L
>13 - 32 (>373 - 396**)	J, K, L
>32 - 36 (>392 - 396**)	J, K, L, M
>36 - 54 (>396 - 414**)	K, L, M
>54 - 58 (>414 - 418**)	K, L, M, N
>58 - 77 (>418 - 437**)	L, M, N
>77 - 81 (>437 - 441**)	L, M, N, P
>81 - 99 (>441 - 459**)	M, N, P
>99 - 103 (>459 - 463**)	M, N, P, Q
>103 - 122 (>463 - 482**)	N, P, Q
>122 - 126 (>482 - 486**)	N, P, Q, R
>126 - 144 (>486 - 504**)	P, Q, R
>144 - 148 (>504 - 508**)	P, Q, R, A
>148 - 167 (>508 - 527**)	Q, R, A
>167 - 171 (>527 - 531**)	Q, R, A, B
>171 - 189 (>531 - 549**)	R, A, B
>189 - 193	R, A, B, C
>193 - 212	A, B, C
>212 - 216	A, B, C, D
>216 - 234	B, C, D
>234 - 238	B, C, D, E
>238 - 257	C, D, E
>257 - 261	C, D, E, F
>261 - 279	D, E, F
>279 - 283	D, E, F, G
>283 - 302	E, F, G
>302 - 306	E, F, G, H
>306 - 324	F, G, H
>324 - 328	F, G, H, J
>328 - 347	G, H, J
>347 - 351	G, H, J, K

* As read on PPCS or Control Room instruments.

** > 360 as read on chart recorder.

ATTACHMENT B
GENERAL EMERGENCY OFFSITE PROTECTIVE ACTIONS



(1) Situations requiring urgent action by offsite officials (based on control room indicators, no dose projections required).

(2) >30,000 R/hr in containment high radiation monitors.

(3) LOSS criteria for RCS barrier in EPIP 1.2, Attachment C, exceeded.

(4) LOSS criteria for containment barrier in EPIP 1.2, Attachment C, exceeded.

(5) In some cases (e.g., short-duration puff release, inclement weather), sheltering may be an appropriate recommendation. This should be discussed with the state and/or counties if appropriate.

ATTACHMENT C
REINSTALLATION OF WEDAP SOFTWARE

1.0 NOTEBOOK PERSONAL COMPUTER (PC) ACCESS

The Wisconsin Electric Dose Assessment Program (WEDAP) is a resident of the hard drive of the Level A notebook personal computers (PC) in the Control Room and EOF (TSC as a backup) dose assessment areas. The directory location is "J:\Apps\NP\WEDAP".

1.1 **IF** the WEDAP directory and files are **NOT** found on the hard drive of the notebook PC in the EOF (TSC),
THEN the notebook PC must be recloned and WEDAP reinstalled using the CD-Roms located in the EOF (TSC) inventory cabinet.

1.1.1 Recloning the notebook PC

a. Insert the cloning "Install" CD-Rom.

b. Reboot the notebook PC.

c. Wait for the prompt, following any instruction prompts given.

1.1.2 Installing WEDAP from the cloning CD.

a. Insert the "WEDAP" application CD-Rom.

b. Select the "Start Bar - Enterprise Applications - Application Install - Install/Update Application" (top choice).

c. Click on "Install" to run the auto-install.

1.2 Return to EPIP 1.3, Step 5.2.1
OR IF WEDAP is still unavailable,
THEN perform manual calculations per EPIP 1.3, Step 5.4.

2.0 PRINTING DATA TO LOCAL PRINTER IN THE EOF (TSC)

2.1 Ensure the laserjet printer in the EOF (TSC) is connected to the notebook PC via the printer cable and the printer is in the "ON" position.
2.2 From WEDAP, select "File - Print" **OR** the "Printer Icon" to print a case.

ATTACHMENT C
REINSTALLATION OF WEDAP SOFTWARE

2.3 Return to EPIP 1.3, Step 5.2.20 **IF** able to print.

2.4 **IF** still unable to print,
THEN reset the printer connection.

2.4.1 Select "Start - Settings - Printers - HP LaserJet 4000" and verify the printer properties have LPT1 selected for the port connection.

2.4.2 From WEDAP, select "File - Print" **OR** the "Printer Icon" to print a case.

2.4.3 Return to EPIP 1.3, Step 5.2.20 **IF** able to print.

2.5 **IF** still unable to print,
THEN reinstall the printer drivers.

2.5.1 Obtain the cloning "Install" CD-Rom from the EOF (TSC) inventory cabinet and place in the notebook PC while still logged on.

2.5.2 Select Start - Settings - Printers

2.5.3 Execute "Add Local Printer"

2.5.4 Select "My Computer" and "Next" arrow

2.5.5 Select "LPT1" local port and "Next" arrow

2.5.6 At "Add Print Wizard" select "Have Disk...."

2.5.7 At "Install From Disk" select "Browse..."

2.5.8 When message of "A:\ Isn't Accessible" select "Cancel"

2.5.9 At "Local File Window" Select "My Computer"

2.5.10 Select "D"\Prntdrvs\1386\HP4000~1\PC16\Oemnt40.inf **OR** other appropriate printer.

2.5.11 Select "OK" at "Install from Disk"

2.5.12 Select "HP LaserJet 4000 Series PCL 6" **OR** other appropriate printer and "Next" arrow.

2.5.13 Name the printer HPLJ4000 **OR** other appropriate name and "Next" arrow

ATTACHMENT C
REINSTALLATION OF WEDAP SOFTWARE

2.5.14 Select "Not Shared" and "Next" arrow

2.5.15 Select "Yes" to print a test page and "Finish" when completed

2.5.16 Select the newly installed printer as the "Default"

2.5.17 **IF** printer prints test page,
THEN retry printing per Attachment C, Step 2.2

2.5.18 **IF** printer still does not print,
THEN initiate a call for computer support.

2.6 Return to EPIP 1.3, Step 5.2.20.

EPIP 7.3.7

ESTIMATING RADIOIODINE AIR CONCENTRATIONS AND THYROID DOSE RATE

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_____ _____ _____

_____ _____ _____

TABLE OF CONTENTS

1.0 PURPOSE

This procedure provides a method to estimate radioiodine air concentrations and thyroid dose rate. A set of tables are used to estimate radioiodine concentrations from sample cartridge contact dose rates. These estimated concentrations, or concentrations measured by MCA are then used to calculate thyroid dose rate.

2.0 PREREQUISITES

2.1 Responsibilities

Radiation Protection Supervision (Offsite Radiation Protection Coordinator and/or Radiation Protection Leader) is responsible for:

2.1.1 Estimation of radioiodine air concentrations and thyroid dose rate calculation.

2.1.2 Implementation of radiological monitoring controls.

2.1.3 Ensuring Dose/PAR Coordinator or Rad/Chem Coordinator is informed of results.

2.2 Equipment

Emergency Preparedness Radiation Protection Equipment maintained in OSRPF and/or OSC.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel shall wear prescribed protective clothing, dosimetry devices, and other protection equipment when performing sample analyses.

3.2 Improper handling of radioactive material can result in personnel contamination, radioactive material uptake, unplanned personnel exposure, and cross-contamination of samples.

3.3 An air particulate filter will have been placed in front of the charcoal filter to collect particulate matter and prevent charcoal filter contamination by particulates.

3.4 The thyroid dose rate determined by this procedure is for iodine radionuclides only.

4.0 INITIAL CONDITIONS

4.1 The contact dose rate reading (after purging, if charcoal filter) on the air sample cartridge is greater than 1 mR/hr or the spectroscopy amplifier dead time is greater than 20%, **OR** .

4.2 The iodine air sampling cartridge contains activity which exceeds the counting capability of the MCA, **OR**

4.3 The MCA is unavailable, **OR**

4.4 Radioactive concentration results are available from MCA, **OR**

4.5 As required for Emergency Plan activities (e.g. EAL determination).

5.0 PROCEDURE

5.1 Purging Charcoal Filter

NOTE: IF a silver zeolite cartridge was used for the sample, THEN no purging is necessary.

IF a charcoal cartridge was used,
THEN purge the cartridge with non-radioactive air to remove radioactive noble gases that may have accumulated in the filter. Purging may be accomplished utilizing the following:

NOTE: Purging should be accomplished inside a chemistry laboratory hood or in an open area away from personnel.

5.1.1 IF service air is utilized to perform the purge,
THEN verify that the plant service air is not contaminated.

5.1.2 IF an air sampler is utilized to perform the purge,
THEN place the filter in another sampler and operate it in an area outside the known radioactive airborne area. Use a clean particulate filter to prevent contamination from particulates.

5.1.3 Purge until the contact reading on filter stabilizes over 5 minutes.

5.2 Determining Contact Dose Rate

NOTE: The contact dose rate is defined as the dose rate observed when the inlet side of the cartridge is placed in contact with the beta shield of the survey meter in the closed window position. The contact dose rate may be measured through a plastic bag.

5.2.1 Measure the iodine air sampling cartridge contact dose rate with a Survey Meter (i.e., Eberline RO-2, Bicron RSO-5, or equivalent).

5.2.2 Record the contact dose rate on Worksheet 1 and on the plastic bag the cartridge is in.

5.3 Determining Radioiodine Air Concentrations

NOTE 1: The user may need to interpolate to get the desired numbers from the tables.

NOTE 2: If radioiodine air concentrations from MCA results are available, they may be entered on Worksheet 1 (Step 5.3.3) and Steps 5.3.1-5.3.2 are not applicable.

5.3.1 Determine the appropriate table to be used by selecting the table matching:

a. The type of iodine air sampling cartridge used, and

b. The flow rate used during the air sampling.

5.3.2 Record the conversion factors from the appropriate table on Worksheet 1.

5.3.3 Calculate the radioiodine air concentrations by multiplying the conversion factors by the contact dose rate and enter result on Worksheet 1 **OR** enter the radioiodine air concentrations from MCA results.

5.4 Determining Thyroid Dose Rate

NOTE: Use Worksheet 1 for the following steps.

5.4.1 Calculate the DAC-ratio for each radionuclide listed by dividing the radioiodine air concentration by the corresponding DAC conversion factor.

5.4.2 Sum the DAC-ratios for all listed radionuclides to get total DAC and enter result on Worksheet 1.

5.4.3 Calculate the Thyroid Dose Rate by multiplying the total DAC by 0.025 rem/hr.

5.4.4 Sign/Print the "Completed by" and "Date" sections of Worksheet 1.

5.4.5 Forward the results to the Dose/PAR Coordinator or Rad/Chem Coordinator.

6.0 REFERENCES

6.1 Correspondence, NEM-89-510, Contact Dose Rate to Air Concentration Conversion Factors for I-130, I-132, I-133, I-134 and I-135, 8/7/89

6.2 Calculation 1999-0113, Air Cartridge Contact Dose Rate to Air Concentration Conversion Factors for Radioiodines

7.0 BASES

B-1 10 CFR 20, Standards for Protection Against Radiation

TABLE 1
CARTRIDGE - CHARCOAL - FLOW RATE - 100 LPM
AIR CARTRIDGE CONTACT DOSE RATE TO AIR CONCENTRATION
CONVERSION FACTORS

Time Post-Accident (Hours)	Conversion Factor (μCi/cc per mR/h contact total)				
	I-131	I-132	I-133	I-134	I-135
0	1.52E-07	2.19E-07	3.12E-07	3.43E-07	2.91E-07
0.5	1.83E-07	2.26E-07	3.68E-07	2.77E-07	3.32E-07
1	2.14-E-07	2.28E-07	4.25E-07	2.19E-07	3.69E-07
1.5	2.46E-07	2.26E-07	4.81E-07	1.70E-07	4.04E-07
2	2.78E-07	2.20E-07	5.36E-07	1.30E-07	4.34E-07
4	4.02E-07	1.75E-07	7.30E-07	3.88E-08	5.12E-07
6	5.18E-07	1.24E-07	8.87E-07	1.04E-08	5.39E-07
8	6.31E-07	8.35E-08	1.02E-06	2.62E-09	5.36E-07
10	7.42E-07	5.42E-08	1.13E-06	6.38E10	5.15E-07
12	8.53E-07	3.43E-08	1.22E-06	1.52E-10	4.83E-07
18	1.18E-06	7.93E-09	1.41E-06	1.86E-12	3.63E-07
24	1.49E-06	1.68E-09	1.49E-06	2.10E-14	2.50E-07
30	1.78E-06	3.37E-10	1.49E-06	2.23E-16	1.63E-07
36	2.05E-06	6.48E-11	1.44E-06	2.28E-18	1.02E-07
48	2.49E-06	2.21E-12	1.22E-06	2.19E-22	3.68E-08
72	3.11E-06	2.18E-15	7.48E-07	1.72E-30	4.05E-09
96	3.49E-06	1.92E-18	4.11E-07	1.20E-38	4.00E-10
168	3.88E-06	1.04E-27	5.37E-08	3.28E-63	3.03E-13

TABLE 2
CARTRIDGE - CHARCOAL - FLOW RATE - 30 LPM
AIR CARTRIDGE CONTACT DOSE RATE TO AIR CONCENTRATION CONVERSION FACTORS

Time Post-Accident (Hours)	Conversion Factor (µCi/cc per mR/h contact total)				
	I-131	I-132	I-133	I-134	I-135
0	1.48E-07	2.13E-07	3.03E-07	3.34E-07	2.83E-07
0.5	1.78E-07	2.19E-07	3.58E-07	2.70E-07	3.23E-07
1	2.08E-07	2.21E-07	4.13E-07	2.13E-07	3.59E-07
1.5	2.39E-07	2.19E-07	4.68E-07	1.65E-07	3.93E-07
2	2.70E-07	2.14E-07	5.21E-07	1.26E-07	4.22E-07
4	3.91E-07	1.70E-07	7.10E-07	3.78E-08	4.98E-07
6	5.04E-07	1.21E-07	8.63E-07	1.01E-08	5.25E-07
8	6.14E-07	8.13E-08	9.90E-07	2.55E-09	5.22E-07
10	7.22E-07	5.27E-08	1.10E-06	6.21E-10	5.01E-07
12	8.29E-07	3.34E-08	1.19E-06	1.48E-10	4.70E-07
18	1.14E-06	7.72E-09	1.37E-06	1.81E-12	3.53E-07
24	1.45E-06	1.64E-09	1.45E-06	2.04E-14	2.44E-07
30	1.73E-06	3.28E-10	1.45E-06	2.17E-16	1.59E-07
36	1.99E-06	6.30E-11	1.40E-06	2.22E-18	9.92E-08
48	2.42E-06	2.15E-12	1.19E-06	2.13E-22	3.58E-08
72	3.03E-06	2.12E-15	7.28E-07	1.67E-30	3.94E-09
96	3.39E-06	1.87E-18	4.00E-07	1.17E-38	3.89E-10
168	3.77E-06	1.02E-27	5.23E-08	3.19E-63	2.94E-13

TABLE 3
CARTRIDGE - SILVER ZEOLITE - FLOW RATE - 100 LPM
AIR CARTRIDGE CONTACT DOSE RATE TO AIR CONCENTRATION
CONVERSION FACTORS

Time Post-Accident (Hours)	Conversion Factor (µCi/cc per mR/h contact total)				
	I-131	I-132	I-133	I-134	I-135
0	1.64E-07	2.36E-07	3.36E-07	3.70E-07	3.14E-07
0.5	1.97E-07	2.43E-07	3.97E-07	2.99E-07	3.57E-07
1	2.31E-07	2.45E-07	4.58E-07	2.36E-07	3.98E-07
1.5	2.65E-07	2.43E-07	5.19E-07	1.83E-07	4.35E-07
2	3.00E-07	2.37E-07	5.78E-07	1.40E-07	4.67E-07
4	4.33E-07	1.89E-07	7.87E-07	4.19E-08	5.52E-07
6	5.59E-07	1.34E-07	9.56E-07	1.12E-08	5.81E-07
8	6.80E-07	9.00E-08	1.10E-06	2.82E-09	5.78E-07
10	8.00E-07	5.84E-08	1.22E-06	6.88E-10	5.55E-07
12	9.19E-07	3.70E-08	1.32E-06	1.64E-10	5.21E-07
18	1.27E-06	8.55E-09	1.52E-06	2.01E-12	3.92E-07
24	1.61E-06	1.81E-09	1.61E-06	2.26E-14	2.70E-07
30	1.92E-06	3.63E-10	1.61E-06	2.41E-16	1.76E-07
36	2.21E-06	6.99E-11	1.55E-06	2.46E-18	1.10E-07
48	2.68E-06	2.39E-12	1.32E-06	2.37E-22	3.97E-08
72	3.35E-06	2.35E-15	8.07E-07	1.85E-30	4.36E-09
96	3.76E-06	2.07E-18	4.43E-07	1.30E-38	4.31E-10
168	4.18E-06	1.13E-27	5.79E-08	3.53E-63	3.26E-13

TABLE 4
CARTRIDGE - SILVER ZEOLITE - FLOW RATE - 30 LPM
AIR CARTRIDGE CONTACT DOSE RATE TO AIR CONCENTRATION
CONVERSION FACTORS

Time Post-Accident (Hours)	**Conversion Factor (μCi/cc per mR/h contact total)**				
	I-131	**I-132**	**I-133**	**I-134**	**I-135**
0	1.49E-07	2.14E-07	3.06E-07	3.37E-07	2.86E-07
0.5	1.79E-07	2.21E-07	3.61E-07	2.72E-07	3.25E-07
1	2.10E-07	2.23E-07	4.17E-07	2.15E-07	3.62E-07
1.5	2.41E-07	2.21E-07	4.72E-07	1.67E-07	3.96E-07
2	2.73E-07	2.15E-07	5.25E-07	1.27E-07	4.25E-07
4	3.94E-07	1.72E-07	7.16E-07	3.81E-08	5.02E-07
6	5.08E-07	1.22E-08	8.70E-07	1.02E-08	5.29E-07
8	6.19E-07	8.19E-08	9.98E-07	2.57E-09	5.26E-07
10	7.28E-07	5.31E-08	1.11E-06	6.26E-10	5.05E-07
12	8.36E-07	3.36E-08	1.20E-06	1.49E-10	4.74E-07
18	1.15E-06	7.78E-09	1.38E-06	1.83E-12	3.56E-07
24	1.46E-06	1.65E-09	1.46E-06	2.06E-14	2.46E-07
30	1.75E-06	3.30E-10	1.46E-06	2.19E-16	1.60E-07
36	2.01E-06	6.35E-11	1.41E-06	2.24E-18	1.00E-07
48	2.44E-06	2.17E-12	1.20E-06	2.15E-22	3.61E-08
72	3.05E-06	2.14E-15	7.34E-07	1.68E-30	3.97E-09
96	3.42E-06	1.89E-18	4.03E-07	1.18E-38	3.92E-10
168	3.80E-06	1.02E-27	5.27E-08	3.21E-63	2.97E-13

WORKSHEET 1
IODINE AIR CONCENTRATIONS AND THYROID DOSE RATE ESTIMATIONS

Time of shutdown _____

Time air sampling initiated _____

Time contact dose rate determined _____

Time elapsed between shutdown and start of air sampling _____ hours

Sample Volume _____ cc

Iodine air sampling media used: Charcoal Silver Zeolite
(Circle one)

Was charcoal cartridge purged? Yes No
(Circle one)

Contact dose rate (after purging, if charcoal filter) _____ mrem/hr

Radionuclide	Air Concentration Conversion Factor from Tables 1-4 (μCi/cc per mR/h)		Contact Dose Rate (mR/h)		Air Concentration (μCi/cc)		DAC (μCi/cc)[1]		DAC-Ratio
I-131	_____	×	_____	=	_____	÷	2E-8	=	_____
I-132	_____	×	_____	=	_____	÷	3E-6	=	_____
I-133	_____	×	_____	=	_____	÷	1E-7	=	_____
I-134	_____	×	_____	=	_____	÷	2E-5	=	_____
I-135	_____	×	_____	=	_____	÷	7E-7	=	_____
							Total DAC		_____

$$\text{Thyroid Dose Rate} = \frac{\text{(Total DAC)}}{\text{DAC}} \times \frac{0.025\ \text{rem/hr}^{(2)}}{\text{DAC}} = \text{_____ rem/hr.}$$

(1) 10 CFR 20, Appendix B, Table B-1

(2) Radioiodine DACs are based on non-stochastic ALIs (50 rem CDE)

Completed By: _____ Date: _____ Time: _____

FORWARD THE RESULTS TO THE DOSE/PAR COORDINATOR OR RAD/CHEM COORDINATOR