Exelon Generation
4300 Winfield Road
Warrenville, IL 60555
630 657 2000 Office

10 CFR 50.54(q)(5)
10 CFR 50.4
10 CFR 72.44(f)

RS-17-170

December 19, 2017

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456, 50-457, and 72-73

Byron Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. 50-454, 50-455, and 72-68

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Dresden Nuclear Power Station, Units 1, 2, and 3
Facility Operating License No. DPR-2
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-010, 50-237, 50-249, and 72-37

LaSalle County Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373, 50-374, and 72-70

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254, 50-265, and 72-53

Subject: Exelon Generation Company Emergency Plan Annex and Addendum Revisions

In accordance with 10 CFR 50.4(b)(5), *"Emergency Plan and related submissions,"* Exelon Generation Company, LLC (EGC) is submitting Emergency Plan Annex and Addendum revisions for the cited facilities as listed in the table below.

Procedure No.	Revision	Title
EP-AA-1001	34	*Exelon Nuclear Radiological Emergency Plan Annex for Braidwood Station*
EP-AA-1001, Addendum 3	3	*Emergency Action Levels for Braidwood Station*
EP-AA-1002	35	*Exelon Nuclear Radiological Emergency Plan Annex for Byron Station*
EP-AA-1003	28	*Exelon Nuclear Radiological Emergency Plan Annex for Clinton Station*
EP-AA-1004	36	*Exelon Nuclear Radiological Emergency Plan Annex for Dresden Station*
EP-AA-1005	40	*Exelon Nuclear Radiological Emergency Plan Annex for LaSalle Station*
EP-AA-1006	40	Exelon Nuclear Radiological Emergency Plan Annex for Quad Cities Station

The changes to the Emergency Plan Annexes and Addendum for the plants listed were evaluated under the requirements of 10 CFR 50.54(q) and were determined not to result in a reduction in the effectiveness of the Emergency Plans. This notification is being submitted within 30 days of implementation of the Emergency Plan Annex and Addendum changes as required by 10 CFR 50.54(q)(5). The changes continue to meet the applicable planning standards established in 10 CFR 50.47(b) and 10 CFR 50, Appendix E.

In addition, as required by 10 CFR 50.54(q)(5), this submittal includes a summary analysis of the changes to the Emergency Plan Annexes and Addendum in Attachment 1.

There are no regulatory commitments in this submittal.

If you have any questions or require additional information, please contact Amy Hambly at (630) 657-2808.

Respectfully,

Patrick R Simpson

Patrick R. Simpson
Manager, Licensing
Exelon Generation Company, LLC

Attachments:

1. 10 CFR 50.54(q)(5) Change Summary Analysis
2. EP-AA-1001, Revision 34, "*Exelon Nuclear Radiological Emergency Plan Annex for Braidwood Station*"
3. EP-AA-1001, Addendum 3, Revision 3, *"Emergency Action Levels for Braidwood Station"*

4. EP-AA-1002, Revision 35, *"Exelon Nuclear Radiological Emergency Plan Annex for Byron Station"*
5. EP-AA-1003, Revision 28, *"Exelon Nuclear Radiological Emergency Plan Annex for Clinton Station"*
6. EP-AA-1004, Revision 36, *"Exelon Nuclear Radiological Emergency Plan Annex for Dresden Station"*
7. EP-AA-1005, Revision 40, *"Exelon Nuclear Radiological Emergency Plan Annex for LaSalle Station"*
8. EP-AA-1006, Revision 40, *"Exelon Nuclear Radiological Emergency Plan Annex for Quad Cities Station*

cc: w/ Attachment 1 only

Regional Administrator - NRC Region III
Director, NRC Division of Spent Fuel Management, ONMSS
NRC Senior Resident Inspector - Braidwood Station
NRC Senior Resident Inspector - Byron Station
NRC Senior Resident Inspector - Clinton Power Station
NRC Senior Resident Inspector - Dresden Nuclear Power Station
NRC Senior Resident Inspector - LaSalle County Station
NRC Senior Resident Inspector - Quad Cities Nuclear Power Station
NRC Project Manager, NRR - Braidwood Station
NRC Project Manager, NRR - Byron Station
NRC Project Manager, NRR - Clinton Power Station
NRC Project Manager, NRR - Dresden Nuclear Power Station
NRC Project Manager, NRR - LaSalle County Station
NRC Project Manager, NRR - Quad Cities Nuclear Power Station
Illinois Emergency Management Agency - Division of Nuclear Safety

bcc: w/ Attachment 1 only

Site Vice President - Braidwood Station
Site Vice President - Byron Station
Site Vice President - Clinton Power Station
Site Vice President - Dresden Nuclear Power Station
Site Vice President - LaSalle County Station
Site Vice President - Quad Cities Nuclear Power Station
Regulatory Assurance Manager - Braidwood Station
Regulatory Assurance Manager - Byron Station
Regulatory Assurance Manager - Clinton Power Station
Regulatory Assurance Manager - Dresden Nuclear Power Station
Regulatory Assurance Manager - LaSalle County Station
Regulatory Assurance Manager - Quad Cities Nuclear Power Station
Site EP Manager - Braidwood Station
Site EP Manager - Byron Station
Site EP Manager - Clinton Power Station
Site EP Manager - Dresden Nuclear Power Station
Site EP Manager - LaSalle County Station
Site EP Manager - Quad Cities Nuclear Power Station
Corporate EP Director - Cantera
Corporate EP Manager - KSA
Corporate Licensing Director - Cantera
Corporate Licensing Managers - West
Records Management - KSA
Commitment Tracking Coordinator - East
Commitment Tracking Coordinator - West

ATTACHMENT 1

10 CFR 50.54(q)(5) Change Summary Analysis

ATTACHMENT 1

10 CFR 50.54(q)(5) Change Summary Analysis

Document Titles

Exelon Generation Company, LLC (EGC) has issued the following Emergency Plan Annex and Addendum revisions for Braidwood Station, Byron Station, Clinton Power Station, Dresden Nuclear Power Station, LaSalle County Station, and Quad Cities Nuclear Power Station:

- EP-AA-1001, Revision 34, "*Exelon Nuclear Radiological Emergency Plan Annex for Braidwood Station"*
- EP-AA-1001, Addendum 3, Revision 3, *"Emergency Action Levels for Braidwood Station"*
- EP-AA-1002, Revision 35, *"Exelon Nuclear Radiological Emergency Plan Annex for Byron Station"*
- EP-AA-1003, Revision 28, *"Exelon Nuclear Radiological Emergency Plan Annex for Clinton Station"*
- EP-AA-1004, Revision 36, *"Exelon Nuclear Radiological Emergency Plan Annex for Dresden Station"*
- EP-AA-1005, Revision 40, *"Exelon Nuclear Radiological Emergency Plan Annex for LaSalle Station"*
- EP-AA-1006, Revision 40, *"Exelon Nuclear Radiological Emergency Plan Annex for Quad Cities Station*

Description of Procedures

Emergency Plan Annex

The Emergency Plan Annexes listed (i.e., EP-AA-1001, 1002, 1003, 1004, 1005, and 1006) contain emergency planning information and guidance unique to the EGC stations. This includes facility geography, emergency response facility locations, and process and radiation monitoring instrumentation that provides a description of the station's emergency response capabilities, as well as any station unique commitments.

In conjunction with the Emergency Plan Annexes, EGC maintains a Nuclear Standardized Radiological Emergency Plan (i.e., EP-AA-1000) that outlines the basis for the response actions that would be implemented during an emergency. The planning efforts common to all EGC nuclear stations are encompassed within the Standard Plan.

Emergency Plan Addendum

The Emergency Plan Addendum listed (i.e., EP-AA-1001, Addendum 3) describes the Emergency Action Levels (EALs) implemented at Braidwood for entering Emergency Classification Levels (ECLs).

Description of Changes

EP-AA-1001, Revision 34

The following changes were made in this Emergency Plan Annex revision for Braidwood:

- EP-AA-1001, Step 2.1 was revised to state*: "The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes following the declaration of an Alert or higher emergency classification as specified under Table 2-1.*" The wording contained in the Standard Plan (i.e., EP-AA-1000), Step H.4, provides 60 minutes for augmentation following the declaration of an Alert or higher emergency classification for the ERO personnel responding to the station Emergency Response Facilities (ERFs) and the offsite Emergency Operations Facility (EOF). This change aligns the wording for augmentation of the ERO as listed in the station Emergency Plan Annex with that in the Standard Plan. There is no change in the augmentation time.

- On May 12, 2017, the State of Illinois confirmed the full support of the Illinois Emergency Management Agency's (IEMA's) implementation of the new concurrent Nuclear Accident Reporting System (NARS) notification process. The NARS notification process in the State of Illinois is that EGC notifies the State via NARS, then the State notifies the applicable counties via a State NARS message. This ensures that the State and affected counties receive the notification of the event. EGC will provide a courtesy notification to the counties in parallel with the State notification. The Emergency Plan Annex was revised to state the responsibilities for notification and recognize that the commitment to notify the counties is satisfied by response and acknowledgement of the NARS notification to either the county's Sheriff's Department or the county's Emergency Operations Center (EOC).

EP-AA-1001, Addendum 3, Revision 3

The following changes were made in this Emergency Plan Addendum revision for Braidwood:

The Nuclear Energy Institute's (NEI's) guidance document NEI 99-01, Revision 6, *"Development of Emergency Action Levels for Non-Passive Reactors,"* provides the following information for the development of EAL E-HU1, *"Independent Spent Fuel Storage Installation (ISFSI) Damage to a loaded cask CONFINEMENT BOUNDARY"*:

ECL: *Notification of Unusual Event*

Initiating Condition: *Damage to a loaded cask CONFINEMENT BOUNDARY.*

Operating Mode Applicability: *All*

Example Emergency Action Levels:

(1) Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading greater than (2 times the site-specific cask specific technical specification allowable radiation level) on the surface of the spent fuel cask.

Basis:

This IC addresses an event that results in damage to the CONFINEMENT BOUNDARY of a storage cask containing spent fuel. It applies to irradiated fuel that is licensed for dry storage beginning at the point that the loaded storage cask is sealed. The issues of concern are the creation of a potential or actual release path to the environment, degradation of one or more fuel assemblies due to environmental factors, and configuration changes which could cause challenges in removing the cask or fuel from storage.

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

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

Developer Notes:

The results of the ISFSI Safety Analysis Report (SAR) [per NUREG 1536], or a SAR referenced in the cask Certificate of Compliance and the related NRC Safety Evaluation Report, identify the natural phenomena events and accident conditions that could potentially affect the CONFINEMENT BOUNDARY. This EAL addresses damage that could result from the range of identified natural or man-made events (e.g., a dropped or tipped over cask, EXPLOSION, FIRE, EARTHQUAKE, etc.).

The allowable radiation level for a spent fuel cask can be found in the cask's technical specification located in the Certificate of Compliance.

ECL Assignment Attributes: 3.1.1.B

Braidwood has installed the HI-STORM 100 Cask System. The governing Technical Specifications (TS) are include in Certificate of Compliance (CoC) No. 1014, Amendment Nos. 3, and 9.1, Appendix A. The current EAL thresholds encompass the casks in use under Amendment No. 3. The thresholds for the casks in use under Amendment No. 9.1 are being added.

Section 5.7.4 of Appendix A (TS) has the following allowable peak dose rates for a HI-STORM 100 Cask System loaded overpack governed by CoC No. 1014, Amendment No. 9.1 Appendix A:

- 30 mrem/hr (gamma + neutron) on the top of the overpack
- 300 mrem/hr (gamma + neutron) on the side of the overpack excluding inlet and outlet ducts

The guidance in NEI 99-01, Revision 6 specifies using 2-times the allowable radiation level as the EAL threshold basis. Braidwood EAL E-HU1 was revised as follows, to include the thresholds for the use of the HI-STORM 100 Cask System as follows:

- 60 mrem/hr (gamma + neutron) on the top of the spent fuel cask
- 600 mrem/hr (gamma + neutron) on the side of the spent fuel cask excluding inlet and outlet ducts

The Basis for EAL E-HU1 refers to the use of the word *"cask"* versus *"overpack"* as follows:

> *"The word cask, as used in this EAL, refers to the storage container in use at the site for dry storage of irradiated fuel."*

This allows for common terminology to be used in the EAL threshold across the EGC fleet sites.

The following wording was added to the Basis section to better describe why there are now two (2) sets of threshold values.

> *"There are multiple Certificate of Compliance (CoC) Amendments issued at the station, to which the canisters were loaded to, and have different technical specification surface dose rate limits (A3 casks for EAL threshold #1 and A9.1 casks for EAL threshold #2). While the technical specification limits are different, the station meets 10CFR72.104 dose limit requirements as referenced in the station 72.212 report."*

The Reference section in the Basis for EAL E-HU1 was updated to reference all of the applicable CoC amendments of the TS for Braidwood.

Also, units were revised from "mr/hr" to "mrem/hr" to be consistent with the units used in CoC No. 1014, Amendment No. 9.1, Appendix A.

<u>EP-AA-1002, Revision 35</u>

The following changes were made in this Emergency Plan Annex revision for Byron:

- EP-AA-1002, Step 2.1 was revised to state: *"The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes following the declaration of an Alert or higher emergency classification as specified under Table 2-1."* The wording in the Standard Plan (EP-AA-1000), Step H.4, provides a goal of 60 minutes for augmentation following the declaration of an Alert or higher emergency classification for the ERO personnel responding to the station's ERFs and the offsite EOF. This change aligns the wording for augmentation of the ERO in the Emergency Plan Annex with that in the Standard Plan. There is no change in the augmentation time.

- On May 12, 2017, the State of Illinois confirmed the full support of IEMA's implementation of the new concurrent NARS notification process. The NARS notification process in the State of Illinois is that EGC notifies the State via NARS then the State notifies the applicable counties via a State NARS message. This ensures that the State and counties receive the notification of the event. EGC now provides a courtesy notification to the affected counties in parallel with the State notification. The Emergency Plan Annex was revised to state the responsibilities for notification and recognize that the commitment to notify the counties is satisfied by response and acknowledgement of the NARS notification to either the county's Sheriff's Department or the county's EOC.

- The local hospital's name was changed from Rockford Memorial Hospital to Mercyhealth Hospital - Rockton Avenue.

EP-AA-1003, Revision 28

The following changes were made in this Emergency Plan Annex revision for Clinton:

- On May 12, 2017, the State of Illinois confirmed the full support of IEMA's implementation of the new concurrent NARS notification process. The NARS notification process in the State of Illinois is that EGC notifies the State via NARS then the State notifies the applicable counties via a State NARS message. This ensures that the State and counties receive the notification of the event. EGC now provides a courtesy notification to the affected counties in parallel with the State notification. The Emergency Plan Annex was revised to state the responsibilities for notification and recognize that the commitment to notify the counties is satisfied by response and acknowledgement of the NARS notification to either the county's Sheriff's Department or the county's EOC.

- The name of the John Warner Hospital was changed to the Warner Hospital.

- An administrative discrepancy was corrected in this revision (Revision 28). Revision 27 of this Annex was scheduled to be implemented on March 31, 2017, and the revision history and footers for the document reflect a March 2017 implementation. However, the document was not entered into the records system at Clinton until April 3, 2017, which required a change to the revision history.

EP-AA-1004, Revision 36

The following changes were made in this Emergency Plan Annex revision for Dresden:

- EP-AA-1004, Step 2.1 was revised to state: *"The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes following the declaration of an Alert or higher emergency classification as specified under Table 2-1."* The wording contained in the Standard Plan (EP-AA-100), Step H.4 provides 60 minutes for augmentation following the declaration of an Alert or higher emergency classification for the ERO personnel responding to the station's ERFs and the offsite EOF. This change aligns the wording for augmentation of the ERO in the Emergency Plan Annex with that in the Standard Plan. There is no change in the augmentation time.

- On May 12, 2017, the State of Illinois confirmed the full support of IEMA's implementation of the new concurrent NARS notification process. The NARS notification process in the State of Illinois is that EGC notifies the State via NARS then the State notifies the applicable counties via a State NARS message. This ensures that the State and counties receive the notification of the event. EGC now provides a courtesy notification to the affected counties in parallel with the State notification. The Emergency Plan Annex was revised to state the responsibilities for notification and recognize that the commitment to notify the counties is satisfied by response and acknowledgement of the NARS notification to either the county's Sheriff's Department or the county's EOC.

<u>EP-AA-1005, Revision 40</u>

The following changes were made in this Emergency Plan Annex revision for LaSalle:

- EP-AA-1005, Step 2.1 was revised to state: *"The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes following the declaration of an Alert or higher emergency classification as specified under Table 2-1."* The wording in the Standard Plan (EP-AA-1000), Step H.4 provides a goal of 60 minutes for augmentation following the declaration of an Alert or higher emergency classification for the ERO personnel responding to the station's ERFs and the offsite EOF. This change aligns the wording for augmentation of the ERO in the Emergency Plan Annex with that in the Standard Plan. There is no change in the augmentation time.

- On May 12, 2017, the State of Illinois confirmed the full support of IEMA's implementation of the new concurrent NARS notification process. The NARS notification process in the State of Illinois is that EGC notifies the State via NARS then the State notifies the applicable counties via a State NARS message. This ensures that the State and counties receive the notification of the event. EGC now provides a courtesy notification to the affected counties in parallel with the State notification. The Emergency Plan Annex was revised to state the responsibilities for notification and recognize that the commitment to notify the counties is satisfied by response and acknowledgement of the NARS notification to either the county's Sheriff's Department or the county's EOC.

<u>EP-AA-1006, Revision 40</u>

The following changes were made in this Emergency Plan Annex revision for Quad Cities:

- Revision 39, revised Step 4.1, *"Notification of the Emergency Organization,"* to clarify that both the county Sheriff's Department and the county EOC need not be notified as part of the NARS notification process. Specifically, the county notification commitment was satisfied with either notification of the county Sheriff's Department or the county EOC. However, in Revision 39, the committed requirement to notify the State of Illinois counties at a General Emergency (GE) classification was inadvertently omitted. The omission was identified during parallel reviews of similar changes at other EGC Midwest stations prior to the implementation of Revision 39 which has not been implemented. Quad Cities requested that a new revision (i.e., Revision 40) be processed to the Emergency Plan Station Annex. Therefore, this revision reinstates the commitment to notify the applicable counties in the

State of Illinois if a General Emergency (GE) is the initial event via a NARS notification. It should be noted that although the Revision 39 changes were administratively processed internally, Revision 39 was not actually implemented since it was immediately superseded by the issuance of Revision 40. Revision 40 does include the changes for Revision 39.

- This revision also addresses that the State of Iowa Emergency Management Division (IEMD) is now the State of Iowa Homeland Security and Emergency Management Division (HSEMD).

Description of How the Changes Still Comply with Regulations

Emergency Plan Annex Revisions

The changes to the Emergency Plan Annexes (i.e., EP-AA-1001, 1002, 1003, 1004, 1005, and 1006) for Braidwood, Byron, Clinton, Dresden, LaSalle, and Quad Cities described above are fundamentally administrative in nature. The changes addressed in these Annex revisions do not alter the capability of the ERO to implement required Emergency Plan functions, and do not affect the timeliness of the performance of Emergency Preparedness (EP) functions. The changes continue to meet the applicable EP planning standard requirements established in 10 CFR 50.47 and 10 CFR 50, Appendix E as well as program elements described in the guidance of NUREG-0654.

Emergency Plan Addendum Revision

With regard to the revision for EP-AA-1001, Addendum 3 for Braidwood, the changes to EAL E-HU1 reflect the use of an additional type of HI-STORM 100 Cask System Overpack at the ISFSI at Braidwood. CoC No. 1014, Amendment No. 9.1, Appendix A documents the allowable peak dose rates for the additional type of HI-STORM 100 Cask System Overpack.

NEI 99-01, Revision 6 provides the guidance for the development of the EAL E-HU1 threshold as 2-times the allowable peak dose rates. This revision adds EAL #2 thresholds of > 60 mrem/hr (gamma + neutron) on top of the spent fuel cask, and > 600 mrem/hr (gamma + neutron) on the side of the spent fuel cask, excluding inlet and outlet ducts, and revises EAL #1 to include the cask labeling. Also, units were revised from "mr/hr" to "mrem/hr" to be consistent with the units used in CoC No. 1014, Amendment No. 9.1, Appendix A. Additional explanatory wording was added to the Basis section for EAL E-HU-1 to better describe why there are now two (2) sets of threshold values as well updating the Reference section in the Basis to include CoC No. 1014, Amendment No. 9.1, Appendix A.

Updating the EAL threshold values based on an approved CoC does not alter the meaning or intent of the basis of the approved EAL. The addition of the new type of ISFSI cask was reviewed and approved in a 10 CFR 72.212 Evaluation Report (Revision 2, dated August 28, 2014), for Braidwood, Units 1 and 2. Providing additional explanatory wording to the Basis section, updating the Reference section, and revising the units from *"mr/hr"* to *"mrem/hr"* do not alter the meaning or intent of the approved EAL. Also, the applicable EP regulations and commitments to the NRC continue to be met.

Regulatory Guide (RG) 1.219, *"Guidance on Making Changes to Emergency Plans for Nuclear Power Reactors,"* provides the following guidance related to adding the new threshold for the approved ISFSI cask:

> *f. The following examples would <u>generally not require</u> prior NRC approval:*
>
> *(1) A change to an EAL numeric threshold to reflect an approved change in a technical specification, provided that the basis of the approved EAL is unchanged (e.g., an EAL basis refers to a particular technical specification but not a limiting condition for operation value)...,*

<u>Description of Why the Changes are Not a Reduction in Effectiveness (RIE)</u>

The revisions to the Emergency Plan Annexes and Addendum for the cited EGC plants remain consistent with the applicable EP planning standard requirements specified in 10 CFR 50.47 and 10 CFR 50, Appendix E, and the program elements described in the guidance of NUREG-0654. Updating the EAL threshold values for Braidwood as described based on an approved CoC does not alter the meaning or intent of the basis of the approved EAL and the changes in the threshold values are consistent with the guidance described in RG 1.219. The changes do not alter the capability of the ERO to implement required Emergency Plan functions, and do not affect the timeliness of the performance of EP functions. No existing EP requirements have been deleted or minimized by these changes.

Therefore, the revisions to the Emergency Plan Annexes and Addendum do not constitute a reduction in effectiveness since the changes are consistent with existing EP planning standards, program requirements, and regulatory commitments.

ATTACHMENT 2

Radiological Emergency Plan Annex Revision

EP-AA-1001, Revision 34, "*Exelon Nuclear Radiological Emergency Plan Annex for Braidwood Station*"

EXELON NUCLEAR

RADIOLOGICAL EMERGENCY PLAN ANNEX FOR BRAIDWOOD STATION

Page Intentionally left Blank

Table of Contents

REVISION HISTORY

Revision 1; March 1986	Revision 3m: March 05, 1999	Revision 19, April 2007
Revision 2a; June 1987	Revision 4: May 13, 1999	Revision 20, October 2007
Revision 2b; May 1988	Revision 5: June 23, 1999	Revision 21, March 2008
Revision 3; January 1991	Revision 6: January 08, 2001	Revision 22, August 2008
Revision 3a; November 1992	Revision 7: October 08, 2001	Revision 23, March 2010
Revision 3b; December 1993	Revision 8: October 31, 2001	Revision 24, May 2010
Revision 3c; January 1994	Revision 9: January 03, 2002	Revision 25, September 2010
Revision 3d; November 1994	Revision 10: July 08, 2002	Revision 26, February 2011
Revision 3e; December 1994	Revision 11: August 30, 2002	Revision 27, March 2011
Revision 3f; November 1995	Revision 12: November 15, 2002	Revision 28, June 2012
Revision 3g; June 1996	Revision 13: May 16, 2003	Revision 29, November 2012
Revision 3h; June 1996	Revision 14, December 2004	Revision 30, December 2012
Revision 3i; June 1997	Revision 15, May 2005	Revision 31, June 2013
Revision 3j: January 05, 1998	Revision 16, January 2006	Revision 32, June 2014
Revision 3k: August 14, 1998	Revision 17, March 2006	Revision 33, December 2014
Revision 3l: October 16, 1998	Revision 18, October 2006	Revision 34, November 2017

Section 1: Introduction

As required in the conditions set forth by the Nuclear Regulatory Commission (NRC) for the operating licenses for the Exelon Nuclear Stations, the management of Exelon recognizes its responsibility and authority to operate and maintain the nuclear power stations in such a manner as to provide for the safety of the general public.

The Exelon Emergency Preparedness Program consists of the Exelon Nuclear Radiological Emergency Plan, Station Annexes, emergency plan implementing procedures, and associated program administrative documents. The Exelon Nuclear Radiological Emergency Plan outlines the basis for response actions that would be implemented in an emergency. Planning efforts common to all Exelon Nuclear generating stations are encompassed within the Exelon Nuclear Radiological Emergency Plan.

This document serves as the Braidwood Station Annex and contains information and guidance that is unique to the station. This includes facility geography and location for a full understanding and representation of the station's emergency response capabilities. The Station Annex is subject to the same review and audit requirements as the Exelon Nuclear Radiological Emergency Plan.

1.1 Facility Description

The Braidwood Power Station - Units 1 & 2 (Braidwood Station) is located in northern Illinois, approximately 20.0 miles south-southwest of the City of Joliet and 3.0 miles west of the Kankakee River, in Will County. The site is situated in an area composed of flat agricultural farmland that has been scarred from coal strip mining.

The station site is roughly rectangular in shape, with the plant structures occupying the northwest portion of the site.

At its closest approach, the Kankakee River is approximately 3.0 miles east of the northeastern site boundary.

Braidwood Station occupies approximately 4454 acres of land. This area includes the main site area and the cooling lake. The main site area occupies approximately 1917 acres, and the cooling lake occupies the remaining 2537 acres.

Figure 1-1 shows the general location of Braidwood Station. More specific information on station siting may be found in the Updated Final Safety Analysis Report (UFSAR).

The plant consists of two identical pressurized water reactor (PWR) nuclear steam supply systems (NSSS) and turbine-generators furnished by Westinghouse Electric Corporation. Each nuclear steam supply system is designed for a power output of 3645 MWt. Cooling for the plant is provided by a cooling lake of 2537 acres with an average depth of approximately 10 feet.

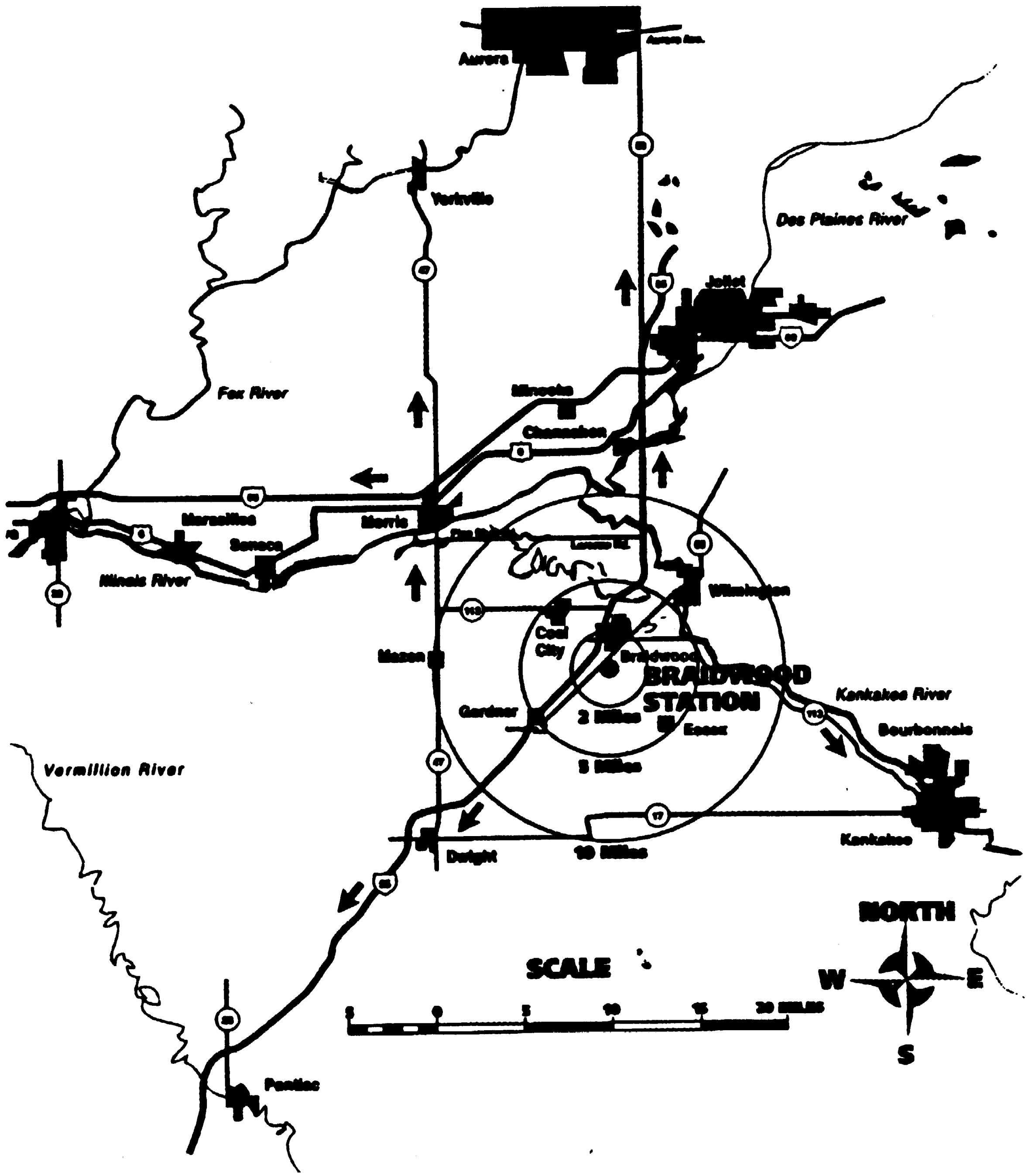
Braidwood Station has two release points for gaseous radioactive effluents, the two Auxiliary Building ventilation stacks. The top of each stack rises 200 feet above the grade elevation. Braidwood Station has one release point for liquid radioactive effluents, the Kankakee River. Liquid radioactive wastes are stored and sampled prior to release to the Kankakee River. A radiation monitor in the discharge line will automatically terminate releases if radioactivity levels exceed predetermined values.

1.2 Emergency Planning Zone

The plume exposure Emergency Planning Zone (EPZ) for Braidwood Station shall be an area surrounding the Station with a radius of about ten miles. (Exact boundaries are determined by the State of Illinois). Refer to Figure 1-1.

The ingestion pathway EPZ for Braidwood Station shall be an area surrounding the Station with a radius of about 50 miles.

Figure 1-1: Braidwood Station Location and 10 Mile EPZ



Section 2: Organizational Control of Emergencies

This section describes the Emergency Response Organization (ERO) and its key positions. It outlines the staffing requirements which provide initial emergency response actions and provisions for timely augmentation of on-shift personnel when required. It also describes interfaces among Exelon Nuclear emergency response personnel and specifies the offsite support available to respond to the nuclear generating stations.

2.1 Shift Organization Staffing

Initial response to any emergency is by the normal plant organization present at the site. This organization includes positions that are onsite 24 hours per day and is described in Section B.1 of the Exelon Nuclear Standardized Radiological Emergency Plan. The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes following the declaration of an Alert or higher emergency classification as specified under Table 2-1. ERO activation is described in Section H.4 of the Exelon Nuclear Standardized Radiological Emergency Plan.

Table 2-1 outlines ERO positions required to meet minimum staffing and full augmentation of the on-shift complement at an Alert or higher classification, and the major tasks assigned to each position. Responsibilities for each position are described in Section B.5 of the Exelon Nuclear Standardized Radiological Emergency Plan.

2.2 Emergency Response Organization Block Diagram

Figures B-1a through B-1d of the Exelon Nuclear Standardized Radiological Emergency Plan illustrates the overall emergency response organization.

2.3 Non-Exelon Nuclear Support Groups

Exelon Nuclear has contractual agreements with several companies whose services would be available in the event of a radiological emergency. These agencies and their available services are listed in Appendix 3 of the Exelon Nuclear Standardized Radiological Emergency Plan.

Emergency response coordination with governmental agencies and other support organizations is discussed in Section A of the Exelon Nuclear Standardized Radiological Emergency Plan.

Agreements exist on file at Braidwood Station with several support agencies. These agencies and their support roles are listed in Appendix 2, Station Letters of Agreement.

Table 2-1: Minimum Staffing Requirements

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
1. Plant Operations/Safe Shutdown and Assessment of Operational Aspects	Control Room Staff	Shift Manager	1			
		Shift Supervisor	1			
		Nuclear Station Operator	3			
		Non-Licensed Operator	4			
2. Emergency Direction and Control	Command and Control	Shift Emergency Director (CR)	1[(a)]			
		Station Emergency Director (TSC)		1		
		Corporate Emergency Director (EOF)		1		
3. Notification & Communication	Emergency Communications	Plant Shift Personnel	1			
		TSC Director (TSC)		1		
		EOF Director (EOF)		1		
		State/Local Communicator		1 (EOF)		1 (TSC)
		ENS Communicator		1 (TSC)		1 (EOF)
		HPN Communicator		1 (EOF)		1 (TSC)
	Plant Status	OPs Communicator (CR/TSC)				2
		Operations Advisor (EOF)				1
	In-Plant Team Control	Damage Control Comm. (CR/TSC/OSC)				3
	Technical Activities	Technical Communicator (TSC)				1
		Technical Advisor (EOF)				1
	Governmental	State Environs Communicator (EOF)				(b)
		EOC Communicator (EOF)				1
		State EOC Liaison (State EOC)				(b)
		County EOC Liaison (County EOC)				(b)
		Regulatory Liaison (EOF)				1
4. Radiological Assessment	Offsite Dose Assessment	RP Personnel	1			
		Dose Assessment Coordinator (EOF)		1		
		Dose Assessor (EOF)				1
		Radiation Controls Coordinator (TSC)				1
	Offsite Surveys	Environmental Coordinator (EOF)		1		
		Field Team Communicator (EOF)				1
		Offsite Field Team Personnel		4		(b)
	Onsite Surveys	Onsite Field Team Personnel		2		(b)
	In-plant Surveys	RP Personnel	1	2		(b)
	Chemistry	Chemistry Personnel	1	1		(b)
	RP Supervisory	Radiation Protection Manager(TSC/EOF)		2		

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Other On-Call	Full Augmentation
5. Plant System Engineering, Repair, and Corrective Actions	Technical Support	STA / Incident Assessor (CR)	1			
		Technical Manager (TSC)		1		
		Core Thermal/Hydraulic Engineer (TSC)		1		
		Mechanical Engineer (TSC)		1		
		Electrical Engineer (TSC)		1		
		SAMG Decision-Maker (TSC)		1[(a)]		
		SAMG Evaluator (TSC)		2[(a)]		
		Operations Manager (TSC)		1		
		Radiation Controls Engineer (TSC)				1
		Technical Support Manager (EOF)				1
	Repair and Corrective Actions	Mechanical Maintenance (OSC)	1[(a)]	2		(b)
		Electrical/I&C Maintenance (OSC)	1[(a)]	3		(b)
		Maintenance Manager (TSC)		1		
		OSC Director (OSC)		1		
		Assistant OSC Director (OSC)				1
		OPs Lead & Support Personnel (OSC)				(b)
6. In-Plant Protective Actions	Radiation Protection	RP Personnel	2[(a)]	4		(b)
7. Fire Fighting	--	Fire Brigade[(c)]	5			
8. 1st Aid and Rescue Operations	--	Plant Personnel	2[(a)]			(b)
9. Site Access Control and Personnel Accountability	Security & Accountability	Security Team Personnel	(d)	(d)		
		Security Coordinator (TSC)				1
	EOF Security	Security Coordinator (EOF)				1
10. Resource Allocation and Administration	Logistics	Logistics Manager (EOF)		1		
		Logistics Coordinator (TSC)				1
	Administration	Administrative Coordinator (EOF)				1
		Clerical Staff (TSC/EOF/JIC)				(b)
	Inter Facility Logs	Events Recorder (EOF/JIC)				2
	Facility Support	Computer Specialist (EOF)				1

Functional Area	Major Tasks	Emergency Positions		Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
11. Public Information	Media Interface	Corporate Spokesperson	(JIC)			1	
		Rad Protection Spokesperson	(JIC)				1
		Technical Spokesperson	(JIC)				1
	Information Development	Public Information Director				1	
		News Writer					1
	Media Monitoring and Rumor Control	Media Monitoring Staff					(b)
		Rumor Control Staff					(b)
	Facility Operation and Control	JIC Director	(JIC)			1	
		JIC Coordinator	(JIC)				1
		Administrative Coordinator	(JIC)				1
		Access Controls	(JIC)				1
		Facility Support Staff	(JIC)				(b)
			TOTAL:	**19**	**37**	**3**	**32[(b)]**

* Response time is based on optimum travel conditions.

(a) May be provided by personnel assigned other functions.

(b) Personnel numbers depend on the type and extent of the emergency.

(c) Fire Brigade per FSAR/Technical Specifications, as applicable.

(d) Function performed by on-shift security personnel.

Section 3: Classification of Emergencies

The Braidwood Emergency Action Levels and supporting information are located in EP-AA-1001, Addendum 3.

Section 4: Emergency Measures

Exelon Nuclear emergency response actions are the same for all nuclear stations and are thus covered by Section E of the Emergency Plan.

4.1 Notification of the Emergency Organization

The Emergency Director is responsible for notifying the State of Illinois Emergency Management Agency (IEMA) via NARS. Will County, Grundy County, and Kankakee County will also be notified via NARS; however, IEMA will maintain responsibility of county notification. At the Braidwood Station, if a General Emergency is the initiating event, the Emergency Director is also responsible for notifying the following local agencies:

- Will County
- Grundy County
- Kankakee County

4.2 Assessment Actions

Throughout each emergency situation, continuing assessment will occur. Assessment actions at Braidwood Station may include an evaluation of plant conditions; in-plant, onsite, and initial offsite radiological measurements; and initial estimates of offsite doses. Core damage information is used to refine dose assessments and confirm or extend initial protective action recommendations. Braidwood Station utilizes WCAP-14696-A, Revision 1, (1999) as the basis for the methodology for post-accident core damage assessment. This methodology utilizes real-time plant indications. In addition, Braidwood Station may use samples of plant fluids and atmospheres as inputs to the CDAM (Core Damage Assessment Methodology) program for core damage estimation.

4.3 Protective Actions for the Offsite Public

To aid the Emergency Response Organization during a developing emergency situation, EP-AA-111, "Emergency Classification and Protective Action Recommendations" has been developed based on Section J.10.m of the Exelon Nuclear Radiological Emergency Plan.

4.3.1 Alert and Notification System (ANS) Sirens

The ANS consists of a permanently installed outdoor notification system within the ten mile radius around the station. The ten mile radius around the station is primarily an agricultural area with a population density below 2000 persons per square mile.

The ANS as installed consists of mechanical and electronic sirens that will cover this entire area with a minimum sound level of 60 db. Additionally, the ANS will cover the heavily populated areas within the ten mile radius around the station with a minimum sound level of 70 db to ensure complete coverage.

Backup means of notification is achieved through Route Alerting, which is contained within the State and respective counties' Radiological Emergency Response Plans and procedures. The means consists of utilizing vehicles with public address (PA) systems in the event the primary method of alerting and

notification is unavailable. The backup method has the capability to alert and notify the public within the plume exposure pathway EPZ within a reasonable time, but does not need to meet the 15-minute design objective for the primary prompt public alert and notification system.

4.3.2 Evacuation Time Estimates

The ETE study used population data from the 2010 census which includes parts of three counties in Illinois (Will, Kankakee and Grundy). The evacuation times are based on a detailed consideration of the EPZ roadway network and population distribution. The ETE Study, contained in EP-AA-1001 Addendum 2, Evacuation Time Estimates for the Braidwood Generating Station Plume Exposure Pathway Emergency Planning Zone, presents evacuation times for daytime and nighttime scenarios under various weather conditions for the evacuation of various areas around the Braidwood Station, once a decision has been made to evacuate.

4.4 Protective Actions for Onsite Personnel

Braidwood Station has a siren system to assemble personnel during emergency conditions. Upon hearing a continuous two (2) minute siren, all personnel not having emergency assignments have been instructed to assemble in predesignated assembly areas. Refer to Figure 4-1.

If a site evacuation of non-essential personnel is required by Section J of the Emergency Plan, personnel will be either relocated and monitored at the designated relocation centers or sent home if there is no release or radiological or safety concerns. The designated relocation centers for Braidwood Station are:

- Mazon Relocation Center, Mazon, Illinois
- Dresden Station, Morris, Illinois
- LaSalle County Nuclear Power Station, Marseilles, Illinois

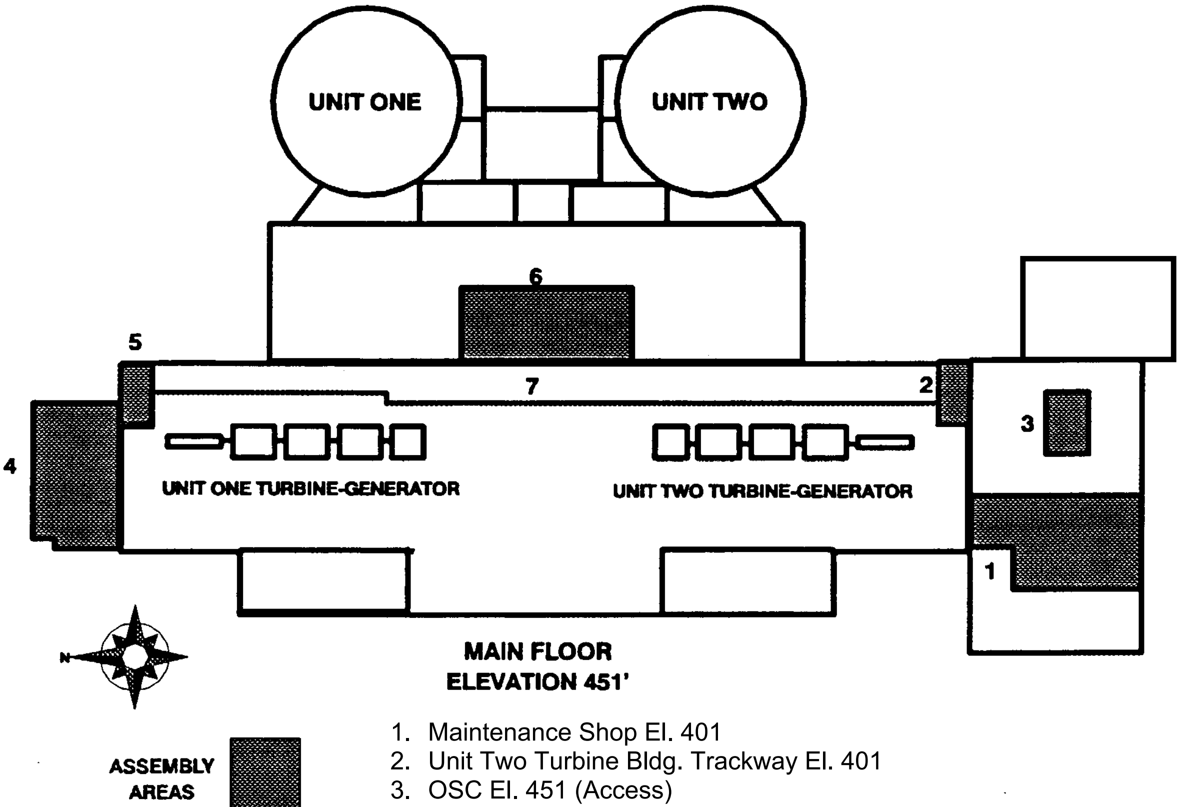
For evacuation routes, refer to EP-AA-113-F-17.

Traffic control for onsite areas will be accomplished by Station personnel, if necessary.

Equipment and personnel would be available at the Mazon Relocation Center, Dresden Station, and LaSalle Station for monitoring and decontamination of evacuated personnel. If major decontamination, follow-up or bioassay samples are necessary, those persons would be sent to Dresden or LaSalle Stations.

Other emergency measures are common to all nuclear stations and are thus discussed in the Emergency Plan.

Figure 4-1: Braidwood Onsite Assembly Areas and Emergency Response Facilities



1. Maintenance Shop El. 401
2. Unit Two Turbine Bldg. Trackway El. 401
3. OSC El. 451 (Access)
4. TSC El. 451 (Access)
5. Unit One Turbine Bldg. Trackway El. 401
6. Control Room El. 451
7. Pathway to TSC

Section 5: Emergency Facilities and Equipment

5.1 Emergency Response Facilities

Refer to Figure 4-1 for the location of the Braidwood Station Control Room, Technical Support Center (TSC), and Operations Support Center (OSC) within the Station's Protected Area boundary.

5.1.1 Station Control Room

The Braidwood Station Control Room is the initial onsite center of emergency control and is located on the 451' elevation of the Auxiliary Building.

5.1.2 Technical Support Center (TSC)

Braidwood Station has designated a Technical Support Center which exists at the north end of the Turbine Building. The TSC fully meets the requirements of Section H.1.b of the Emergency Plan.

5.1.3 Operational Support Center (OSC)

Braidwood Station has designated a primary Operational Support Center. The Primary OSC is on 451' elevation of the Service Building. The OSC conforms to the requirements of Section H of the Emergency Plan and is the location to which operations support personnel will report during an emergency and from which they will be dispatched for assignments in support of emergency operations.

The backup OSC is the Shift Manager's office on 451' elevation of the Auxiliary Building.

5.1.4 Alternative Facility

The Alternative Facility maintains the capability for staging the TSC/OSC emergency response organization personnel in the event of a hostile action. The alternative facility has the capability for communications with the emergency operations facility, control room, and plant security and the capability for engineering assessment activities, including damage control team planning and preparation. Consistent with NRC EPFAQ No. 2013-005, the EOF will satisfy the offsite notification responsibilities for the Alternative Facility. The Alternative Facility is located at 960 North Rt. 47 Morris, Illinois. **(CM-1, ref. AR 1362747.44)**

5.2 Assessment Resources

5.2.1 Onsite Meteorological Monitoring Instrumentation

A 320-foot meteorological tower has been erected on the site approximately 1880 feet northeast of the Braidwood U-1 reactor building, the major plant structure closest to the tower. Wind speed and wind direction are measured at 34 feet and 203 feet above grade level. Temperature is measured at 30 feet and temperature difference is determined between the 30-foot and 199-foot levels. A precipitation gauge is utilized to measure rain and snowfall at ground level near the base of the tower.

The onsite meteorological monitoring program is covered in the contract specification and vendor procedures of the meteorological monitoring contractor. These data are used to generate wind roses and to provide estimates of airborne concentrations of gaseous effluents.

5.2.1.1 Instrumentation

The meteorological tower is instrumented with equipment that conforms with the recommendations of Regulatory Guide 1.23 and ANSI/ANS 2.5 (1984). The equipment is placed on booms oriented into the generally prevailing wind at the site.

Equipment signals are brought to an instrument shelter with controlled environmental conditions. The shelter at the base of the tower houses the recording equipment, signal conditions, etc. used to process and re-transmit the data to the end point users.

5.2.1.2 Meteorological Measurement Program During a Disaster

Cooperation between the corporate office and the meteorological contractor assures that a timely restoration of any outage can be made. Emergency field visits to the site are made as quickly as possible after detection of a failure.

Should a disaster of sufficient magnitude occur to destroy the tower structure, a contract is maintained to have a temporary tower erected within 72 hours, weather conditions permitting. Further, the meteorological contractor maintains two levels of sensors (wind speed, wind direction and temperature) in a state of readiness for use on the temporary tower.

Additionally, Exelon Nuclear's existing instrumented towers at other nuclear sites provide a high density measurement network with multiple backup opportunities.

Meteorological data are available to the station Control Room, Technical Support Center and Emergency Operations Facility for use in the Dose Assessment computer model for estimating the environmental impact of unplanned releases of radioactivity from the station.

5.2.2 Onsite Radiation Monitoring Equipment

The onsite radiation monitoring capability includes an installed process, effluent, and area radiation monitoring system; portable survey instrumentation; counting equipment for radiochemical analysis; and a personnel dosimetry program to record integrated exposure. Some onsite equipment is particularly valuable for accident situations and is described in the following subsections.

5.2.2.1 Radiation Monitoring System

Chapters 11 and 12 of the Braidwood UFSAR describe the radiation monitoring system (RMS) in detail. The installed RMS is designed to continuously monitor the containment atmosphere, plant effluents, and various in-plant locations.

The system includes Control Room readouts and recorders for selected parameters that are monitored and an audible Control Room alarm when predetermined setpoints are exceeded. The system can be subdivided into process/effluent instrumentation and an area monitoring system.

- The process/effluent instrumentation consists of pumps, filter samplers, detectors, and associated electronics to determine noble gas, iodine, and particulate concentrations in plant cubicles or liquid and gaseous effluents. Several monitored effluent pathways have control functions that will terminate the release at a predetermined setpoint. These setpoints are premised on compliance with federal regulations.

- The area monitoring system provides information of existing radiation levels in various areas of the plant to ensure safe occupancy. It is equipped with Control Room and local readout and audible alarms to warn personnel of an increased radiation level.

5.2.2.2 Radiological Noble Gas Effluent Monitoring

Two General Atomic Company wide-range gas monitors (WRGMs) are installed on the auxiliary building vent stacks (final release points), one monitor per stack. The monitor has a range for radioactive gas concentration of 1 x 10^{-7} uCi/cc to 1 x 10^{5} uCi/cc. The monitor includes the following: two isokinetic nozzles, one for normal conditions operating at 2 ft3/min. and one for high range conditions operating at 0.06 ft3/min; sampling rack; sample conditioner to filter out large concentrations of radioiodine and particulates; and the wide-range gas detectors assembly, consisting of three radioactive gas detectors, a low-range detector, a mid-range detector, and a high-range detector. Each monitor system has a microprocessor which utilizes digital processing techniques to analyze data and control monitor functions. Control Room readouts include a RM-23 remote display module for all monitored parameters.

Two General Atomic Company detectors are provided for each of the four main steamlines upstream of the safety and relief valves. The range of the monitor is 10^{-1} mR/hr to 10^{4}mRem/hr. The monitors are mounted external to the main steamline piping and corrections made for the loss of low energy gammas.

5.2.2.3 Radioiodine and Particulate Effluent Monitoring

The General Atomic Company wide range gas monitor includes a sampling rack for collection of the auxiliary building vent stack particulate and radioiodine samples. Filter holders and valves are provided to allow grab sample collection for isotopic analyses in the station's counting rooms. The sampling rack is shielded to minimize personnel exposure. The sampling media will be analyzed by a gamma ray spectrometer which utilizes a gamma spectrometer system. In addition, silver zeolite cartridges are available to further reduce the interference of noble gases.

5.2.2.4 High-Range Containment Radiation Monitors

Two high range containment radiation monitors are installed for each operating reactor. The monitors will detect and measure the radiation level within the reactor containment during and following an accident. The range of the monitors is 1 rad/hr to 10^7 Rads/hr.

5.2.2.5 In-plant Iodine Instrumentation

Effective monitoring of increasing iodine levels in buildings under accident conditions will include the use of portable instruments using silver zeolite as a sample media. Braidwood Station has a Post Accident Radionuclide Analysis Portable System (PARAPS) for analyzing samples that cannot be counted and analyzed in the normal Station counting room because of background problems. Auxiliary counting room locations have been identified within the Turbine Building. It is expected that a sample can be obtained, purged, and analyzed for iodine content within a two-hour time frame.

5.2.3 Onsite Process Monitors

An adequate monitoring capability exists to properly assess the plant status for all modes of operation and is described in the Braidwood UFSAR. The operability of the post-accident instrumentation ensures information is available on selected plant parameters to monitor and assess important variables following an accident. Instrumentation is available to monitor the parameters and ranges given in Technical Specifications.

Braidwood Station Emergency Operating Procedures assist personnel in recognizing inadequate core cooling using applicable instrumentation.

5.2.4 Onsite Fire Detection Instrumentation

The fire detection system is designed in accordance with applicable National Fire Protection Association (NFPA) Standards. The System is equipped with electrically supervised ionization smoke and heat detectors to quickly detect any fires and the instrumentation to provide local indication and Control Room annunciation. In addition to the smoke and heat detection systems, each fire

protection carbon dioxide, halon, or water system is instrumented to inform the Control Room of its actuation or of system trouble.

In the event that a portion of the fire detection instrumentation is inoperable, fire watches in affected areas may be required.

5.2.5 Facilities and Equipment for Offsite Monitoring

Consult Chapter 11 of the station specific Offsite Dose Calculation Manual (ODCM) for the most current location for fixed continuous air samplers and DLR locations.

Braidwood Station maintains a supply of emergency equipment and supplies for offsite monitoring and sampling. These supplies meet the initial requirements of two (2) environmental field teams. During subsequent phases of an emergency, additional equipment is available from other Exelon Nuclear facilities, vendors and the Corporate Emergency Response Organization.

5.2.6 Site Hydrological Characteristics

The hydrological characteristics of the Braidwood Station vicinity are described in Section 2.4 of the Braidwood UFSAR. The river screen house is the only structure that could be affected by flooding on the Kankakee River. The controlling event for flooding at the site is the probable maximum flood for the cooling pond, resulting in a short-term maximum water surface elevation of 600.6 ft in the immediate plant area.

Although the plant grade elevation is 600 ft, the safety related facilities are situated at elevation 601 ft; 0.4 ft above the estimated maximum water surface elevation.

Low flows in the Kankakee River cannot affect safety related facilities of the plant. In the unlikely event that emergency make-up water requirements cannot be satisfied by surface water withdrawals from the Kankakee River, the Cooling Lake will operate under a closed cycle system. Emergency shut down water is available from the Cooling Lake. Because of the site hydrological characteristics given above, plant operation should not be affected by Kankakee River water level conditions and therefore, hydrological monitors have not been installed.

The Kankakee River was not used for any public water supply within 50 miles downstream of this site prior to 1990. In January, 1990, the City of Wilmington, Illinois began withdrawing water, four miles downstream on the west bed of the Kankakee River. Provisions have been established for weekly samples to be collected and computed for monthly analysis. The City of Joliet, Illinois has submitted a plan to also use the Kankakee River to supply public water. Upon completion of the facility, provisions will be made for weekly sample collection and analysis. In performing dose calculations from liquid releases, the liquid release model has been revised to reflect the change of parameters due to the new public water intake.

5.3 Protective Facilities and Equipment

The principal onsite assembly areas for Braidwood Station are the Machine Shop on the 401-foot elevation of the Service Building and the Turbine Building trackways. These areas are suitable because:

1) They are large open areas suitable for assembling a large number of people in a short time;

2) They can be easily exited if a site evacuation is deemed necessary following an assembly; and

3) They have a low probability of being affected by a serious accident involving the Reactor or primary systems.

The offsite relocation centers for Braidwood Station are discussed in Section 4 of this annex. Both locations are suitable, depending on the emergency condition, with personnel, supplies and communications readily available.

5.4 First Aid and Medical Facilities

Braidwood Station has an inplant first aid/decontamination room on the 426 foot elevation of the auxiliary building near the station laboratory complex. This room is provided with a sink, a shower, and a supply cabinet.

First aid kits, stretchers, sinks, eyewashes and emergency showers have been placed in strategic locations throughout the station.

Medical treatment given to injured persons at the station is of a "first aid" nature. When more professional care is needed, injured persons are transported to a local hospital or clinic. Presence St. Joseph Medical Center in Joliet, Illinois is the designated support hospital. Morris Hospital in Morris, IL is the backup medical facility.

Both hospitals agree in the event of a Radiological Event, including a hostile action based event, to ensure the capability for the evaluation of radiation exposure and uptake, including assurance that persons providing these services are adequately prepared to handle contaminated individuals and capable of providing medical support for any contaminated injured individual.

5.5 Law Enforcement Agencies

A Letter of Agreement is established for Local Law Enforcement to support Braidwood Station to respond to a Radiological Event including a Hostile Action Based Event, in conjunction with the National Incident Management System upon notification by the station in accordance with the established communications protocol.

5.6 Fire Fighting Organizations

A Letter of Agreement is established for the Local Fire Department to respond to a Radiological Event including a Hostile Action Based Event, in conjunction with the Mutual Aid Box Alarm System (MABAS), as requested via the 911 Dispatch System.

5.7 EMS Support

A Letter of Agreement is established for the Local Fire Department to provide Emergency Medical Services in respond to a Radiological Event including a Hostile Action Based Event, This includes transportation of patients from the Braidwood Station, including those who may have been exposed to radiation or may have injuries complicated by radioactive contamination, to Presence St. Joseph’s Medical Center in Joliet or Morris Hospital upon request through established protocols.

Appendix 1: NUREG-0654 Cross-Reference

Annex Section	NUREG-0654
1.0	Part I, Section A
1.1	Part I, Section C
1.2	Part I, Section D
Figure 1-1	Part I, Section D
2.0	Part II, Section A.4
2.1	Part II, Section A.3
3.0	Part II, Section D
4.1	Part II, Section E.1 & J.7
4.2	Part II, Section I.2 & 3
4.3	Part II, Section J.10.m
4.3.1	Part II, Section E.6
4.3.2	Part II, Section J.8
4.4	Part II, Section J.1-5
EP-AA-111	Part II, Section J.10.m
EP-AA-1001, Addendum 2	Part II, Section J.5
4.4	Part II, Section J.2 & 3
Table 4-1	Part II, Section J.8
Table 4-2	Part II, Section J.10.b
5.1	Part II, Section H.1 & G.3
5.2.1	Part II, Section H.5.a & 8
5.2.2	Part II, Section H.5.b & I.2
5.2.3	Part II, Section H.5.c
5.2.4	Part II, Section H.5.d
5.2.5	Part II, Section H.6.b & 7
5.2.6	Part II, Section H.5.a & 6.a
5.3	Part II, Section J.1-5
5.4	Part II, Section L.1 & 2

Appendix 2: Station Letters of Agreement

1. Will County Sheriff – law enforcement.
2. Braidwood Fire Department – fire suppression support and EMS transport.
3. Presence St. Joseph's Medical Center – medical support and treatment.
4. Morris Hospital – backup medical support and treatment.

ATTACHMENT 3

Radiological Emergency Plan Addendum Revision

EP-AA-1001, Addendum 3, Revision 3, *"Emergency Action Levels for Braidwood Station"*

EXELON NUCLEAR

EMERGENCY ACTION LEVELS FOR BRAIDWOOD STATION

REVISION HISTORY

Rev. 0 December 2014		
Rev. 1 February 2016		
Rev. 2 September 2016		
Rev. 3 December 2017		

Section 1: Classification of Emergencies

1.1 General

Section D of the Exelon Nuclear Standardized Emergency Plan divides the types of emergencies into four EMERGENCY CLASSIFICATION LEVELS (ECLs). The first four are the UNUSUAL EVENT (UE), ALERT, SITE AREA EMERGENCY (SAE), and GENERAL EMERGENCY (GE). These ECLs are entered by satisfying the Initiating Condition (IC) through meeting an Emergency Action Level (EAL) of the IC provided in this section of the Annex. The ECLs are escalated from least severe to most severe according to relative threat to the health and safety of the public and emergency workers. Depending on the severity of an event, prior to returning to a standard day-to-day organization, a state or phase called RECOVERY may be entered to provide dedicated resources and organization in support of restoration and communication activities following the termination of the emergency.

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

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

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

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

<u>RECOVERY:</u> Recovery can be considered as a phase of the emergency and is entered by meeting emergency termination criteria provided in EP-AA-111 Emergency Classification and Protective Action Recommendations.

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

- UNUSUAL EVENT (UE)
- ALERT
- SITE AREA EMERGENCY (SAE)
- GENERAL EMERGENCY (GE)

<u>INITIATING CONDITION (IC):</u> An event or condition that aligns with the definition of one of the four EMERGENCY CLASSIFICATION LEVELS by virtue of the potential or actual effects or consequences.

<u>EMERGENCY ACTION LEVEL (EAL):</u> A pre-determined, site-specific, observable threshold for an INITIATING CONDITION that, when met or exceeded, places the plant in a given EMERGENCY CLASSIFICATION LEVEL.

An emergency is classified by assessing plant conditions and comparing abnormal conditions to ICs and EALs.

Individuals responsible for the classification of events will refer to the Initiating Condition and EALs on the matrix of the appropriate station Standardized Emergency Plan Annex (this document). This matrix will contain ICs, EALs, Mode Applicability Designators, appropriate EAL numbering system, and additional guidance necessary to classify events. It may be provided as a user aid.

The matrix is set up in six Recognition Categories. The first is designated as "R" and relates to Abnormal Radiological Conditions / Abnormal Radiological Effluent Releases. The second is designated as "F" and relates to Fission Product Barrier Degradation. The third is designated as "M" and relates to hot condition System Malfunctions. The fourth is designated as "C" and relates to Cold Shutdown / Refueling System Malfunctions. The fifth is designated as "H" and relates to Hazards and Other Conditions Affecting Plant Safety. The sixth is designated "E-H" and relates to ISFSI Malfunctions.

The matrix is designed to provide an evaluation of the Initiating Conditions from the worst conditions (General Emergencies) on the left to the relatively less severe conditions on the right (Unusual Events). Evaluating conditions from left to right will reduce the possibility that an event will be under classified. All Recognition Categories should be reviewed for applicability prior to classification.

The Initiating Conditions are coded with a two letter and one number code. The first letter is the Recognition Category designator, the second letter is the Classification Level, “U” for (NOTIFICATION OF) UNUSUAL EVENT, “A” for ALERT, “S” for SITE AREA EMERGENCY and “G” for GENERAL EMERGENCY. The EAL number is a sequential number for that Recognition Category series. All ICs that are describing the severity of a common condition (series) will have the same number.

The EAL number may then be used to reference a corresponding page(s), which provides the basis information pertaining to the IC:

- EAL
- Mode Applicability
- Basis

Classification is not to be made without referencing, comparing and satisfying the specified Emergency Action Levels.

A list of definitions is provided as part of this document for terms having specific meaning to the EALs. Site specific definitions are provided for terms with the intent to be used for a particular IC/EAL and may not be applicable to other uses of that term at other sites, the Emergency Plan or procedures.

References are also included to documents that were used to develop the EALs.

References to the Emergency Director means the person in Command and Control as defined in the Emergency Plan. Classification of emergencies is a non-delegable responsibility of Command and Control for the onsite facilities with responsibility assigned to the Shift Emergency Director (Control Room Shift Manager) or the Station Emergency Director (Technical Support Center). Classification of emergencies remains the responsibility of the applicable onsite facility even after Command and Control is transferred to the Corporate Emergency Director (Emergency Operations Facility).

Although the majority of the EALs provide very specific thresholds, the Emergency Director must remain alert to events or conditions that lead to the conclusion that exceeding the EAL is IMMINENT. If, in the judgment of the Emergency Director, an IMMINENT situation is at hand, the classification should be made as if the EAL has been exceeded. While this is particularly prudent at the higher ECL (as the early classification may provide for more effective implementation of protective measures), it is nonetheless applicable to all ECLs.

1.2 Classification, Instrumentation and Transient Events

Classifications are based on evaluation of each Unit. All classifications are to be based upon valid indications, reports or conditions. Indications, reports or conditions are considered valid when they are verified by (1) an instrument channel check, or (2) indications on related or redundant indications, or (3) by direct observation by plant personnel, such that doubt related to the indication's operability, the condition's existence, or the report's accuracy is removed. Implicit in this is the need for timely assessment.

Indications used for monitoring and evaluation of plant conditions include the normally used instrumentation, backup or redundant instrumentation, and the use of other parameters that provide information that supports determination if an EAL has been reached. When an EAL refers to a specific instrument or indication that is determined to be inaccurate or unavailable, then alternate indications shall be used to monitor the specified condition.

The assessment of some EALs is based on the results of analyses that are necessary to ascertain whether a specific EAL has been exceeded (e.g., dose assessments, chemistry sampling, RCS leak rate calculation, etc.); the EAL and/or the associated basis discussion will identify the necessary analysis. In these cases, the 15-minute declaration period starts with the availability of the analysis results that show the EAL to be exceeded (i.e., this is the time that the EAL information is first available).

During an event that results in changing parameters trending towards an EAL classification, and instrumentation that was available to monitor this parameter becomes unavailable or the parameter goes off scale, the parameter should be assumed to have been exceeded consistent with the trend and the classification made if there are no other direct or indirect means available to determine if the EAL has not been exceeded.

Planned evolutions involve preplanning to address the limitations imposed by the condition, the performance of required surveillance testing, and the implementation of specific controls prior to knowingly entering the condition in accordance with the specific requirements of the site's Technical Specifications. Activities which cause the site to operate beyond that allowed by the site's Technical Specifications, planned or unplanned, may result in an EAL being met or exceeded. Planned evolutions to test, manipulate, repair, perform maintenance or modifications to systems and equipment that result in an EAL being met or exceeded are not subject to classification and activation requirements as long as the evolution proceeds as planned and is within the operational limitations imposed by the specific operating license. However, these conditions may be subject to the reporting requirements of 10 CFR 50.72.

When two or more EALs are determined, declaration will be made on the highest classification level for the Unit. When both units are affected, the highest classification for the Station will be used for notification purposes and both Units' ECLs will be noted.

Concerning ECL Downgrading, Exelon Nuclear policy is that ECLs shall not be downgraded to a lower classification. Once declared, the event shall remain in effect until no Classification is warranted or until such time as conditions warrant classification to Recovery.

There may be cases in which a plant condition that exceeded an EAL was not recognized at the time of occurrence but is identified well after the condition has occurred (e.g., as a result of routine log or record review), and the condition no longer exists. In these cases, an emergency should not be declared. Reporting requirements of 10 CFR 50.72 are applicable, the guidance of NUREG-1022, Event Reporting Guidelines 10 CFR 50.72 and 50.73 and the Reportability Reference Manual, should be applied.

1.3 Mode Applicability

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

For events that occur in Cold Shutdown or Refueling, escalation is via EALs that have Cold Shutdown or Refueling for mode applicability, even if Hot Shutdown (or a higher mode) is entered during any subsequent heat-up. In particular, the Fission Product Barrier Matrix EALs are applicable only to events that initiate in Hot Shutdown or higher.

If there is a change in Mode following an event declaration, any subsequent events involving EALs outside of the current declaration escalation path will be evaluated on the Mode of the plant at the time the subsequent events occur.

1.4 Emergency Director Judgment

Emergency Director (ED) Judgment EALs are provided in the Hazards and Other Condition Affecting Plant Safety section and on the Fission Product Barrier (FPB) Matrix. Both of the ED Judgment EALs have specific criteria for when they should be applied.

The Hazards Section ED Judgment EALs are intended to address unanticipated conditions which are not addressed explicitly by other EALs but warrant declaration of an emergency because conditions exist which are believed by the ED to fall under specific emergency classifications (UE, Alert, SAE or GE).

The FPB Matrix ED Judgment EALs are intended to include unanticipated conditions, which are not addressed explicitly by any of the other FPB threshold values, but warrant determination because conditions exist that fall under the broader definition for a significant Loss or Potential Loss of the barrier (equal to or greater than the defined FPB threshold values).

1.5 Fission Product Barrier (FPB) Threshold

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

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

- Fuel Clad (FC)
- Reactor Coolant System (RCS)
- Containment (CT)

Upon determination that one or more FPB thresholds have been exceeded, the combination of barrier loss and/or potential loss thresholds is compared to the FPB IC/EAL criteria to determine the appropriate ECL.

In some accident sequences, the ICs and EALs presented in the Abnormal Radiation Levels/ Radiological Effluent (R) Recognition Category will be exceeded at the same time, or shortly after, the loss of one or more fission product barriers. This redundancy is intentional as the former ICs address radioactivity releases that result in certain offsite doses from whatever cause, including events that might not be fully encompassed by fission product barriers (e.g., spent fuel pool accidents, design containment leakage following a LOCA, etc.).

1.6 Fission Product Barrier Restoration

Fission Product Barriers are not treated the same as EAL threshold values. Conditions warranting declaration of the loss or potential loss of a FPB may occur resulting in a specific classification. The condition that caused the loss or potential loss declaration could be rectified as the result of Operator action, automatic actions, or designed plant response. Barriers will be considered re-established when there are direct verifiable indications (containment penetration or open valve has been isolated, coolant sample results, etc) that the barrier has been restored and is capable of mitigating future events.

The reestablishment of a FPB does not alter or lower the existing classification. Termination and entry into RECOVERY phase is still required for exiting the present classification. However the reestablishment of the barrier should be considered in determining future classifications should plant conditions or events change.

1.7 Definitions

CONFINEMENT BOUNDARY: The irradiated fuel dry storage cask barrier(s) between areas containing radioactive substances and the environment.

CONTAINMENT CLOSURE: The procedurally defined actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

EXPLOSION: A rapid, violent and catastrophic failure of a piece of equipment due to combustion, chemical reaction or overpressurization. A release of steam (from high energy lines or components) or an electrical component failure (caused by short circuits, grounding, arcing, etc.) should not automatically be considered an explosion. Such events may require a post-event inspection to determine if the attributes of an explosion are present.

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

FIRE: Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fire. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

FISSION PRODUCT BARRIER (FPB) THRESHOLD: A pre-determined, site-specific, observable threshold indicating the loss or potential loss of a fission product barrier.

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

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

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

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

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

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

OPERATING MODES:

(1) Power Operations:	Reactor Power > 5%, Keff ≥ 0.99
(2) Startup:	Reactor Power ≤ 5%, Keff ≥ 0.99
(3) Hot Standby:	RCS ≥ 350° F, Keff < 0.99
(4) Hot Shutdown:	200° F < RCS < 350° F, Keff < 0.99
(5) Cold Shutdown:	RCS ≤ 200° F, Keff < 0.99
(6) Refueling:	One or more vessel head closure bolts less than fully tensioned.
(D) Defueled:	All reactor fuel removed from reactor pressure vessel (full core off load during refueling or extended outage).

Hot Matrix – applies in modes (1), (2), (3), and (4)

Cold Matrix – applies in modes (5), (6), and (D)

OWNER CONTROLLED AREA (OCA): The property associated with the station and owned by the company. Access is normally limited to persons entering for official business.

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

PROTECTED AREA: An area that normally encompasses all controlled areas within the security protected area fence.

REFUELING PATHWAY: all the cavities, tubes, canals and pools through which irradiated fuel may be moved or stored, but not including the reactor vessel below the flange.

RUPTURED: The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection.

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

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

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

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

VISIBLE DAMAGE: Damage to a component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

Emergency Action Level Technical Basis Page Index

Abnormal Rad Levels / Radiological Effluents

Radiological Effluents

GENERAL EMERGENCY

RG1 Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mRem TEDE or 5,000 mRem thyroid CDE. 1 2 3 4 5 6 D

__Emergency Action Levels (EAL):__

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until dose assessment results are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+09 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment Using actual meteorology indicates doses at or beyond the site boundary of **EITHER**:

   a. **> 1000 mRem TEDE**

   OR

   b. **> 5000 mRem CDE Thyroid**

   OR

3. Field survey results at or beyond the site boundary indicate **EITHER**:

   a. Gamma (closed window) dose rates **>1000 mRem/hr** are expected to continue for **≥ 60 minutes**.

   OR

   b. Analyses of field survey samples indicate **> 5000 mRem CDE Thyroid** for **60 minutes** of inhalation.

SITE AREA EMERGENCY

RS1 Release of gaseous radioactivity resulting in offsite dose greater than 100 mRem TEDE or 500 mRem thyroid CDE. 1 2 3 4 5 6 D

__Emergency Action Levels (EAL):__

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until dose assessment results are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+08 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment Using actual meteorology indicates doses at or beyond the site boundary of **EITHER**:

   a. **> 100 mRem TEDE**

   OR

   b. **> 500 mRem CDE Thyroid**

   OR

3. Field survey results at or beyond the site boundary indicate **EITHER**:

   a. Gamma (closed window) dose rates **>100 mRem/hr** are expected to continue for **≥ 60 minutes**.

   OR

   b. Analyses of field survey samples indicate **> 500 mRem CDE Thyroid** for **60 minutes** of inhalation.

ALERT

RA1 Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE. 1 2 3 4 5 6 D

__Emergency Action Levels (EAL):__

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until dose assessment results are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+07 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER**:

   a. **> 10 mRem TEDE**

   OR

   b. **> 50 mRem CDE Thyroid**

   OR

3. Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses greater than **EITHER** of the following at or beyond the site boundary

   a. **10 mrem TEDE** for **60 minutes** of exposure

   OR

   b. **50 mrem CDE Thyroid** for **60 minutes** of exposure

   OR

4. Field survey results at or beyond the site boundary indicate **EITHER**:

   a. Gamma (closed window) dose rates **> 10 mR/hr** are expected to continue for **≥ 60 minutes**.

   OR

   b. Analyses of field survey samples indicate **> 50 mRem CDE Thyroid** for **60 minutes** of inhalation.

UNUSUAL EVENT

RU1 Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer. 1 2 3 4 5 6 D

__Emergency Action Levels (EAL):__

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 60 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

1. Reading on **ANY** of the following effluent monitors **> 2 times alarm setpoint** established by a current radioactive release discharge permit for **≥ 60 minutes**.

   - 0PR01J, Liquid Radwaste Effluent Monitor
   - 0PR90J, Liquid Radwaste Effluent Monitor
   - 0PR02J, Gas Decay Tank Effluent Monitor
   - 0PR10J, Station Blowdown Monitor
   - 1/2 PR01J, Containment Purge Effluent Monitor
   - Discharge Permit specified monitor

   OR

2. The sum of readings on the Unit 1 and 2 Aux Bldg Vent WRGMs (1/2 RE-PR030) **> 4.42 E+05 µCi/sec** for **≥ 60 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

3. Confirmed sample analyses for gaseous or liquid releases indicate concentrations or release rates **> 2 times ODCM Limit** with a release duration of **≥ 60 minutes**.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

Abnormal Rad Levels / Radiological Effluents

Radiological Effluents

GENERAL EMERGENCY

RG2 Spent fuel pool level cannot be restored to at least 1.00 ft. as indicated on 0LI-FC001B(2B) for 60 minutes or longer. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the General Emergency promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Spent fuel pool level cannot be restored to at least **1.00 ft.** as indicated on 0LI-FC001B(2B) for **60 minutes** or longer.

Table R1 Fuel Handling Incident Radiation Monitors
• Fuel Building Fuel Handling Incident Monitor 0RE-AR055 • Fuel Building Fuel Handling Incident Monitor 0RE-AR056 • Containment Fuel Handling Incident Monitor 1/2RE-AR011 • Containment Fuel Handling Incident Monitor 1/2RE-AR012

SITE AREA EMERGENCY

RS2 Spent fuel pool level at 1.00 ft. as indicated on 0LI-FC001B(2B) 1 2 3 4 5 6 D

Emergency Action Level (EAL):

Lowering of spent fuel pool level to **1.00 ft.** as indicated on 0LI-FC001B(2B).

Table R2 Areas Requiring Continuous Occupancy
• Main Control Room – 1/2RE-AR010 • Central Alarm Station – (by survey)

Table R3 Areas with Entry Related Mode Applicability	
Area	**Entry Related Mode Applicability**
Auxiliary Building 426' VCT Valve Aisle	Mode 4, 5, and 6
Auxiliary Building 401' Curved Wall Area Penetration Area	
Auxiliary Building 383' Remote Shutdown Panel Area	
Auxiliary Building 364' CV Pp areas Curved Wall Area	
Auxiliary Building 346' RH pump areas	

ALERT

RA2 Significant lowering of water level above, or damage to, irradiated fuel. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

1. Uncovery of irradiated fuel in the REFUELING PATHWAY.

OR

2. Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by **ANY** Table R1 Radiation Monitor reading **>1000 mRem/hr**

OR

3. Lowering of spent fuel pool level to **10.50 ft.** as indicated on 0LI-FC001B(2B).

RA3 Radiation levels that impede access to equipment necessary for normal plant operations, cooldown or shutdown. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Note: If the equipment in the listed room or area was already inoperable, or out of service, before the event occurred, then no emergency classification is warranted

1. Dose rate greater than **15 mR/hr** in **ANY** of the areas contained in Table R2.

OR

2. An UNPLANNED event results in radiation levels that prevent or significantly impede access to **ANY** of the plant rooms in Table R3.

UNUSUAL EVENT

RU2 UNPLANNED loss of water level above irradiated fuel. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

1. a. UNPLANNED water level drop in the REFUELING PATHWAY as indicated by **ANY** of the following:
   - Refueling Cavity water level **<23 ft.** above the Reactor Flange (**< 423 ft.** indicated level)

   OR

   - Spent Fuel Pool water level **< 23 ft.** above the fuel (**< 422 ft. 9 in.** indicated level)

   OR

   - Indication or report of a drop in water level in the REFUELING PATHWAY.

   AND

   b. UNPLANNED Area Radiation Monitor reading rise on **ANY** radiation monitor in Table R1.

RU3 Reactor coolant activity greater than Technical Specification allowable limits. 1 2 3 4

Emergency Action Levels (EAL):

1. Gross Failed Fuel Monitor 1/2RE-PR006 indicating I-135 concentration **> 5 µCi/cc.**

OR

2. Sample analysis indicates that:
   a. Dose Equivalent I-131 specific coolant activity **> 60.0 µCi/gm.**

   OR

   b. Dose Equivalent XE-133 specific coolant activity **> 603.0 µCi/gm.**

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

Fission Product Barrier Matrix **Hot Matrix**

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT
FG1 Loss of any two barriers AND Loss or Potential Loss of third barrier. 1 2 3 4	**FS1** Loss or Potential Loss of ANY two barriers. 1 2 3 4	**FA1** ANY Loss or ANY Potential Loss of either Fuel Clad or RCS 1 2 3 4

Sub-Category	FC – Fuel Clad		RC – Reactor Coolant System		CT - Containment	
	Loss	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
1. RCS or SG Tube Leakage	None	**Core-Cooling CSF – Orange Path** conditions exist.	1. Automatic or manual SI actuation is required by **EITHER** of the following: a. UNISOLABLE RCS leakage **OR** b. SG tube RUPTURE.	2. The capacity of one charging pump in the normal charging mode is exceeded due to **EITHER** of the following: a. UNISOLABLE RCS leakage **OR** b. SG tube leakage. **OR** 3. **RCS Integrity CSF - Red path** conditions exist.	A leaking or RUPTURED SG is FAULTED outside of containment.	None
2. Inadequate Heat Removal	**1. Core-Cooling CSF – Red Path** conditions exist.	2. **Core-Cooling CSF – Orange Path** conditions exist. **OR** 3. **Heat Sink CSF - Red Path** conditions exist.	None	**Heat Sink CSF - Red Path** conditions exist.	None	**Core-Cooling CSF Red Path** conditions exist **AND** Functional Restoration procedures <u>not</u> effective in **< 15 minutes**
3. Containment Radiation / RCS Activity	1. Containment radiation monitor (AR020(21)) reading **> 1.95E+03 R/hr**. **OR** 2. Coolant activity as sampled **> 300µCi/gm** Dose Equivalent I-131.	None	Containment radiation monitor (AR020(21)) reading **> 25 R/hr**.	None	None	Containment radiation monitor (AR020(21)) reading **> 4.40E+03 R/hr**.
4. Containment Integrity or Bypass	None	None	None	None	1. Containment isolation is required and **EITHER** of the following: a. UNPLANNED lowering in containment pressure or rise in radiation monitor readings outside of containment in the Emergency Director judgment indicate a loss of containment integrity. **OR** b. UNISOLABLE pathway from containment to the environment exists. **OR** 2. Indication of RCS leakage outside of containment	3. **Containment CSF - Red path** conditions exist. **OR** 4. Hydrogen concentration in containment **≥ 5%.** **OR** 5. a. Containment pressure **≥ 20 psig**. **AND** b. Less than one full train of Containment Spray is operating per design for ≥15 minutes.
5. Emergency Director Judgment	1. Any Condition in the opinion of the Emergency Director that indicates Loss of the Fuel Clad Barrier.	2. Any Condition in the opinion of the Emergency Director that indicates Potential Loss of the Fuel Clad Barrier.	1. Any Condition in the opinion of the Emergency Director that indicates Loss of the RCS Barrier.	2. Any Condition in the opinion of the Emergency Director that indicates Potential Loss of the RCS Barrier.	1. Any Condition in the opinion of the Emergency Director that indicates Loss of the Containment Barrier.	2. Any Condition in the opinion of the Emergency Director that indicates Potential Loss of the Containment Barrier.

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
System Malfunction				
Loss of AC Power	**MG1** Prolonged loss of all offsite and all onsite AC power to emergency buses. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. Loss of **ALL** offsite AC power to unit ESF buses. **AND** 2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses. **AND** 3. **EITHER** of the following: a. Restoration of at least one unit ESF bus in **< 4 hours is <u>not</u>** likely. **OR** b. **Core Cooling CSF – Red Path** conditions exist	**MS1** Loss of all Off-site and On-Site AC power to emergency buses for 15 minutes or longer. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. Loss of **ALL** off-site AC power to unit ESF buses. **AND** 2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses. **AND** 3. Failure to restore power to at least one unit ESF bus in **< 15 minutes** from the time of loss of both offsite and onsite AC power.	**MA1** Loss of all but one AC power source to emergency buses for 15 minutes or longer. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. AC power capability to unit ESF buses reduced to only one of the following power sources for **≥ 15 minutes.** • Affected unit SAT 142-1(242-1) • Affected unit SAT 142-2(242-2) • Emergency Diesel Generator DG 1A(2A) • Emergency Diesel Generator DG 1B(2B) • Unit crosstie breakers **AND** 2. Any additional single power source failure will result in a loss of **ALL** AC power to SAFETY SYSTEMS.	**MU1** Loss of all offsite AC power capability to emergency buses for 15 minutes or longer. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. Loss of **ALL** offsite AC power capability to unit ESF buses for **≥ 15 minutes**
Loss of DC Power	**MG2** Loss of all AC and Vital DC power sources for 15 minutes or longer. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. Loss of **ALL** offsite AC power to unit ESF buses. **AND** 2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses. **AND** 3. Voltage is **< 108 VDC** on unit 125 VDC battery buses 111(211) and 112(212). **AND** 4. **ALL** AC and Vital DC power sources have been lost for **≥ 15 minutes.**	**MS2** Loss of all Vital DC power for 15 minutes or longer. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. Voltage is **< 108 VDC** on unit 125 VDC battery buses 111(211) and 112(212) for **≥ 15 minutes**.		

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
System Malfunction				
RPS Failure		**MS3** Inability to shutdown the reactor causing a challenge to core cooling or RCS heat removal. 1 2 **Emergency Action Levels (EAL):** 1. Automatic or Manual Trip did **not** shutdown the reactor as indicated by Reactor Power **≥ 5%.** **AND** 2. **ALL** manual actions to shutdown the reactor have been unsuccessful as indicated by Reactor Power **≥ 5%.** **AND** 3. **EITHER** of the following conditions exist: a. **Core Cooling CSF-RED Path** conditions exist. **OR** b. **Heat Sink CSF-RED Path** conditions exist.	**MA3** Automatic or manual trip fails to shutdown the reactor, and subsequent manual actions taken at the reactor control consoles are not successful in shutting down the reactor. 1 2 **Emergency Action Levels (EAL):** **Note:** A manual action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies. 1. Automatic or manual Trip did **not** shutdown the reactor as indicated by Reactor Power **≥ 5%.** **AND** 2. Manual actions taken at the Main Control Board are **not** successful in shutting down the reactor as indicated by Reactor Power **≥ 5%.**	**MU3** Automatic or manual trip fails to shutdown the reactor. 1 2 **Emergency Action Levels (EAL):** **Note:** A manual action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies. 1. a. Automatic Trip did not shutdown the reactor as indicated by Reactor Power **≥ 5%.** **AND** b. Subsequent manual action taken at the Main Control Board is successful in shutting down the reactor as indicated by Reactor Power **< 5%.** **OR** 2. a. Manual Trip did not shutdown the reactor as indicated by Reactor Power **≥ 5%.** **AND** b. **EITHER** of the following: 1. Subsequent manual action taken at the Main Control Board is successful in shutting down the reactor as indicated by Reactor Power **< 5%.** **OR** 2. Subsequent Automatic Trip is successful in shutting down the reactor as indicated by Reactor Power **< 5%.**
Control Room Indications	**Table M1 – Control Room Parameters** • Reactor Power • PZR Level • RCS Pressure • In Core/Core Exit Temperature • Narrow Range level in at least one Steam Generator • Steam Generator Auxiliary Feed Water Flow	**Table M2 – Significant Transients** • Automatic Turbine Runback **>25%** thermal reactor power • Electrical Load Rejection **>25%** full electrical load • Reactor Trip • Safety Injection Actuation	**MA4** UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. a UNPLANNED event results in the inability to monitor **ANY** Table M1 parameters from within the Control Room for **≥ 15 minutes.** **AND** b. **ANY** Table M2 transient in progress.	**MU4** UNPLANNED loss of Control Room indications for 15 minutes or longer. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. UNPLANNED event results in the inability to monitor **ANY** Table M1 parameters from within the Control Room for **≥ 15 minutes.**

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
System Malfunction				
Hazard affects Safety System			**MA5** Hazardous event affecting a SAFETY SYSTEM required for the current operating mode. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** If it is determined that the conditions of MA5 are not met then assess the event via HU3, HU4, or HU6. 1. The occurrence of **ANY** of the following hazardous events: • Seismic event (earthquake) • Internal or external flooding event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager **AND** 2. **EITHER** of the following: a. Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM required by Technical Specifications for the current operating mode. **OR** b. The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure required by Technical Specifications for the current operating mode.	
RCS Leak				**MU6** RCS leakage for 15 minutes or longer. 1 2 3 4 **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. RCS unidentified or pressure boundary leakage **> 10 gpm** for **≥ 15 minutes** **OR** 2. RCS identified leakage **>25 gpm** for **≥ 15 minutes** **OR** 3. Leakage from the RCS to a location outside containment **>25 gpm** for **≥ 15 minutes**

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

System Malfunction

Communications

Table M3 – Communications Capability

System	Onsite	Offsite	NRC
Radios	X		
Plant page	X		
Plant Telephone System	X		
Commercial Telephones	X	X	X
NARS		X	
ENS		X	X
HPN		X	X
Satellite phones		X	X

MU7 Loss of all On-site or Off-site communication capabilities. 1 2 3 4

Emergency Action Levels (EAL):

1. Loss of **ALL** Table M3 **Onsite** communications capability affecting the ability to perform routine operations.

   OR

2. Loss of **ALL** Table M3 **Offsite** communication capability affecting the ability to perform offsite notifications.

   OR

3. Loss of **ALL** Table M3 **NRC** communication capability affecting the ability to perform NRC notifications.

Containment

MU8 Failure to isolate containment or loss of containment pressure control. 1 2 3 4

Emergency Action Levels (EAL):

1. a. Failure of containment to isolate when required by an actuation signal.

   AND

   b. **ANY** required penetration remains open **> 15 minutes** of the actuation signal.

   OR

2. a. Containment pressure **≥ 20 psig.**

   AND

   b. Less than one full train of Containment Spray is operating per design for **≥ 15 minutes.**

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Hazards and Other conditions Affecting Plant Safety				
Hostile Action	**HG1** HOSTILE ACTION resulting in loss of physical control of the facility 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** 1. A notification from the Security Force that a HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA. **AND** 2. a. **ANY** Table H1 safety function **cannot** be controlled or maintained. **OR** b. Damage to spent fuel has occurred or is IMMINENT	**HS1** HOSTILE ACTION within the PROTECTED AREA 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** A notification from the Security Force that a HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA.	**HA1** HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** 1. A validated notification from NRC of an aircraft attack threat **< 30 minutes** from the site. **OR** 2. Notification by the Security Force that a HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLED AREA.	**HU1** Confirmed SECURITY CONDITION or threat. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** 1. Notification of a credible security threat directed at the site as determined per SY-AA-101-132, Security Assessment and Response to Unusual Activities. **OR** 2. A validated notification from the NRC providing information of an aircraft threat. **OR** 3. Notification by the Security Force of a SECURITY CONDITION that does **not** involve a HOSTILE ACTION.
Transfer of Plant Control	**Table H1 – Safety Functions** • Reactivity Control (ability to shutdown the reactor and keep it shutdown) • Core Cooling (ability to cool the core) • RCS Heat Removal (ability to maintain a heat sink)	**HS2** Inability to control a key safety function from outside the Control Room 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. A Control Room evacuation has resulted in plant control being transferred from the Control Room to alternate locations per 1/2BwOA PRI-5, Control Room Inaccessibility. **AND** 2. Control of **ANY** Table H1 key safety function is **not** reestablished in **< 15 minutes**.	**HA2** Control Room evacuation resulting in transfer of plant control to alternate locations 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** A Control Room evacuation has resulted in plant control being transferred from the Control Room to alternate locations per 1/2BwOA PRI-5, Control Room Inaccessibility.	

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Hazards and Other conditions Affecting Plant Safety			
Fire		**Table H2 – Vital Areas** • Containment • Auxiliary Building • Fuel Handling Building • Main Steam Tunnels • RWST's • Condensate Storage Tanks • Lake Screen House	**HU3** FIRE potentially degrading the level of safety of the plant. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. Escalation of the emergency classification level would be via IC CA2 or MA5 1. A FIRE in **ANY** Table H2 area is **not** extinguished in **< 15-minutes** of **ANY** of the following FIRE detection indications: • Report from the field (i.e., visual observation) • Receipt of multiple (more than 1) fire alarms or indications • Field verification of a single fire alarm **OR** 2. a. Receipt of a single fire alarm in **ANY** Table H2 area (i.e., no other indications of a FIRE). **AND** b. The existence of a FIRE is **not** verified in **< 30 minutes** of alarm receipt. **OR** 3. A FIRE within the plant PROTECTED AREA not extinguished in **< 60 minutes** of the initial report, alarm or indication. **OR** 4. A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Hazards and Other conditions Affecting Plant Safety			
Earthquake			**HU4** Seismic event greater than OBE levels 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** **Note:** Escalation of the emergency classification level would be via IC CA2 or MA5 For emergency classification if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in manner deemed appropriate by the Shift Manager or Emergency Director in < **15 mins** of the event. 1. Seismic event **> Operating Basis Earthquake (OBE)** as indicated by seismic check at panel 0PA02J. **OR** 2. When Seismic Monitoring Equipment is **not** available: a. Control Room personnel feel an actual or potential seismic event. **AND** b. **ANY** one of the following confirmed in < **15 mins** of the event: • The earthquake resulted in Modified Mercalli Intensity (MMI) **> VI** and occurred **< 3.5 miles** of the plant. • The earthquake was magnitude **> 6.0** • The earthquake was magnitude **> 5.0** and occurred **< 125 miles** of the plant.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

<table>
<tr><th></th><th>GENERAL EMERGENCY</th><th>SITE AREA EMERGENCY</th><th>ALERT</th><th>UNUSUAL EVENT</th></tr>
<tr><td colspan="5">Hazards and Other conditions Affecting Plant Safety</td></tr>
<tr><td>Toxic Gas</td><td></td><td>
Table H3
Areas with Entry Related Mode Applicability
<table>
<tr><th>Area</th><th>Entry Related Mode Applicability</th></tr>
<tr><td>Auxiliary Building 426’
VCT Valve Aisle</td><td rowspan="5">Mode 4, 5, and 6</td></tr>
<tr><td>Auxiliary Building 401’
Curved Wall Area
Penetration Area</td></tr>
<tr><td>Auxiliary Building 383’
Remote Shutdown
Panel Area</td></tr>
<tr><td>Auxiliary Building 364’
CV Pp areas
Curved Wall Area</td></tr>
<tr><td>Auxiliary Building 346’
RH pump areas</td></tr>
</table>
</td><td>
HA5 Gaseous release impeding access to equipment necessary for normal plant operations, cooldown or shutdown. 4 5 6

<u>Emergency Action Levels (EAL):</u>
Note: If the equipment in the listed room or area was already inoperable, or out of service, before the event occurred, then no emergency classification is warranted.

1. Release of a toxic, corrosive, asphyxiant or flammable gas in ANY Table H3 area.
AND
2. Entry into the room or area is prohibited or impeded.
</td><td></td></tr>
<tr><td>Hazardous Event</td><td></td><td></td><td></td><td>
HU6 Hazardous Event 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
Note: EAL #4 does not apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.
Escalation of the emergency classification level would be via IC CA2 or MA5
1. Tornado strike within the PROTECTED AREA.
OR
2. Internal room or area flooding of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode.
OR
3. Movement of personnel within the PROTECTED AREA is impeded due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release).
OR
4. A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles.
</td></tr>
</table>

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Hazards and Other conditions Affecting Plant Safety			
Emergency Director Judgment			
HG7 Other conditions exist which in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY. 1 2 3 4 5 6 D	**HS7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY. 1 2 3 4 5 6 D	**HA7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of an ALERT. 1 2 3 4 5 6 D	**HU7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of an UNUSUAL EVENT. 1 2 3 4 5 6 D .
<u>Emergency Action Levels (EAL):</u>	**<u>Emergency Action Levels (EAL):</u>**	**<u>Emergency Action Levels (EAL):</u>**	**<u>Emergency Action Levels (EAL):</u>**
Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the site boundary.	Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
ISFSI Malfunction				
ISFSI				**E-HU1** Damage to a loaded cask CONFINEMENT BOUNDARY. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading: 1. HI-STORM (labeled as xxx-A3) • **> 40 mrem/hr** (gamma + neutron) on top of the spent fuel cask **OR** • **> 220 mrem/hr** (gamma + neutron) on the side of the spent fuel cask, excluding inlet and outlet ducts **OR** 2. HI-STORM (labeled as xxx-A9.1) • **> 60 mrem/hr** (gamma + neutron) on top of the spent fuel cask **OR** • **> 600 mrem/hr** (gamma + neutron) on the side of the spent fuel cask, excluding inlet and outlet ducts

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

Abnormal Rad Levels / Radiological Effluents

Radiological Effluents

GENERAL EMERGENCY

RG1 Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mRem TEDE or 5,000 mRem thyroid CDE. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until dose assessment results are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+09 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment Using actual meteorology indicates doses at or beyond the site bondary of **EITHER**:

   a. > 1000 mRem TEDE

   OR

   b. > 5000 mRem CDE Thyroid

   OR

3. Field survey results at or beyond the site boundary indicate **EITHER**:

   a. Gamma (closed window) dose rates **>1000 mRem/hr** are expected to continue for **≥ 60 minutes**.

   OR

   b. Analyses of field survey samples indicate **> 5000 mRem CDE Thyroid** for **60 minutes** of inhalation.

SITE AREA EMERGENCY

RS1 Release of gaseous radioactivity resulting in offsite dose greater than 100 mRem TEDE or 500 mRem thyroid CDE. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until dose assessment results are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+08 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment Using actual meteorology indicates doses at or beyond the site bondary of **EITHER**:

   a. > 100 mRem TEDE

   OR

   b. > 500 mRem CDE Thyroid

   OR

3. Field survey results at or beyond the site boundary indicate **EITHER**:

   a. Gamma (closed window) dose rates **>100 mRem/hr** are expected to continue for **≥ 60 minutes**.

   OR

   b. Analyses of field survey samples indicate **> 500 mRem CDE Thyroid** for **60 minutes** of inhalation.

ALERT

RA1 Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until dose assessment results are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+07 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER**:

   a. **> 10 mRem TEDE**

   OR

   b. **> 50 mRem CDE Thyroid**

   OR

3. Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses greater than **EITHER** of the following at or beyond the site boundary

   a. **10 mrem TEDE** for **60 minutes** of exposure

   OR

   b. **50 mrem CDE Thyroid** for **60 minutes** of exposure

   OR

4. Field survey results at or beyond the site boundary indicate **EITHER**:

   a. Gamma (closed window) dose rates **> 10 mR/hr** are expected to continue for **≥ 60 minutes.**

   OR

   b. Analyses of field survey samples indicate **> 50 mRem CDE Thyroid** for **60 minutes** of inhalation.

UNUSUAL EVENT

RU1 Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 60 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

1. Reading on **ANY** of the following effluent monitors **> 2 times alarm setpoint** established by a current radioactive release discharge permit for **≥ 60 minutes**.
   - 0PR01J, Liquid Radwaste Effluent Monitor
   - 0PR90J, Liquid Radwaste Effluent Monitor
   - 0PR02J, Gas Decay Tank Effluent Monitor
   - 0PR10J, Station Blowdown Monitor
   - 1/2 PR01J, Containment Purge Effluent Monitor
   - Discharge Permit specified monitor

   OR

2. The sum of readings on the Unit 1 and 2 Aux Bldg Vent WRGMs (1/2 RE-PR030) **> 4.42 E+05 µCi/sec** for **≥ 60 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

3. Confirmed sample analyses for gaseous or liquid releases indicate concentrations or release rates **> 2 times ODCM Limit** with a release duration of **≥ 60 minutes**.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

 COLD SHUTDOWN/REFUELING MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

Abnormal Rad Levels / Radiological Effluents

Radiological Effluents

RG2 Spent fuel pool level cannot be restored to at least 1.00 ft. as indicated on 0LI-FC001B(2B) for 60 minutes or longer. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the General Emergency promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Spent fuel pool level cannot be restored to at least **1.00 ft.** as indicated on 0LI-FC001B(2B) for **60 minutes** or longer.

Table R1 Fuel Handling Incident Radiation Monitors
• Fuel Building Fuel Handling Incident Monitor 0RE-AR055
• Fuel Building Fuel Handling Incident Monitor 0RE-AR056
• Containment Fuel Handling Incident Monitor 1/2RE-AR011
• Containment Fuel Handling Incident Monitor 1/2RE-AR012

RS2 Spent fuel pool level at 1.00 ft. as indicated on 0LI-FC001B(2B) 1 2 3 4 5 6 D

Emergency Action Level (EAL):

Lowering of spent fuel pool level to **1.00 ft.** as indicated on 0LI-FC001B(2B).

Table R2 Areas Requiring Continuous Occupancy
• Main Control Room – 1/2RE-AR010
• Central Alarm Station – (by survey)

Table R3
Areas with Entry Related Mode Applicability

Area	Entry Related Mode Applicability
Auxiliary Building 426' VCT Valve Aisle	Mode 4, 5, and 6
Auxiliary Building 401' Curved Wall Area Penetration Area	
Auxiliary Building 383' Remote Shutdown Panel Area	
Auxiliary Building 364' CV Pp areas Curved Wall Area	
Auxiliary Building 346' RH pump areas	

RA2 Significant lowering of water level above, or damage to, irradiated fuel. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

1. Uncovery of irradiated fuel in the REFUELING PATHWAY.

OR

2. Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by **ANY** Table R1 Radiation Monitor reading **>1000 mRem/hr**

OR

3. Lowering of spent fuel pool level to **10.50 ft.** as indicated on 0LI-FC001B(2B).

RA3 Radiation levels that impede access to equipment necessary for normal plant operations, cooldown or shutdown. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Note: If the equipment in the listed room or area was already inoperable, or out of service, before the event occurred, then no emergency classification is warranted

1. Dose rate greater than **15 mR/hr** in **ANY** of the areas contained in Table R2.

OR

2. An UNPLANNED event results in radiation levels that prevent or significantly impede access to **ANY** of the plant rooms in Table R3.

RU2 UNPLANNED loss of water level above irradiated fuel. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

1. a. UNPLANNED water level drop in the REFUELING PATHWAY as indicated by **ANY** of the following:
   - Refueling Cavity water level **<23 ft.** above the Reactor Flange (**< 423 ft.** indicated level)

   OR

   - Spent Fuel Pool water level **< 23 ft.** above the fuel (**<422 ft. 9 in.** indicated level)

   OR

   - Indication or report of a drop in water level in the REFUELING PATHWAY.

   AND

   b. UNPLANNED Area Radiation Monitor reading rise on **ANY** radiation monitor in Table R1.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

 COLD SHUTDOWN/REFUELING MATRIX

Cold Shutdown / Refueling System Malfunctions

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of AC Power			**CA1** Loss of all offsite and onsite AC power to emergency buses for 15 minutes or longer. 5 6 D **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. Loss of **ALL** off-site AC power to unit ESF buses. **AND** 2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses. **AND** 3. Failure to restore power to at least one unit ESF bus in **< 15 minutes** from the time of loss of both offsite and onsite AC power.	**CU1** Loss of all but one AC power source to emergency buses for 15 minutes or longer. 5 6 D **Emergency Action Levels (EAL):** **Note:** The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. 1. AC power capability to unit ESF buses reduced to only one of the following power sources for **≥ 15 minutes.** • Affected unit SAT 142-1(242-1) • Affected unit SAT 142-2(242-2) • Emergency Diesel Generator DG 1A(2A) • Emergency Diesel Generator DG 1B(2B) • Unit crosstie breakers **AND** 2. Any additional single power source failure will result in a loss of **ALL** AC power to SAFETY SYSTEMS.
Safety System			**CA2** Hazardous event affecting SAFETY SYSTEM required for the current operating mode. 5 6 **Emergency Action Levels (EAL):** **Note:** If it is determined that the conditions of CA2 are not met then assess the event via HU3, HU4, or HU6. 1. The occurrence of **ANY** of the following hazardous events: • Seismic event (earthquake) • Internal or external flooding event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager **AND** 2. **EITHER** of the following: a. Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM required by Technical Specifications for the current operating mode. **OR** b. The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure required by Technical Specifications for the current operating mode.	

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

COLD SHUTDOWN/REFUELING MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

Cold Shutdown / Refueling System Malfunctions

DC Power

CU3 Loss of Vital DC power for 15 minutes or longer. 5 6

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Voltage is **< 108 VDC** on required unit 125 VDC battery buses 111(211) and 112(212) for **≥ 15 minutes**.

Communications

Table C1 – Communications Capability

System	Onsite	Offsite	NRC
Radios	X		
Plant page	X		
Plant Telephone System	X		
Commercial Telephones	X	X	X
NARS		X	
ENS		X	X
HPN		X	X
Satellite phones		X	X

CU4 Loss of all onsite or offsite communication capabilities. 5 6 D

Emergency Action Levels (EAL):

1. Loss of **ALL** Table C1 **Onsite** communications capability affecting the ability to perform routine operations.

   OR

2. Loss of **ALL** Table C1 **Offsite** communication capability affecting the ability to perform offsite notifications.

   OR

3. Loss of **ALL** Table C1 **NRC** communication capability affecting the ability to perform NRC notifications.

Heat Sink

Table C2 – RCS Heat-up Duration Thresholds

RCS Status	Containment Closure Status	Heat-up Duration
Intact	Not Applicable	60 minutes*
Not Intact **OR** Reduced Inventory (<397 ft.)	Established	20 minutes*
	Not Established	0 minutes

* If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced, then EAL #1 is **not** applicable.

CA5 Inability to maintain plant in cold shutdown 5 6

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

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

1. UNPLANNED rise in RCS temperature **> 200ºF** for **> Table C2 duration**.

   OR

2. UNPLANNED RCS pressure rise **> 10 psig** as a result of temperature rise (This EAL does not apply in solid plant conditions.)

CU5 UNPLANNED rise in RCS temperature. 5 6

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

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

1. UNPLANNED rise in RCS temperature **> 200ºF.**

   OR

2. Loss of the following for **≥ 15 minutes.**
   - **ALL** RCS temperature indications

     AND
   - **ALL** RCS level indications

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

COLD SHUTDOWN/REFUELING MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

Cold Shutdown / Refueling System Malfunctions

RCS Leakage / Inventory

GENERAL EMERGENCY

CG6 Loss of Reactor Vessel / RCS inventory affecting fuel clad integrity with containment challenged. 5 6

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. a. RVLIS indicates **0% Plenum** for **≥ 30 minutes.**

   OR

   Reactor Vessel Refueling Level Indicators LT-046 and LT-049 **< 392 ft. el.** for **≥ 30 minutes.**

   AND

   b. **ANY** Containment Challenge Indication (Table C4)

OR

2. a. Reactor Vessel / RCS level **cannot** be monitored for **≥ 30 minutes.**

   AND

   b. Core uncovery is indicated by **ANY** of the following:
   - Table C3 indications of a sufficient magnitude to indicate core uncovery.

     OR
   - Erratic Source Range Neutron Monitor indication.

     OR
   - 1/2 RE-AR011 or 1/2 RE-AR12 Containment Fuel Handling Incident radiation monitors **> 3000 mR/hr.**

   AND

   c. Any Containment Challenge Indication (Table C4)

Table C3 Indications of RCS Leakage
• UNPLANNED Containment Sump level rise* • UNPLANNED Auxiliary Bldg. Sump level rise* • UNPLANNED Tank (rad waste) level rise* • UNPLANNED rise in RCS makeup • Observation of leakage or inventory loss
*Rise in level is attributed to a loss of Reactor Vessel / RCS inventory.

SITE AREA EMERGENCY

CS6 Loss of Reactor Vessel / RCS inventory affecting core decay heat removal capabilities. 5 6

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. With CONTAINMENT CLOSURE established **EITHER:**
   - RVLIS indicates **0% Plenum**

     OR
   - Reactor Vessel Refueling Level Indicators LT-046 and LT-049 **< 392 ft el.**
2. With CONTAINMENT CLOSURE **not** established **EITHER:**
   - RVLIS **≤ 15% Plenum.**

     OR
   - Reactor Vessel Refueling Level Indicators LT-046 and LT-049 **< 393 ft. el.**
3. a. Reactor Vessel / RCS level **cannot** be monitored for **≥30 minutes.**

   AND

   b. Core uncovery is indicated by **ANY** of the following:
   - Table C3 indications of a sufficient magnitude to indicate core uncovery.

     OR
   - Erratic Source Range Neutron Monitor indication.

     OR
   - 1/2 RE-AR011 or 1/2 RE-AR12 Containment Fuel Handling Incident radiation monitors **> 3000 mR/hr.**

Table C4 – Containment Challenge Indications
• Hydrogen Concentration in Containment **≥ 5%** • UNPLANNED rise in containment pressure • CONTAINMENT CLOSURE **not** established*
* if CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute core uncovery time limit, then escalation to a General Emergency is not required.

ALERT

CA6 Loss of Reactor Vessel / RCS inventory 5 6

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. a. Loss of Reactor Vessel / RCS inventory as indicated RVLIS **< 37% Plenum**.

   OR

   b. Loss of Reactor Vessel / RCS inventory as indicated by LT-046 and LT-049 **< 393.4 ft. el.**

OR

2. a. Reactor Vessel / RCS level **cannot** be monitored for **≥ 15 minutes**.

   AND

   b. Loss of Reactor Vessel / RCS inventory per Table C3 indications.

UNUSUAL EVENT

CU6 UNPLANNED loss of Reactor Vessel / RCS inventory for 15 minutes or longer. 5 6

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. UNPLANNED loss of reactor coolant results in the inability to restore and maintain Reactor Vessel / RCS level to **> procedurally established lower limit** for ≥15 minutes.

   OR
2. a. Reactor Vessel / RCS level **cannot** be monitored.

   AND

   b. Loss of Reactor Vessel / RCS inventory per Table C3 indications.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

<table>
<tr><th></th><th>GENERAL EMERGENCY</th><th>SITE AREA EMERGENCY</th><th>ALERT</th><th>UNUSUAL EVENT</th></tr>
<tr><td colspan="5">Hazards and Other conditions Affecting Plant Safety</td></tr>
<tr><td>Hostile Action</td>
<td>HG1 HOSTILE ACTION resulting in loss of physical control of the facility 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
1. A notification from the Security Force that a HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA.
AND
2. a. ANY Table H1 safety function <u>cannot</u> be controlled or maintained.
OR
b. Damage to spent fuel has occurred or is IMMINENT</td>
<td>HS1 HOSTILE ACTION within the PROTECTED AREA 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
A notification from the Security Force that a HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA.</td>
<td>HA1 HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes. 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
1. A validated notification from NRC of an aircraft attack threat < 30 minutes from the site.
OR
2. Notification by the Security Force that a HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLED AREA.</td>
<td>HU1 Confirmed SECURITY CONDITION or threat. 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
1. Notification of a credible security threat directed at the site as determined per SY-AA-101-132, Security Assessment and Response to Unusual Activities.
OR
2. A validated notification from the NRC providing information of an aircraft threat.
OR
3. Notification by the Security Force of a SECURITY CONDITION that does <u>not</u> involve a HOSTILE ACTION.</td></tr>
<tr><td>Transfer of Plant Control</td>
<td>Table H1 – Safety Functions
• Reactivity Control
(ability to shutdown the reactor and keep it shutdown)
• Core Cooling (ability to cool the core)
• RCS Heat Removal (ability to maintain a heat sink)</td>
<td>HS2 Inability to control a key safety function from outside the Control Room 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
1. A Control Room evacuation has resulted in plant control being transferred from the Control Room to alternate locations per 1/2BwOA PRI-5, Control Room Inaccessibility.
AND
2. Control of ANY Table H1 key safety function is <u>not</u> reestablished in < 15 minutes.</td>
<td>HA2 Control Room evacuation resulting in transfer of plant control to alternate locations 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
A Control Room evacuation has resulted in plant control being transferred from the Control Room to alternate locations per 1/2BwOA PRI-5, Control Room Inaccessibility.</td>
<td></td></tr>
</table>

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D – Defueled

COLD SHUTDOWN/REFUELING MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

Hazards and Other conditions Affecting Plant Safety

Fire

HU3 FIRE potentially degrading the level of safety of the plant. 1 2 3 4 5 6 D

Emergency Action Levels (EAL):

Note: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Escalation of the emergency classification level would be via IC CA2 or MA5

1. A FIRE in **ANY** Table H2 area is **not** extinguished in **< 15-minutes** of **ANY** of the following FIRE detection indications:
   - Report from the field (i.e., visual observation)
   - Receipt of multiple (more than 1) fire alarms or indications
   - Field verification of a single fire alarm

OR

2. a. Receipt of a single fire alarm in **ANY** Table H2 area (i.e., no other indications of a FIRE).

   AND

   b. The existence of a FIRE is **not** verified in **< 30 minutes** of alarm receipt.

OR

3. A FIRE within the plant PROTECTED AREA not extinguished in **< 60 minutes** of the initial report, alarm or indication.

OR

4. A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish.

Table H2 – Vital Areas
• Containment • Auxiliary Building • Fuel Handling Building • Main Steam Tunnels • RWST's • Condensate Storage Tanks • Lake Screen House

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

COLD SHUTDOWN/REFUELING MATRIX

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Hazards and Other conditions Affecting Plant Safety				
Earthquake				**HU4** Seismic event greater than OBE levels 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** **Note:** Escalation of the emergency classification level would be via IC CA2 or MA5 For emergency classification if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in manner deemed appropriate by the Shift Manager or Emergency Director in **≤ 15 mins** of the event. 1. Seismic event **> Operating Basis Earthquake (OBE)** as indicated by seismic check at panel 0PA02J. **OR** 2. When Seismic Monitoring Equipment is **not** available: a. Control Room personnel feel an actual or potential seismic event. **AND** b. **ANY** one of the following confirmed in **≤ 15 mins** of the event: • The earthquake resulted in Modified Mercalli Intensity (MMI) **≥ VI** and occurred **≤ 3.5 miles** of the plant. • The earthquake was magnitude **≥ 6.0** • The earthquake was magnitude **≥ 5.0** and occurred **≤ 125 miles** of the plant.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

<table>
<tr><th></th><th>GENERAL EMERGENCY</th><th>SITE AREA EMERGENCY</th><th>ALERT</th><th>UNUSUAL EVENT</th></tr>
<tr><td colspan="5">Hazards and Other conditions Affecting Plant Safety</td></tr>
<tr><td>Toxic Gas</td><td></td><td>
<table>
<tr><th colspan="2">Table H3
Areas with Entry Related Mode Applicability</th></tr>
<tr><th>Area</th><th>Entry Related Mode Applicability</th></tr>
<tr><td>Auxiliary Building 426’
VCT Valve Aisle</td><td rowspan="5">Mode 4, 5, and 6</td></tr>
<tr><td>Auxiliary Building 401’
Curved Wall Area
Penetration Area</td></tr>
<tr><td>Auxiliary Building 383’
Remote Shutdown Panel Area</td></tr>
<tr><td>Auxiliary Building 364’
CV Pp areas
Curved Wall Area</td></tr>
<tr><td>Auxiliary Building 346’
RH pump areas</td></tr>
</table>
</td><td>HA5 Gaseous release impeding access to equipment necessary for normal plant operations, cooldown or shutdown. 4 5 6

<u>Emergency Action Levels (EAL):</u>
Note: If the equipment in the listed room or area was already inoperable, or out of service, before the event occurred, then no emergency classification is warranted.
1. Release of a toxic, corrosive, asphyxiant or flammable gas in ANY Table H3 area.
AND
2. Entry into the room or area is prohibited or impeded.</td><td></td></tr>
<tr><td>Hazardous Event</td><td></td><td></td><td></td><td>HU6 Hazardous Event 1 2 3 4 5 6 D

<u>Emergency Action Levels (EAL):</u>
Note: EAL #4 does not apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.
Escalation of the emergency classification level would be via IC CA2 or MA5
1. Tornado strike within the PROTECTED AREA.
OR
2. Internal room or area flooding of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode.
OR
3. Movement of personnel within the PROTECTED AREA is impeded due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release).
OR
4. A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles.</td></tr>
</table>

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D – Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Hazards and Other conditions Affecting Plant Safety			
Emergency Director Judgment			
HG7 Other conditions exist which in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.	**HS7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the site boundary.	**HA7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of an ALERT. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	**HU7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of an UNUSUAL EVENT. 1 2 3 4 5 6 D . **Emergency Action Levels (EAL):** Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
ISFSI Malfunction				
ISFSI				**E-HU1** Damage to a loaded cask CONFINEMENT BOUNDARY. 1 2 3 4 5 6 D **Emergency Action Levels (EAL):** Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading: 1. HI-STORM (labeled as xxx-A3) • **> 40 mrem/hr** (gamma + neutron) on top of the spent fuel cask **OR** • **> 220 mrem/hr** (gamma + neutron) on the side of the spent fuel cask, excluding inlet and outlet ducts **OR** 2. HI-STORM (labeled as xxx-A9.1) • **> 60 mrem/hr** (gamma + neutron) on top of the spent fuel cask **OR** • **> 600 mrem/hr** (gamma + neutron) on the side of the spent fuel cask, excluding inlet and outlet ducts

Mode: 1 – Power Operations 2 – Startup 3 – Hot Standby 4 – Hot Shutdown 5 – Cold Shutdown 6 – Refueling D - Defueled

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RG1

Initiating Condition:

Release of gaseous radioactivity resulting in offsite dose greater than 1000 mRem TEDE or 5000 mRem thyroid CDE.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+09 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment Using actual meteorology indicates doses at or beyond the site boundary of **EITHER**:

   a. **> 1000 mRem TEDE**

      OR

   b. **> 5000 mRem CDE Thyroid**

   OR

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RG1 (cont)

Emergency Action Level (EAL) (cont):

3. Field survey results at or beyond the site boundary indicate **EITHER**:
   a. Gamma (closed window) dose rates **>1000 mRem/hr** are expected to continue for **≥ 60 minutes**.

   OR

   b. Analyses of field survey samples indicate **> 5000 mRem CDE Thyroid** for **60 minutes** of inhalation.

Basis:

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

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

The TEDE dose is set at the EPA PAG of 1000 mRem while the 5000 mRem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Basis Reference(s):

1. NEI 99-01 Rev 6, AG1
2. EP-EAL-0601, Criteria for Choosing Radiological Gaseous Effluent EAL Threshold Values Braidwood Station
3. EP-AA-112-500 Emergency Environmental Monitoring

RECOGNITION CATEGORY
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RS1

Initiating Condition:

Release of gaseous radioactivity resulting in offsite dose greater than 100 mRem TEDE or 500 mRem thyroid CDE.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+08 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER**:

   a. **> 100 mRem TEDE**

      OR

   b. **> 500 mRem CDE Thyroid**

   OR

3. Field survey results at or beyond the site boundary indicate **EITHER**:

   a. Gamma (closed window) dose rates **>100 mR/hr** are expected to continue for **≥ 60 minutes**.

      OR

   b. Analyses of field survey samples indicate **> 500 mRem CDE Thyroid** for **60 minutes** of inhalation.

RECOGNITION CATEGORY
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RS1 (cont)

Basis:

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

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

The TEDE dose is set at 10% of the EPA PAG of 1000 mRem while the 500 mRem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Escalation of the emergency classification level would be via IC RG1.

Basis Reference(s):

1. NEI 99-01 Rev 6, AS1
2. EP-EAL-0601, Criteria for Choosing Radiological Gaseous Effluent EAL Threshold Values Braidwood Station
3. EP-AA-112-500 Emergency Environmental Monitoring

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA1

Initiating Condition:

Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mRem TEDE or 50 mRem thyroid CDE.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

1. The sum of readings on the Unit 1 and 2 Aux BLDG Vent WRGMs (1/2 RE-PR030) **> 3.87 E+07 µCi/sec** for **≥ 15 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

   OR

2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER**:

   a. **> 10 mRem TEDE**

   OR

   b. **> 50 mRem CDE Thyroid**

   OR

3. Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses greater than **EITHER** of the following at or beyond the site boundary

   a. **10 mRem TEDE** for **60 minutes** of exposure

   OR

   b. **50 mRem CDE Thyroid** for **60 minutes** of exposure

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA1 (cont)

Emergency Action Level (EAL) (cont):

OR

4. Field survey results at or beyond the site boundary indicate **EITHER**:
   a. Gamma (closed window) dose rates **> 10 mR/hr** are expected to continue for **≥ 60 minutes**.

   OR

   b. Analyses of field survey samples indicate **> 50 mRem CDE Thyroid** for **60 minutes** of inhalation.

Basis:

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

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

The TEDE dose is set at 1% of the EPA PAG of 1000 mRem while the 50 mRem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

This EAL includes any release for which a radioactivity discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.) on the applicable permit.

Escalation of the emergency classification level would be via IC RS1.

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA1 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, AA1
2. ODCM Section 12.3 Liquid Effluents
3. EP-EAL-0601, Criteria for Choosing Radiological Gaseous Effluent EAL Threshold Values Braidwood Station
4. EP-EAL-0618, Braidwood Criteria for Choosing Radiological Liquid Effluents EAL Threshold Values
5. 0BwIS RETS 2.1-1, Digital Channel Operational Test of 0PR01J
6. 0BwISR 11.A.3-002, Rev 001 Channel Operation Test of Liquid Radwaste Effluent Radiation Monitor 0PR01J
7. EP-EAL-0623, Braidwood Criteria for Choosing Radiological Gaseous Effluents EAL Threshold Values for Waste Gas Decay Tanks

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RU1

Initiating Condition:

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

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Notes:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 60 minutes.
- Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

1. Reading on **ANY** of the following effluent monitors **> 2 times alarm setpoint** established by a current radioactive release discharge permit for **≥ 60 minutes**.
    - 0PR01J, Liquid Radwaste Effluent Monitor
    - 0PR90J, Liquid Radwaste Effluent Monitor
    - 0PR02J, Gas Decay Tank Effluent Monitor
    - 0PR10J, Station Blowdown Monitor
    - 1/2PR01J, Containment Purge Effluent Monitor
    - Discharge Permit specified monitor

    OR

2. The sum of readings on the Unit 1 and 2 Aux Bldg Vent WRGMs (1/2 RE-PR030) **> 4.42 E+05 μCi/sec** for **≥ 60 minutes** (as determined from Unit 1 & 2 PF430 or PPDS – Total Noble Gas Release Rate).

    OR

3. Confirmed sample analyses for gaseous or liquid releases indicate concentrations or release rates **> 2 times ODCM Limit** with a release duration of **≥ 60 minutes**.

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RU1 (cont)

Basis:

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

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

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

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

EAL #1 Basis:

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

The effluent monitors listed are those normally used for planned discharges. If a discharge is performed using a different flowpath or effluent monitor other than those listed (e.g., a portable or temporary effluent monitor), then the declaration criteria will be based on the monitor specified in the Discharge Permit.

EAL #2 Basis:

This EAL addresses normally occurring continuous radioactivity releases from monitored gaseous effluent pathways.

EAL #3 Basis

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

Escalation of the emergency classification level would be via IC RA1.

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RU1 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, AU1
2. UFSAR Section 11.5.2.3
3. ODCM Section 12.3 Liquid Effluents
4. EP-EAL-0601, Criteria for Choosing Radiological Gaseous Effluent EAL Threshold Values Braidwood Station
5. 0BwSR 11.A.3-002, Rev 001 Channel Operation Test of Liquid Radwaste Effluent Radiation Monitor 0PR01J

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RG2

Initiating Condition:

Spent fuel pool level cannot be restored to at least 1.00 ft. as indicated on 0LI-FC001B(2B) for 60 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Note: The Emergency Director should declare the General Emergency promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Spent fuel pool level cannot be restored to at least **1.00 ft**. as indicated on 0LI-FC001B(2B) for **60 minutes** or longer.

Basis:

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

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

Basis Reference(s):

1. NEI 99-01 Rev 6, AG2
2. EP-EAL-1001, Criteria for Choosing Spent Fuel Pool Level 3 and Level 2 EAL Threshold Values for Braidwood Station

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RS2

Initiating Condition:

Spent fuel pool level at 1.00 ft as indicated on 0LI-FC001B(2B).

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Lowering of spent fuel pool level to **1.00 ft**. as indicated on 0LI-FC001B(2B).

Basis:

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

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

Escalation of the emergency classification level would be via IC RG1 or RG2.

Basis Reference(s):

1. NEI 99-01 Rev 6, AS2
2. EP-EAL-1001, Criteria for Choosing Spent Fuel Pool Level 3 and Level 2 EAL Threshold Values for Braidwood Station

RECOGNITION CATEGORY
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA2

Initiating Condition:

Significant lowering of water level above, or damage to, irradiated fuel.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

1. Uncovery of irradiated fuel in the REFUELING PATHWAY.

   OR

2. Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by **ANY** Table R1 Radiation Monitor reading **>1000 mRem/hr**

   OR

3. Lowering of spent fuel pool level to **10.50 ft**. as indicated on 0LI-FC001B(2B).

Table R1 **Fuel Handling Incident Radiation Monitors**
• Fuel Building Fuel Handling Incident Monitor 0RE-AR055 • Fuel Building Fuel Handling Incident Monitor 0RE-AR056 • Containment Fuel Handling Incident Monitor 1/2RE-AR011 • Containment Fuel Handling Incident Monitor 1/2RE-AR012

Basis:

REFUELING PATHWAY: all the cavities, tubes, canals and pools through which irradiated fuel may be moved or stored, but not including the reactor vessel below the flange.

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

CONFINEMENT BOUNDARY: The irradiated fuel dry storage cask barrier(s) between areas containing radioactive substances and the environment.

This IC addresses events that have caused IMMINENT or actual damage to an irradiated fuel assembly. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant.

RA2 (cont)

Basis (cont):

This IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC E-HU1.

EAL #1 Basis:

This EAL escalates from RU2 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncovery of irradiated fuel. Indications of irradiated fuel uncovery may include direct or indirect visual observation (e.g., reports from personnel or camera images), as well as significant changes in water and radiation levels, or other plant parameters. Computational aids may also be used (e.g., a boil-off curve). Classification of an event using this EAL should be based on the totality of available indications, reports and observations.

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

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

EAL #2 Basis:

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

EAL #3 Basis:

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

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

RECOGNITION CATEGORY
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA2 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, AA2
2. UFSAR 11.5.2.2.6, 11.5.2.2.7, 15.7.4, Table 12.3-3
3. Technical Specification Table 3.3-6-1
4. 1/2BwOA REFUEL-1 Fuel Handling Emergency
5. 1/2BwOA REFUEL-2 Refueling Cavity or Spent Fuel Pool Level Loss
6. TRM 3.9.a, Refueling Operations, Decay Time
7. BwAR 1-1-A2, 2-1-A2, CNMT DRAIN LEAK DETECT FLOW HIGH alarm
8. EP-EAL-1001, Criteria for Choosing Spent Fuel Pool Level 3 and Level 2 EAL Threshold Values for Braidwood Station

RECOGNITION CATEGORY
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RU2

Initiating Condition:

UNPLANNED loss of water level above irradiated fuel.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

1. a. UNPLANNED water level drop in the REFUELING PATHWAY as indicated by **ANY** of the following:

   - Refueling Cavity water level **< 23 ft**. above the Reactor Flange (**< 423 ft**. indicated level).

     OR

   - Spent Fuel Pool water level **< 23 ft**. above the fuel (**< 422 ft. 9 in**. indicated level).

     OR

   - Indication or report of a drop in water level in the REFUELING PATHWAY.

   AND

   b. UNPLANNED Area Radiation Monitor reading rise on **ANY** radiation monitors in Table R1.

Table R1 - Fuel Handling Incident Radiation Monitors
• Fuel Building Fuel Handling Incident Monitor 0RE-AR055
• Fuel Building Fuel Handling Incident Monitor 0RE-AR056
• Containment Fuel Handling Incident Monitor 1/2RE-AR011
• Containment Fuel Handling Incident Monitor 1/2RE-AR012

Basis:

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

REFUELING PATHWAY: all the cavities, tubes, canals and pools through which irradiated fuel may be moved or stored, but not including the reactor vessel below the flange.

RU2 (cont)

Basis (cont):

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

A water level loss will be primarily determined by indications from available level instrumentation. Other sources of level indications may include reports from plant personnel (e.g., from a refueling crew) or video camera observations (if available) or from any other temporarily installed monitoring instrumentation. A significant drop in the water level may also cause a rise in the radiation levels of adjacent areas that can be detected by monitors in those locations.

The effects of planned evolutions should be considered. For example, a refueling bridge area radiation monitor reading may rise due to planned evolutions such as lifting of the reactor vessel head or movement of a fuel assembly. Note that this EAL is applicable only in cases where the elevated reading is due to an UNPLANNED loss of water level.

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

Escalation of the emergency classification level would be via IC RA2.

Basis Reference(s):

1. NEI 99-01 Rev 6, AU2
2. Technical Specifications 3.7.14
3. UFSAR 11.5.2.2.6, 11.5.2.2.7, 15.7.4, Table 12.3-3
4. 1/2BwOA REFUEL-1 Fuel Handling Emergency
5. 1/2BwOA REFUEL-2 Refueling Cavity or Spent Fuel Pool Level Loss
6. 1/2BwOSR 0.1-6 Unit One(Two) Mode 6 Shiftly and Daily Operating Surveillance
7. BwOP RH-8 Filling the Reactor Cavity for Refueling
8. BwOP RH-9 Pump Down of the Reactor Cavity to the RWSTs
9. BwOP RC-4 Reactor Coolant System Drain
10. BwAR 1-6-C3 REFUELING CAVITY LVL HIGH LOW
11. BwAR 1-1-C1 SPENT FUEL PIT LEVEL HIGH LOW

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA3

Initiating Condition:

Radiation levels that impede access to equipment necessary for normal plant operations, cooldown or shutdown.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Note:

- If the equipment in the room or area listed in Table R3 was already inoperable, or out of service, before the event occurred, then no emergency classification is warranted.

1. Dose rate **> 15 mR/hr** in **ANY** of the following Table R2 areas:

Table R2 Areas Requiring Continuous Occupancy
• Main Control Room – 1/2RE-AR010 • Central Alarm Station – (by survey)

OR

2. UNPLANNED event results in radiation levels that prohibit or significantly impede access to **ANY** of the following Table R3 plant rooms or areas:

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA3 (cont)

Emergency Action Level (EAL) (cont):

Table R3
Areas with Entry Related Mode Applicability

Area	Entry Related Mode Applicability
Auxiliary Building 426' VCT Valve Aisle	Mode 4, 5, and 6
Auxiliary Building 401' Curved Wall Area Penetration Area	
Auxiliary Building 383' Remote Shutdown Panel Area	
Auxiliary Building 364' CV Pp areas Curved Wall Area	
Auxiliary Building 346' RH pump areas	

Basis:

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

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

Assuming all plant equipment is operating as designed, normal operation is capable from the Main Control Room (MCR). The plant is also able to transition into a hot shutdown condition from the MCR, therefore Table R3 is a list of plant rooms or areas with entry-related mode applicability that contain equipment which require a manual/local action necessary to transition the plant from normal plant operation to cooldown and shutdown as specified in normal operating procedures (establish shutdown cooling), where if this action is not completed the plant would not be able to attain and maintain cold shutdown. This Table does not include rooms or areas for which entry is required solely to perform

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RA3 (cont)

Basis (cont):

actions of an administrative or record keeping nature (e.g., normal rounds or routine inspections).

Rooms and areas listed in EAL #1 do not need to be included in EAL #2, including the Control Room.

For EAL #2, an Alert declaration is warranted if entry into the affected room/area is, or may be, procedurally required during the plant operating mode in effect and the elevated radiation levels preclude the ability to place shutdown cooling in service. The emergency classification is not contingent upon whether entry is actually necessary at the time of the increased radiation levels. Access should be considered as impeded if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., installing temporary shielding beyond that required by procedure, requiring use of non-routine protective equipment, requesting an extension in dose limits beyond normal administrative limits).

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

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

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

Basis Reference(s):

1. NEI 99-01 Rev 6, AA3
2. UFSAR Chapter 3.02, UFSAR Table 3.2-1

RECOGNITION CATEGORY

ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENTS

RU3

Initiating Condition:

Reactor coolant activity greater than Technical Specification allowable limits.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

1. Gross Failed Fuel Monitor 1/2RE-PR006 indicating I-135 concentration **> 5 µCi/cc.**

   OR

2. Sample analysis indicates that:

   a. Dose Equivalent I-131 specific coolant activity **> 60.0 µCi/gm**.

   OR

   b. Dose Equivalent XE-133 specific coolant activity **> 603.0 µCi/gm**.

Basis:

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Conditions that cause the specified monitor to alarm that are not related to fuel clad degradation should not result in the declaration of an Unusual Event.

This EAL addresses site-specific radiation monitor readings that provide indication of a degradation of fuel clad integrity.

Escalation of the emergency classification level would be via ICs FA1 or the Recognition Category R ICs.

Basis Reference(s):

1. NEI 99-01 Rev 6, SU3
2. Technical Specifications 3.4.16
3. 1/2BwOA PRI-4, High Reactor Coolant Activity Unit 1/2
4. PWR Letdown Rad Monitor Setpoint Calculation for Degraded Fuel Indication

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FG1

Initiating Condition:

Loss of ANY Two Barriers AND Loss or Potential Loss of the third barrier.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Refer to Fission Product Barrier Loss and Potential Loss threshold values to determine barrier status.

Basis:

Fuel Cladding, RCS and Containment comprise the fission product barriers.

At the General Emergency classification level each barrier is weighted equally.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FS1

Initiating Condition:

Loss or Potential Loss of ANY two barriers.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Refer to Fission Product Barrier Loss and Potential Loss threshold values to determine barrier status.

Basis:

Fuel Cladding, RCS and Containment comprise the fission product barriers.

At the Site Area Emergency classification level, each barrier is weighted equally.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FA1

Initiating Condition:

ANY Loss or ANY Potential Loss of either Fuel Clad or RCS.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Refer to Fission Product Barrier Loss and Potential Loss threshold values to determine barrier status.

Basis:

Fuel Cladding, RCS and Containment comprise the fission product barriers.

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

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FC1

Initiating Condition:

RCS or SG Tube Leakage

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

POTENTIAL LOSS

Core Cooling CSF-Orange Path conditions exist

Basis:

There is no Loss threshold associated with RCS or SG Tube Leakage.

Potential Loss Threshold #1 Basis:

Core Cooling - ORANGE indicates subcooling has been lost and that some clad damage may occur.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. 1/2BwFR-C.2 Response to Degraded Core Cooling

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FC2

Initiating Condition:

Inadequate Heat Removal

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

1. **Core-Cooling CSF- Red Path** conditions exist.

POTENTIAL LOSS

2. **Core Cooling CSF-Orange Path** conditions exist.

   OR

3. **Heat Sink CSF- Red Path** conditions exist.

Basis:

Loss Threshold #1 Basis

This reading indicates temperatures within the core are sufficient to cause significant superheating of reactor coolant.

Core Cooling - RED indicates significant superheating and core uncovery and is considered to indicate loss of the Fuel Clad Barrier.

Potential Loss Threshold #2 Basis

This reading indicates temperatures within the core are sufficient to allow the onset of heat-induced cladding damage.

Core Cooling - ORANGE indicates subcooling has been lost and that some clad damage may occur.

Potential Loss Threshold #3 Basis

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the Fuel Clad Barrier. The Heat Sink Critical Safety Function Red path condition exists if narrow range levels in all steam generators (S/Gs) are less than or equal to 10% - Unit 1 (31% adverse containment) and 14% - Unit 2 (34% adverse containment) and total feedwater flow to all S/Gs is less than or equal to 500 gpm. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators by reducing total feed flow to less than 500 gpm; during these conditions, classification using this threshold is not warranted.

Meeting this threshold results in a Site Area Emergency because this threshold is identical to RCS Barrier RC 2 Potential Loss threshold; both will be met. This condition warrants a Site Area Emergency declaration because inadequate RCS heat removal.

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FC2 (cont)

Basis (cont):

Meeting this threshold results in a Site Area Emergency because this threshold is identical to RCS Barrier RC 2 Potential Loss threshold; both will be met. This condition warrants a Site Area Emergency declaration because inadequate RCS heat removal may result in fuel heat-up sufficient to damage the cladding and rise RCS pressure to the point where mass will be lost from the system.

Heat Sink - RED when heat sink is required indicates the ultimate heat sink function is under extreme challenge.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. 1/2BwFR-C.1 Response to Inadequate Core Cooling
3. 1/2BwFR-C.2 Response to Degraded Core Cooling
4. 1/2BwST-3 Heat Sink

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FC3

Initiating Condition:

Containment Radiation / RCS Activity

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

1. Containment radiation monitor (AR020(21)) reading **> 1.95E+03 R/hr**.

   OR

2. Coolant activity as sampled **> 300µCi/gm** Dose Equivalent I-131

Basis:

Loss Threshold #1 Basis

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals 300µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

The radiation monitor reading in this threshold is higher than that specified for RCS Barrier RC3 Loss Threshold since it indicates a loss of both the Fuel Clad Barrier and the RCS Barrier. Note that a combination of the two monitor readings appropriately escalates the emergency classification level to a Site Area Emergency.

Loss Threshold #2 Basis

This threshold indicates that RCS radioactivity concentration is greater than 300 µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

It is recognized that sample collection and analysis of reactor coolant with highly elevated activity levels could require several hours to complete. Nonetheless, a sample-related threshold is included as a backup to other indications

There is no Potential Loss threshold associated with RCS Activity / Containment Radiation.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. S&L calculation BB-ER-02, Rev 0
3. Core Damage Assessment Methodology (CDAM)

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FC5

Initiating Condition:

Emergency Director Judgment.

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

1. Any condition in the opinion of the Emergency Director that indicates Loss of the Fuel Clad Barrier.

POTENTIAL LOSS

2. Any condition in the opinion of the Emergency Director that indicates Potential Loss of the Fuel Clad Barrier.

Basis:

Loss Threshold #1 Basis

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Fuel Clad Barrier is lost.

Potential Loss Threshold #2 Basis

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Fuel Clad Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RC1

Initiating Condition:

RCS or SG Tube Leakage

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

1. Automatic or manual SI actuation is required by **EITHER** of the following:
   a. UNISOLABLE RCS leakage
   OR
   b. Steam Generator tube RUPTURE.

POTENTIAL LOSS

2. The capacity of one charging pump in the normal charging mode is exceeded due to **EITHER** of the following:
   a. UNISOLABLE RCS leakage
   OR
   b. Steam Generator tube leakage.

   OR

3. **RCS Integrity CSF- Red Path** conditions exist.

Basis:

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

RUPTURE(D): The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection.

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

Failure to isolate the leak, within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

Loss Threshold #1 Basis

This threshold is based on an UNISOLABLE RCS leak of sufficient size to require an automatic or manual actuation of the Emergency Core Cooling System (ECCS). This condition clearly represents a loss of the RCS Barrier.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RC1 (cont)

Basis (cont):

interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.A steam generator with primary-to-secondary leakage of sufficient magnitude to require a safety injection is considered to be RUPTURED. If a RUPTURED steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier CT1 Loss threshold will also be met.

Potential Loss Threshold #2 Basis

This threshold is based on an UNISOLABLE RCS leak that results in the inability to maintain pressurizer level within specified limits by operation of a normally used charging (makeup) pump, but an ECCS (SI) actuation has not occurred. The threshold is met when an operating procedure, or operating crew supervision, directs that a standby charging (makeup) pump be placed in service to restore and maintain pressurizer level.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

If a leaking steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier CT1 Loss Threshold will also be met.

Potential Loss Threshold #3 Basis

This condition indicates an extreme challenge to the integrity of the RCS pressure boundary due to pressurized thermal shock – a transient that causes rapid RCS cooldown while the RCS is in Mode 3 or higher (i.e., hot and pressurized).

RCS Integrity - RED indicates an extreme challenge to the safety function derived from appropriate instrument readings.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. 1/2BwST-4 Integrity
3. 1/2BwEP-3 Steam Generator Tube Rupture

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RC2

Initiating Condition:

Inadequate Heat Removal

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

POTENTIAL LOSS

Heat Sink CSF- Red Path conditions exist.

Basis:

There is no Loss threshold associated with Inadequate Heat Removal.

Potential Loss Threshold Basis

Heat Sink - RED when heat sink is required indicates the ultimate heat sink function is under extreme challenge.

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the RCS Barrier. The Heat Sink Critical Safety Function Red path condition exists if narrow range levels in all steam generators (S/Gs) are less than or equal to 10% - Unit 1 (31% adverse containment) and 14% - Unit 2 (34% adverse containment) and total feedwater flow to all S/Gs is less than or equal to 500 gpm. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators by redµCing total feed flow to less than 500 gpm; during these conditions, classification using this threshold is not warranted.

Meeting this threshold results in a Site Area Emergency because this threshold is identical to Fuel Clad Barrier FC2 Potential Loss threshold # 3; both will be met. This condition warrants a Site Area Emergency declaration because inadequate RCS heat removal may result in fuel heat-up sufficient to damage the cladding and rise RCS pressure to the point where mass will be lost from the system.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. 1/2BwST-3 Heat Sink

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RC3

Initiating Condition:

Containment Radiation / RCS Activity

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

Containment radiation monitor (AR020(21)) reading **> 25 R/hr**.

Basis:

Loss Threshold Basis

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals Technical Specification allowable limits. This value is lower than that specified for Fuel Clad Barrier FC3 Loss Threshold #1 since it indicates a loss of the RCS Barrier only.

There is no Potential Loss threshold associated with RCS Activity / Containment Radiation.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. Core Damage Assessment Methodology (CDAM)

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RC5

Initiating Condition:

Emergency Director Judgment.

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

1. Any condition in the opinion of the Emergency Director that indicates Loss of the RCS Barrier.

POTENTIAL LOSS

2. Any condition in the opinion of the Emergency Director that indicates Potential Loss of the RCS Barrier.

Basis:

Loss Threshold #1 Basis

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is lost.

Potential Loss Threshold #2 Basis

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT1

Initiating Condition:

RCS or SG Tube Leakage

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

A leaking or RUPTURED SG is FAULTED outside of containment.

Basis:

RUPTURE(D): The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection.

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

Loss Threshold Basis

This threshold addresses a leaking or RUPTURED Steam Generator (SG) that is also FAULTED outside of containment. The condition of the SG, whether leaking or RUPTURED, is determined in accordance with the thresholds for RCS Barrier RC1 Potential Loss Threshold 2.b and Loss Threshold 1.b, respectively. This condition represents a bypass of the containment barrier.

FAULTED is a defined term within the NEI 99-01 methodology; this determination is not necessarily dependent upon entry into, or diagnostic steps within, an EOP. For example, if the pressure in a steam generator is decreasing uncontrollably [*part of the FAULTED definition*] and the faulted steam generator isolation procedure is not entered because EOP user rules are dictating implementation of another procedure to address a higher priority condition, the steam generator is still considered FAULTED for emergency classification purposes.

The FAULTED criterion establishes an appropriate lower bound on the size of a steam release that may require an emergency classification. Steam releases of this size are readily observable with normal Control Room indications. The lower bound for this aspect of the containment barrier is analogous to the lower bound criteria specified in IC RU3 for the fuel clad barrier (i.e., RCS activity values) and IC MU6 for the RCS barrier (i.e., RCS leak rate values).

This threshold also applies to prolonged steam releases necessitated by operational considerations such as the forced steaming of a leaking or RUPTURED steam generator directly to atmosphere to cooldown the plant, or to drive an auxiliary (emergency) feed water pump. These types of conditions will result in a significant and

Basis (cont):

sustained release of radioactive steam to the environment (and are thus similar to a FAULTED condition). The inability to isolate the steam flow without an adverse effect on plant cooldown meets the intent of a loss of containment.

Steam releases associated with the expected operation of a SG power operated relief valve or safety relief valve do not meet the intent of this threshold. Such releases may occur intermittently for a short period of time following a reactor trip as operators process through emergency operating procedures to bring the plant to a stable condition and prepare to initiate a plant cooldown. Steam releases associated with the unexpected operation of a valve (e.g., a stuck-open safety valve) do meet this threshold.

Following an SG tube leak or rupture, there may be minor radiological releases through a secondary-side system component (e.g., air ejectors, glad seal exhausters, valve packing, etc.). These types of releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category R ICs.

The emergency classification levels resulting from primary-to-secondary leakage, with or without a steam release from the FAULTED SG, are summarized below.

	Affected SG is FAULTED Outside of Containment?	
Primary-to-Secondary Leak Rate	**Yes**	**No**
Less than or equal to 25 gpm	No classification	No classification
Greater than 25 gpm	Unusual Event per MU6	Unusual Event per MU6
The capacity of one charging pump in the normal charging mode is exceeded (*RCS Barrier Potential Loss*)	Site Area Emergency per FS1	Alert per FA1
Requires an automatic or manual SI actuation (*RCS Barrier Loss*)	Site Area Emergency per FS1	Alert per FA1

There is no Potential Loss threshold associated with RCS or SG Tube Leakage.

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT1 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. 1/2BwEP-3 Steam Generator Tube Rupture
3. 1/2BwEP-0 Reactor Trip or Safety Injection Unit 1/2

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT2

Initiating Condition:

Inadequate Heat Removal

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

POTENTIAL LOSS

Core-Cooling CSF- Red Path conditions exist **AND** Functional Restoration procedures **not** effective in **< 15 minutes**.

Basis:

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

There is no Loss threshold associated with Inadequate Heat Removal.

Potential Loss Threshold Basis

This condition represents an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. For this condition to occur, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. If implementation of a procedure(s) to restore adequate core cooling is not effective (successful) within 15 minutes, it is assumed that the event trajectory will likely lead to core melting and a subsequent challenge of the Containment Barrier.

The restoration procedure is considered "effective" if core exit thermocouple readings are decreasing and/or if reactor vessel level is increasing. Whether or not the procedure(s) will be effective should be apparent within 15 minutes. The Emergency Director should escalate the emergency classification level as soon as it is determined that the procedure(s) will not be effective.

Severe accident analyses (e.g., NUREG-1150) have concluded that function restoration procedures can arrest core degradation in a significant fraction of core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide 15 minutes beyond the required entry point to determine if procedural actions can reverse the core melt sequence.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. 1/2BwFR-C.1 Response to Inadequate Core Cooling
3. 1/2BwST-2 Core Cooling

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT3

Initiating Condition:

Containment Radiation / RCS Activity

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

POTENTIAL LOSS

Containment radiation monitor (AR020(21)) reading **> 4.40E+03 R/hr**.

Basis:

There is no Loss threshold associated with RCS Activity / Containment Radiation.

Potential Loss Threshold Basis

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that 20% of the fuel cladding has failed. This level of fuel clad failure is well above that used to determine the analogous Fuel Clad Barrier Loss and RCS Barrier Loss thresholds.

NUREG-1228, *Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents*, indicates the fuel clad failure must be greater than approximately 20% in order for there to be a major release of radioactivity requiring offsite protective actions. For this condition to exist, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. It is therefore prudent to treat this condition as a potential loss of containment which would then escalate the emergency classification level to a General Emergency.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. Core Damage Assessment Methodology (CDAM)

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT4

Initiating Condition:

Containment Integrity or Bypass

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

1. Containment isolation is required and **EITHER** of the following:

   a. UNPLANNED lowering in containment pressure or rise in radiation monitor readings outside of containment in the Emergency Directors judgment indicate a loss of containment integrity.

   OR

   b. UNISOLABLE pathway from containment to the environment exists**.**

   OR

2. Indication of RCS leakage outside of containment

POTENTIAL LOSS

3. **Containment CSF Red Path** conditions exist.

   OR

4. Hydrogen Concentration in Containment $\underline{>}$ **5%.**

   OR

5. a. Containment pressure $\underline{>}$ **20 psig**

   AND

   b. Less than one full train of Containment Spray is operating per design for $\underline{>}$ **15 minutes.**

Basis:

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

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

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

Failure to isolate the leak, within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

Basis (cont):

Loss Threshold #1 Basis

These thresholds address a situation where containment isolation is required and one of two conditions exists as discussed below. Users are reminded that there may be accident and release conditions that simultaneously meet both loss thresholds 1.a and 1.b.

1.a – Containment integrity has been lost, i.e., the actual containment atmospheric leak rate likely exceeds that associated with allowable leakage (or sometimes referred to as design leakage). Following the release of RCS mass into containment, containment pressure will fluctuate based on a variety of factors; a loss of containment integrity condition may (or may not) be accompanied by a noticeable drop in containment pressure. Recognizing the inherent difficulties in determining a containment leak rate during accident conditions, it is expected that the Emergency Director will assess this threshold using judgment, and with due consideration given to current plant conditions, and available operational and radiological data (e.g., containment pressure, readings on radiation monitors outside containment, operating status of containment pressure control equipment, etc.).

Refer to the middle piping run of Figure 3-F-1. Two simplified examples are provided. One is leakage from a penetration and the other is leakage from an in-service system valve. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure.

Another example would be a loss or potential loss of the RCS barrier, and the simultaneous occurrence of two FAULTED locations on a steam generator where one fault is located inside containment (e.g., on a steam or feedwater line) and the other outside of containment. In this case, the associated steam line provides a pathway for the containment atmosphere to escape to an area outside the containment.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable (design) containment leakage through various penetrations or system components. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category R ICs.

1.b - Conditions are such that there is an UNISOLABLE pathway for the migration of radioactive material from the containment atmosphere to the environment. As used here, the term “environment” includes the atmosphere of a room or area, outside the containment, that may, in turn, communicate with the outside-the-plant atmosphere (e.g., through discharge of a ventilation system or atmospheric leakage). Depending upon a variety of factors, this condition may or may not be accompanied by a noticeable drop in containment pressure.

CT4 (cont)

Basis (cont):

Refer to the top piping run of Figure 3-F-1. In this simplified example, the inboard and outboard isolation valves remained open after a containment isolation was required (i.e., containment isolation was not successful). There is now an UNISOLABLE pathway from the containment to the environment.

The existence of a filter is not considered in the threshold assessment. Filters do not remove fission product noble gases. In addition, a filter could become ineffective due to iodine and/or particulate loading beyond design limits (i.e., retention ability has been exceeded) or water saturation from steam/high humidity in the release stream.

Leakage between two interfacing liquid systems, by itself, does not meet this threshold. Refer to the bottom piping run of Figure 3-F-1. In this simplified example, leakage in an RCP seal cooler is allowing radioactive material to enter the Auxiliary Building. The radioactivity would be detected by the Process Monitor. If there is no leakage from the closed water cooling system to the Auxiliary Building, then no threshold has been met. If the pump or system piping developed a leak that allowed steam/water to enter the Auxiliary Building, then loss threshold 2 would be met. Depending upon radiation monitor locations and sensitivities, this leakage could be detected by any of the four monitors depicted in the figure and cause threshold 1.a to be met as well.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable (design) containment leakage through various penetrations or system components. Minor releases may also occur if a containment isolation valve(s) fails to close but the containment atmosphere escapes to a closed system. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category R ICs.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Containment Barrier CT1Loss Threshold.

Loss Threshold #2 Basis

Containment sump, temperature, pressure and/or radiation levels will rise if reactor coolant mass is leaking into the containment. If these parameters have not increased, then the reactor coolant mass may be leaking outside of containment (i.e., a containment bypass sequence). Rises in sump, temperature, pressure, flow and/or radiation level readings outside of the containment may indicate that the RCS mass is being lost outside of containment.

Unexpected elevated readings and alarms on radiation monitors with detectors outside containment should be corroborated with other available indications to confirm that the source is a loss of RCS mass outside of containment. If the fuel clad barrier has not been lost, radiation monitor readings outside of containment may not rise significantly; however, other unexpected changes in sump levels, area temperatures or pressures,

Basis (cont):

flow rates, etc. should be sufficient to determine if RCS mass is being lost outside of the containment.

Refer to the middle piping run of Figure 3-F-1. In this simplified example, a leak has occurred at a reducer on a pipe carrying reactor coolant in the Auxiliary Building. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure and cause loss threshold 1.a to be met as well.

To ensure proper escalation of the emergency classification, the RCS leakage outside of containment must be related to the mass loss that is causing the RCS Barrier RC1 Loss Threshold 1.a and/or Potential Loss threshold 2.a to be met.

Potential Loss Threshold #3 Basis

Containment CSF RED path indicates an extreme challenge to the safety function derived from appropriate instrument readings and/or sampling results, and thus represents a potential loss of containment.

If containment pressure exceeds the design pressure, there exists a potential to lose the Containment Barrier. To reach this level, there must be an inadequate core cooling condition for an extended period of time; therefore, the RCS and Fuel Clad barriers would already be lost. Thus, this threshold is a discriminator between a Site Area Emergency and General Emergency since there is now a potential to lose the third barrier.

Potential Loss Threshold #4 Basis

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

Potential Loss Threshold #5 Basis

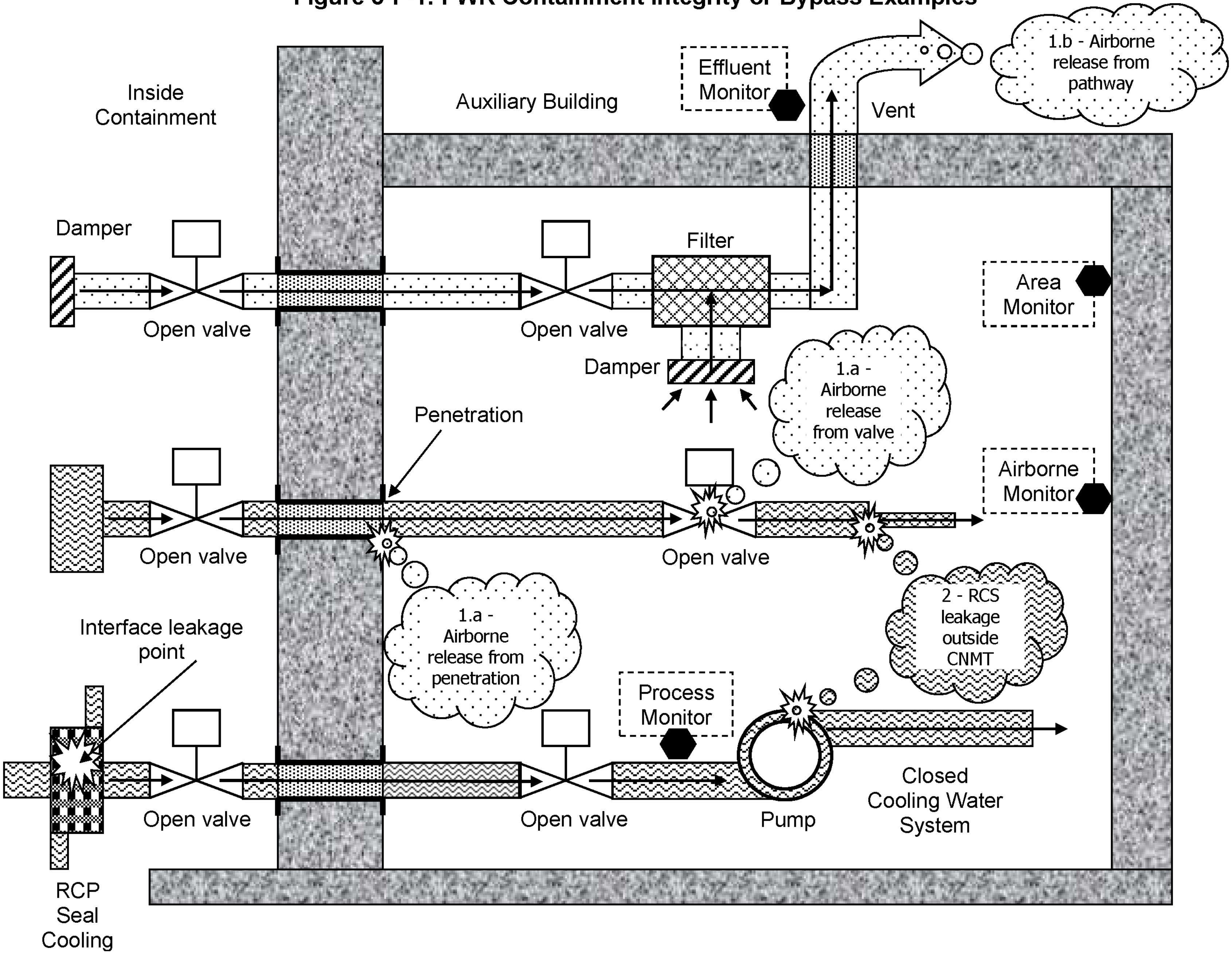
This threshold describes a condition where containment pressure is greater than the set point at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. This threshold represents a potential loss of containment in that containment heat removal/depressurization systems (e.g., containment sprays, ice condenser fans, etc., but not including containment venting strategies) are either lost or performing in a degraded manner.

CT4 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3
2. UFSAR Section 15.6.5.2.1
3. NES-G-14.02, Calculation No. BYR99-010 / BRW-99-0017-I
4. Technical Specifications B 3.6.6, Containment Spray and Cooling Systems
5. 1/2BwST-5 Containment
6. 1/2BwFR-Z.1 Response to High Containment Pressure

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION
Figure 3-F-1: PWR Containment Integrity or Bypass Examples



RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT5

Initiating Condition:

Emergency Director Judgment.

Operating Mode Applicability:

1, 2, 3, 4

Fission Product Barrier (FPB) Threshold:

LOSS

1. Any condition in the opinion of the Emergency Director that indicates Loss of the Containment Barrier.

POTENTIAL LOSS

2. Any condition in the opinion of the Emergency Director that indicates Potential Loss of the Containment Barrier.

Basis:

Loss Threshold #1 Basis

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is lost.

Potential Loss Threshold #2 Basis

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Basis Reference(s):

1. NEI 99-01 Rev 6, Table 9-F-3

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MG1

Initiating Condition:

Prolonged loss of all offsite and all onsite AC power to emergency buses.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. Loss of **ALL** offsite AC power to unit ESF buses.

   AND

2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses.

   AND

3. **EITHER** of the following:

   a. Restoration of at least one unit ESF bus in **< 4 hours** is <u>**not**</u> likely.

   OR

   b. **Core Cooling CSF – Red Path** conditions exist.

Basis:

<u>SAFETY SYSTEM</u>: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses a prolonged loss of all power sources to AC emergency buses. A loss of all AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. A prolonged loss of these buses will lead to a loss of any fission product barriers. In addition, fission product barrier monitoring capabilities may be degraded under these conditions.

The EAL should require declaration of a General Emergency prior to meeting the thresholds for IC FG1. This will allow additional time for implementation of offsite protective actions.

Escalation of the emergency classification from Site Area Emergency will occur if it is projected that power cannot be restored to at least one AC emergency bus by the end of the analyzed station blackout coping period. Beyond this time, plant responses and

Basis (cont):

event trajectory are subject to greater uncertainty, and there is an increased likelihood of challenges to multiple fission product barriers.

The estimate for restoring at least one emergency bus should be based on a realistic appraisal of the situation. Mitigation actions with a low probability of success should not be used as a basis for delaying a classification upgrade. The goal is to maximize the time available to prepare for, and implement, protective actions for the public.

The emergency buses of the affected unit can be powered from the unaffected unit through the crosstie breakers. Unit crosstie is considered an adequate source of offsite power when evaluating this EAL.

The EAL will also require a General Emergency declaration if the loss of AC power results in parameters that indicate an inability to adequately remove decay heat from the core.

Basis Reference(s):

1. NEI 99-01 Rev 6, SG1
2. 20E-0-4001 Station One Line Diagram
3. UFSAR 8.3.1
4. 1/2BwOA ELEC-3 Loss Of 4KV ESF Bus
5. 1/2BwOA ELEC-4 Loss Of Offsite Power Unit 1/2
6. 1/2BwCA-0.0 Loss Of All AC Power Unit 1/2
7. 1/2BwCA-0.1 Loss Of All AC Power Recovery Without SI Required Unit 1/2
8. 1/2BwCA-0.2 Loss Of All AC Power Recovery With SI Required Unit 1/2
9. 1/2BwCA-0.3 Response To Opposite Unit Loss Of All AC Power
10. BwOP AP-37 Unit Two SAT Crosstie To Unit One ESF Bus
11. BwOP AP-38, Unit One SAT Crosstie To Unit Two ESF Bus
12. Safety Evaluations of the Byron Station and Braidwood Station Responses to the Station Blackout (SBO) Rule (TAC NOS. 68522, 68523 AND 68515, 68516)
13. 1/2BwST-2 Core Cooling
14. 1/2BwFR-C.1 Response to Inadequate Core Cooling
15. 1/2BwFR-C.2 Response to Degraded Core Cooling

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MS1

Initiating Condition:

Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. Loss of **ALL** offsite AC Power to unit ESF buses.

   AND

2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses.

   AND

3. Failure to restore power to at least one unit ESF bus in **< 15 minutes** from the time of loss of both offsite and onsite AC power

Basis:

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. In addition, fission product barrier monitoring capabilities may be degraded under these conditions. This IC represents a condition that involves actual or likely major failures of plant functions needed for the protection of the public.

The emergency buses of the affected unit can be powered from the unaffected unit through the crosstie breakers. Unit crosstie is considered an adequate source of offsite power when evaluating this EAL.

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

Escalation of the emergency classification level would be via ICs RG1, FG1 or MG1.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MS1 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, SS1
2. 20E-0-4001 Station One Line Diagram
3. UFSAR 8.3.1
4. 1/2BwOA ELEC-3 Loss Of 4KV ESF Bus
5. 1/2BwOA ELEC-4 Loss Of Offsite Power Unit 1/2
6. 1/2BwCA-0.0 Loss Of All AC Power Unit 1/2
7. 1/2BwCA-0.1 Loss Of All AC Power Recovery Without SI Required Unit 1/2
8. 1/2BwCA-0.2 Loss Of All AC Power Recovery With SI Required Unit 1/2
9. 1/2BwCA-0.3 Response To Opposite Unit Loss Of All AC Power
10. BwOP AP-37 Unit Two SAT Crosstie To Unit One ESF Bus
11. BwOP AP-38, Unit One SAT Crosstie To Unit Two ESF Bus
12. Safety Evaluations of the Byron Station and Braidwood Station Responses to the Station Blackout (SBO) Rule (TAC NOS. 68522, 68523 AND 68515, 68516)

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MA1

Initiating Condition:

Loss of all but one AC power source to emergency buses for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. AC power capability to unit ESF buses reduced to only one of the following power sources for **≥ 15 minutes.**
    - Affected unit SAT 142-1(242-1)
    - Affected unit SAT 142-2(242-2)
    - Emergency Diesel Generator DG 1A(2A)
    - Emergency Diesel Generator DG 1B(2B)
    - Unit crosstie breakers

   AND

2. Any additional single power source failure will result in a loss of **ALL** AC power to SAFETY SYSTEMS.

Basis:

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source may be powering one, or more than one, train of safety-related equipment. This IC provides an escalation path from IC MU1.

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

- A loss of all offsite power with a concurrent failure of all but one emergency power source (e.g., an onsite diesel generator).

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MA1 (cont)

Basis (cont):

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

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

Escalation of the emergency classification level would be via IC MS1.

Basis Reference(s):

1. NEI 99-01 Rev 6, SA1
2. 20E-0-4001 Station One Line Diagram
3. UFSAR 8.3.1
4. 1/2BwOA ELEC-3 Loss Of 4KV ESF Bus
5. 1/2BwOA ELEC-4 Loss Of Offsite Power Unit 1/2
6. 1/2BwCA-0.0 Loss Of All AC Power Unit 1/2
7. 1/2BwCA-0.1 Loss Of All AC Power Recovery Without SI Required Unit 1/2
8. 1/2BwCA-0.2 Loss Of All AC Power Recovery With SI Required Unit 1/2
9. 1/2BwCA-0.3 Response To Opposite Unit Loss Of All AC Power
10. BwOP AP-37 Unit Two SAT Crosstie To Unit One ESF Bus
11. BwOP AP-38, Unit One SAT Crosstie To Unit Two ESF Bus
12. Safety Evaluations of the Byron Station and Braidwood Station Responses to the Station Blackout (SBO) Rule (TAC NOS. 68522, 68523 AND 68515, 68516)

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU1

Initiating Condition:

Loss of all offsite AC power capability to emergency buses for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Loss of **ALL** offsite AC power capability to unit ESF buses for $\geq$ 15 minutes.

Basis:

This IC addresses a prolonged loss of offsite power. The loss of offsite power sources renders the plant more vulnerable to a complete loss of power to AC emergency buses. This condition represents a potential reduction in the level of safety of the plant.

For emergency classification purposes, “capability” means that an offsite AC power source(s) is available to the emergency buses, whether or not the buses are powered from it. (e.g. unit cross-tie breakers)

The emergency buses of the affected unit can be powered from the unaffected unit through the crosstie breakers. Unit crosstie is considered an adequate source of offsite power when evaluating this EAL.

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

Escalation of the emergency classification level would be via IC MA1.

Basis Reference(s):

1. NEI 99-01 Rev 6, SU1
2. 20E-0-4001 Station One Line Diagram
3. UFSAR 8.3.1
4. 1/2BwOA ELEC-3 Loss Of 4KV ESF Bus
5. 1/2BwOA ELEC-4 Loss Of Offsite Power Unit 1/2
6. 1/2BwCA-0.0 Loss Of All AC Power Unit 1/2
7. 1/2BwCA-0.1 Loss Of All AC Power Recovery Without SI Required Unit 1/2
8. 1/2BwCA-0.2 Loss Of All AC Power Recovery With SI Required Unit 1/2
9. 1/2BwCA-0.3 Response To Opposite Unit Loss Of All AC Power
10. BwOP AP-37 Unit Two SAT Crosstie To Unit One ESF Bus
11. BwOP AP-38, Unit One SAT Crosstie To Unit Two ESF Bus

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MG2

Initiating Condition:

Loss of all AC and Vital DC power sources for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. Loss of **ALL** offsite AC power to unit ESF buses.

   AND

2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses.

   AND

3. Voltage is **< 108 VDC** on unit 125 VDC battery buses 111(211) and 112(212)

   AND

4. **ALL** AC and Vital DC power sources have been lost for **≥ 15 minutes.**

Basis:

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses a concurrent and prolonged loss of both AC and Vital DC power. A loss of all AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. A loss of Vital DC power compromises the ability to monitor and control SAFETY SYSTEMS. A sustained loss of both AC and DC power will lead to multiple challenges to fission product barriers.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. The 15-minute emergency declaration clock begins at the point when all EAL conditions are met.

Basis Reference(s):

1. NEI 99-01 Rev 6, SG8
2. UFSAR 8.3.2.1.1
3. 20E-0-4001 Station One Line Diagram
4. BwAR 1/2-21-E10, 125V DC PNL 111/113(211/213) VOLT LOW
5. 1/2BwOA ELEC 1 Loss of DC Bus UNIT 1/2
6. BwAR 1/2-22-E10, 125V DC PNL 112/114 (212/214) VOLT LOW
7. UFSAR 8.3.1
8. 1/2BwOA ELEC-3 Loss Of 4KV ESF Bus
9. 1/2BwOA ELEC-4 Loss Of Offsite Power Unit 1/2
10. 1/2BwCA-0.0 Loss Of All AC Power Unit 1/2
11. 1/2BwCA-0.1 Loss Of All AC Power Recovery Without SI Required Unit 1/2
12. 1/2BwCA-0.2 Loss Of All AC Power Recovery With SI Required Unit 1/2
13. 1/2BwCA-0.3 Response To Opposite Unit Loss Of All AC Power
14. BwOP AP-37 Unit Two SAT Crosstie To Unit One ESF Bus
15. BwOP AP-38, Unit One SAT Crosstie To Unit Two ESF Bus
16. Safety Evaluations of the Byron Station and Braidwood Station Responses to the Station Blackout (SBO) Rule (TAC NOS. 68522, 68523 AND 68515, 68516)
17. 1/2BwST-2 Core Cooling
18. 1/2BwFR-C.1 Response to Inadequate Core Cooling
19. 1/2BwFR-C.2 Response to Degraded Core Cooling

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MS2

Initiating Condition:

Loss of all vital DC power for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Voltage is **< 108 VDC** on unit 125 VDC battery buses 111(211) and 112(212) for **≥15 minutes**.

Basis:

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses a loss of Vital DC power which compromises the ability to monitor and control SAFETY SYSTEMS. In modes above Cold Shutdown, this condition involves a major failure of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via ICs RG1, FG1 or MG3.

Basis Reference(s):

1. NEI 99-01 Rev 6, SS8
2. UFSAR 8.3.2.1.1
3. 20E-0-4001 Station One Line Diagram
4. BwAR 1/2-21-E10, 125V DC PNL 111/113(211/213) VOLT LOW
5. 1/2BwOA ELEC 1 Loss of DC Bus UNIT 1/2
6. BwAR 1/2-22-E10, 125V DC PNL 112/114 (212/214) VOLT LOW

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MS3

Initiating Condition:

Inability to shutdown the reactor causing a challenge to core cooling or RCS heat removal.

Operating Mode Applicability:

1, 2

Emergency Action Level (EAL):

1. Automatic or Manual Trip did **not** shutdown the reactor as indicated by Reactor Power **≥ 5%**.

   AND

2. **ALL** manual actions to shutdown the reactor have been unsuccessful as indicated by Reactor Power **≥ 5%**.

   AND

3. **EITHER** of the following conditions exist:

   a. **Core Cooling CSF-RED Path** conditions exist.

   OR

   b. **Heat Sink CSF-RED Path** conditions exist.

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, all subsequent operator manual actions, both inside and outside the Control Room including driving in control rods and boron injection, are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS. This condition will lead to fuel damage if additional mitigation actions are unsuccessful and thus warrants the declaration of a Site Area Emergency.

If Core Cooling CSF Red Path or Heat Sink CSF Red Path conditions exist prior to a successful reactor shutdown (i.e. < 5% reactor power) then entry is required.

The Heat Sink Critical Safety Function Red path condition exists if narrow range levels in all steam generators (S/Gs) are less than or equal to 10% - Unit 1 (31% adverse containment) and 14% - Unit 2 (34% adverse containment) and total feedwater flow to all S/Gs is less than or equal to 500 gpm. If total feed flow is less than 500 gpm due to procedurally directed operator actions then this condition does not apply.

In some instances, the emergency classification resulting from this IC/EAL may be higher than that resulting from an assessment of the plant responses and symptoms against the Recognition Category F ICs/EALs. This is appropriate in that the Recognition Category F ICs/EALs do not address the additional threat posed by a failure to shutdown the reactor. The inclusion of this IC and EAL ensures the timely

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MS3 (cont)

Basis (cont):

declaration of a Site Area Emergency in response to prolonged failure to shutdown the reactor.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Escalation of the emergency classification level would be via IC RG1 or FG1.

Basis Reference(s):

1. NEI 99-01 Rev 6, SS5
2. 1/2BwST-1 Subcriticality
3. 1/2BwST-2 Core Cooling
4. 1/2BwST-3 Heat Sink
5. 1/2BwFR-S.1 Response to Nuclear Power Generation/ATWS
6. 1/2BwFR-H.1 Response to Loss of Secondary Heat Sink
7. 1/2BwFR C.1 Response to Inadequate Core Cooling
8. 1/2BwOSR 0.1-1,2,3 Unit One(Two) Modes 1, 2, And 3 Shiftly and Daily Operating Surveillance

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MA3

Initiating Condition:

Automatic or manual trip fails to shutdown the reactor, and subsequent manual actions taken at the reactor control consoles are not successful in shutting down the reactor.

Operating Mode Applicability:

1, 2

Emergency Action Level (EAL):

Note:

- A manual action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies.

1. Automatic or manual Trip did **not** shutdown the reactor as indicated by Reactor Power **≥ 5%**.

   AND

2. Manual actions taken at the Main Control Board are **not** successful in shutting down the reactor as indicated by Reactor Power **≥ 5%**.

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and subsequent operator manual actions taken at the reactor control consoles to shutdown the reactor are also unsuccessful. This condition represents an actual or potential substantial degradation of the level of safety of the plant. An emergency declaration is required even if the reactor is subsequently shutdown by an action taken away from the reactor control consoles since this event entails a significant failure of the RPS.

A manual action at the Main Control Board is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip. This action does not include manually driving in control rods or implementation of boron injection strategies. If this action(s) is unsuccessful, operators would immediately pursue additional manual actions at locations away from the reactor control consoles (e.g., locally opening breakers). Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be “at the Main Control Board”.

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If the failure to shutdown the reactor is prolonged enough to cause a challenge to the core cooling or RCS heat removal safety functions, the emergency

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MA3 (cont)

Basis (cont):

classification level will escalate to a Site Area Emergency via IC MS3. Depending upon plant responses and symptoms, escalation is also possible via IC FS1. Absent the plant conditions needed to meet either IC MS3 or FS1, an Alert declaration is appropriate for this event.

It is recognized that plant responses or symptoms may also require an Alert declaration in accordance with the Recognition Category F ICs; however, this IC and EAL are included to ensure a timely emergency declaration.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Basis Reference(s):

1. NEI 99-01 Rev 6, SA5
2. 1/2BwST-1 Subcriticality
3. 1/2BwFR-S.1 Response to Nuclear Power Generation/ATWS
4. 1/2BwOSR 0.1-1,2,3 Unit One(Two) Modes 1, 2, And 3 Shiftly and Daily Operating Surveillance

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU3

Initiating Condition:

Automatic or manual trip fails to shutdown the reactor.

Operating Mode Applicability:

1, 2

Emergency Action Level (EAL):

Note:

- A manual action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies.

1. a. Automatic Trip did not shutdown the reactor as indicated by Reactor Power **≥ 5%**.

   AND

   b. Subsequent manual action taken at the Main Control Board is successful in shutting down the reactor as indicated by Reactor Power **< 5%**.

OR

2. a. Manual Trip did not shutdown the reactor as indicated by Reactor Power **≥ 5%**.

   AND

   b. **EITHER** of the following:

      1. Subsequent manual action taken at the Main Control Board is successful in shutting down the reactor as indicated by Reactor Power **< 5%**.

         OR

      2. Subsequent Automatic Trip is successful in shutting down the reactor as indicated by Reactor Power **< 5%**.

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic trip is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

EAL #1 Basis

Following the failure on an automatic reactor trip, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU3 (cont)

Basis (cont):

EAL #2 Basis

If an initial manual reactor trip is unsuccessful, operators will promptly take manual action at another location(s) on the Main Control Board to shutdown the reactor (e.g., initiate a manual reactor trip using a different switch). Depending upon several factors, the initial or subsequent effort to manually trip the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor trip signal. If a subsequent manual or automatic trip is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the Main Control Board is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the Main Control Board".

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the Main Control Board are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC MA3. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC MA3 or FA1, an Unusual Event declaration is appropriate for this event.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Should a reactor trip signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal generated as a result of plant work causes a plant transient that creates a real condition that should have included an automatic reactor trip and the RPS fails to automatically shutdown the reactor, then this IC and the EALs are applicable, and should be evaluated.
- If the signal generated as a result of plant work does not cause a plant transient but should have generated an RPS trip signal and the trip failure is determined through other means (e.g., assessment of test results), then this IC and the EALs are not applicable and no classification is warranted.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU3 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, SU5
2. 1/2BwST-1 Subcriticality
3. 1/2BwFR-S.1 Response to Nuclear Power Generation/ATWS
4. 1/2BwOSR 0.1-1,2,3 Unit One(Two) Modes 1, 2, And 3 Shiftly and Daily Operating Surveillance

MA4

Initiating Condition:

UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. UNPLANNED event results in the inability to monitor **ANY** Table M1 parameters from within the Control Room for **≥15 minutes**.

Table M1 – Control Room Parameters
• Reactor Power • PZR Level • RCS Pressure • In Core/Core Exit Temperature • Narrow Range level in at least one Steam Generator • Steam Generator Auxiliary Feed Water Flow

AND

2. **ANY** Table M2 transient in progress.

Table M2 – Significant Transients
• Automatic Turbine Runback **>25%** thermal reactor power • Electrical Load Rejection **>25%** full electrical load • Reactor Trip • Safety Injection Actuation

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MA4 (cont)

Basis:

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

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses the difficulty associated with monitoring rapidly changing plant conditions during a transient without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. During this condition, the margin to a potential fission product barrier challenge is reduced. It thus represents a potential substantial degradation in the level of safety of the plant.

As used in this EAL, an “inability to monitor” means that values for any of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, computer point, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine any of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for any of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via ICs FS1 or IC RS1.

Basis Reference(s):

1. NEI 99-01 Rev 6, SA2

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU4

Initiating Condition:

UNPLANNED loss of Control Room indications for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

UNPLANNED event results in the inability to monitor **ANY** Table M1 parameters from within the Control Room for **≥ 15 minutes.**

Table M1 – Control Room Parameters
• Reactor Power • PZR Level • RCS Pressure • In Core/Core Exit Temperature • Narrow Range level in at least one Steam Generator • Steam generator Auxiliary Feed Water Flow

Basis:

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

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses the difficulty associated with monitoring normal plant conditions without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. This condition is a precursor to a more significant event and represents a potential degradation in the level of safety of the plant.

As used in this EAL, an "inability to monitor" means that values for any of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU4 (cont)

Basis (cont):

example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room. An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine any of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for any of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via IC MA4.

Basis Reference(s):

1. NEI 99-01 Rev 6, SU2

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MA5

Initiating Condition:

Hazardous event affecting a SAFETY SYSTEM required for the current operating mode.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- If it is determined that the conditions of MA5 are not met then assess the event via HU3, HU4, or HU6.

1. The occurrence of **ANY** of the following hazardous events:
   - Seismic event (earthquake)
   - Internal or external flooding event
   - High winds or tornado strike
   - FIRE
   - EXPLOSION
   - Other events with similar hazard characteristics as determined by the Shift Manager

   AND

2. **EITHER** of the following:
   a. Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM required by Technical Specifications for the current operating mode.

      OR

   b. The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure required by Technical Specifications for the current operating mode.

Basis:

FIRE: Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute FIRES. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

EXPLOSION: A rapid, violent and catastrophic failure of a piece of equipment due to combustion, chemical reaction or overpressurization. A release of steam (from high energy lines or components) or an electrical component failure (caused by short circuits, grounding, arcing, etc.) should not automatically be considered an explosion. Such

Basis (cont):

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

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

VISIBLE DAMAGE: Damage to a component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

This IC addresses a hazardous event that causes damage to a SAFETY SYSTEM, or a structure containing SAFETY SYSTEM components, required for the current operating mode, "required", i.e. required to be operable by Technical Specifications for the current operating mode. This condition significantly reduces the margin to a loss or potential loss of a fission product barrier, and therefore represents an actual or potential substantial degradation of the level of safety of the plant. Manual or automatic electrical isolation of safety equipment due to flooding, in and of itself, does not constitute degraded performance and is classified under HU6.

EAL #2.a addresses damage to a SAFETY SYSTEM train that is required to be operable by Technical Specifications for the current operating mode, and is in operation since indications for it will be readily available. The indications of degraded performance should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

EAL #2.b addresses damage to a SAFETY SYSTEM component that is required to be operable by Technical Specifications for the current operating mode, and is not in operation or readily apparent through indications alone, as well as damage to a structure containing SAFETY SYSTEM components. Operators will make this determination based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage.

Escalation of the emergency classification level would be via IC FS1 or RS1.

If the EAL conditions of MA5 are not met then assess the event via HU3, HU4, or HU6.

Basis Reference(s):

1. NEI 99-01, Rev 6 SA9

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU6

Initiating Condition:

RCS leakage for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. RCS unidentified or pressure boundary leakage **> 10 gpm** for **≥ 15 minutes.**

   OR

2. RCS identified leakage **>25 gpm** for **≥ 15 minutes.**

   OR

3. Leakage from the RCS to a location outside containment **>25 gpm** for **≥ 15 minutes.**

Basis:

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

Failure to isolate the leak, within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

This IC addresses RCS leakage which may be a precursor to a more significant event. In this case, RCS leakage has been detected and operators, following applicable procedures, have been unable to promptly isolate the leak. This condition is considered to be a potential degradation of the level of safety of the plant.

EAL #1 and EAL #2 Basis

These EALs are focused on a loss of mass from the RCS due to “unidentified leakage", "pressure boundary leakage" or "identified leakage” (as these leakage types are defined in the plant Technical Specifications).

EAL #3 Basis

This EAL addresses a RCS mass loss caused by an UNISOLABLE leak through an interfacing system.

These EALs thus apply to leakage into the containment, a secondary-side system (e.g., steam generator tube leakage) or a location outside of containment.

The leak rate values for each EAL were selected because they are usually observable with normal Control Room indications. Lesser values typically require time-consuming

Basis (cont):

calculations to determine (e.g., a mass balance calculation). EAL #1 uses a lower value that reflects the greater significance of unidentified or pressure boundary leakage.

The release of mass from the RCS due to the as-designed/expected operation of a relief valve does not warrant an emergency classification. An emergency classification would be required if a mass loss is caused by a relief valve that is not functioning as designed/expected (e.g., a relief valve sticks open and the line flow cannot be isolated). The 15-minute threshold duration allows sufficient time for prompt operator actions to isolate the leakage, if possible.

Escalation of the emergency classification level would be via ICs of Recognition Category R or F.

Basis Reference(s):

1. NEI 99-01 Rev 6, SU4
2. Technical Specifications 3.4.13 & 3.4.14
3. UFSAR 6.2, 5.24
4. 1/2BwOSR 3.4.13.1 Unit One(Two) Reactor Coolant System Water Inventory Balance Surveillance
5. LCOAR - RCS Leakage Detection Instrumentation – Tech Spec LCO 3.4.15
6. LCOAR – RCS Operational Leakage – Tech Spec LCO 3.4.13
7. 1/2BwOA PRI-1 Excessive Primary Leakage Unit 1/2
8. 1/2BwOSR 0.1-4 Unit One(Two) Modes 4 Shiftly and Daily Operating Surveillance
9. 1/2BwOS RF-1 Unit One(Two) Containment Floor Drain Monitoring System Non-Routine Surveillance
10. 1/2BwOS XCB-R1 U0 and U1 MCR Meter Color Banding

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU7

Initiating Condition:

Loss of all On-site or Off-site communications capabilities.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

1. Loss of **ALL** Table M3 **Onsite** communications capability affecting the ability to perform routine operations.

   OR

2. Loss of **ALL** Table M3 **Offsite** communication capability affecting the ability to perform offsite notifications.

   OR

3. Loss of **ALL** Table M3 **NRC** communication capability affecting the ability to perform NRC notifications.

Table M3 – Communications Capability			
System	**Onsite**	**Offsite**	**NRC**
Radios	X		
Plant page	X		
Plant Telephone System	X		
Commercial Telephones	X	X	X
NARS		X	
ENS		X	X
HPN		X	X
Satellite phones		X	X

Basis:

This IC addresses a significant loss of on-site, offsite, or NRC communications capabilities. While not a direct challenge to plant or personnel safety, this event warrants prompt notifications to Offsite Response Organizations (OROs) and the NRC.

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

Basis (cont):

EAL #1 Basis

Addresses a total loss of the communications methods used in support of routine plant operations.

EAL #2 Basis

Addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are listed in procedure EP-MW-114-100-F-01, Nuclear Accident Reporting System (NARS) Form.

EAL #3 Basis

Addresses a total loss of the communications methods used to notify the NRC of an emergency declaration.

Basis Reference(s):

1. NEI 99-01 Rev 6, SU6
2. UFSAR 9.5.2
3. EP-MW-124-1001 Facilities Inventories And Equipment Tests

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU8

Initiating Condition:

Failure to isolate containment or loss of containment pressure control.

Operating Mode Applicability:

1, 2, 3, 4

Emergency Action Level (EAL):

1. a. Failure of containment to isolate when required by an actuation signal.

   AND

   b. **ANY** required penetration remains open **> 15 minutes** of the actuation signal.

OR

2. a. Containment pressure **$\geq$ 20 psig**.

   AND

   b. Less than one full train of Containment Spray is operating per design for **$\geq$ 15 minutes.**

Basis:

This IC addresses a failure of any containment penetrations to automatically isolate (close) when required by an actuation signal. It also addresses an event that results in high containment pressure with a concurrent failure of containment pressure control systems. Absent challenges to another fission product barrier, either condition represents potential degradation of the level of safety of the plant.

EAL #1 Basis

The containment isolation signal must be generated as the result on an off-normal/accident condition (e.g., a safety injection or high containment pressure); a failure resulting from testing or maintenance does not warrant classification. The determination of containment and penetration status – isolated or not isolated – should be made in accordance with the appropriate criteria contained in the plant AOPs and EOPs. The 15-minute criterion is included to allow operators time to manually isolate the required penetrations, if possible.

EAL #2 Basis

Addresses a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. The inability to start the required equipment indicates that containment heat removal/depressurization systems (e.g., containment sprays or ice condenser fans) are either lost or performing in a degraded manner.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS

MU8 (cont)

Basis (cont):

This event would escalate to a Site Area Emergency in accordance with IC FS1 if there were a concurrent loss or potential loss of either the Fuel Clad or RCS fission product barriers.

Basis Reference(s):

1. NEI 99-01 Rev 6, SU7
2. 1/2BwST-5 Containment

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA1

Initiating Condition:

Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer.

Operating Mode Applicability:

5, 6, D

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. Loss of **ALL** offsite AC power to unit ESF buses.

   AND

2. Failure of DG 1A(2A) and DG 1B(2B) emergency diesel generators to supply power to unit ESF buses.

   AND

3. Failure to restore power to at least one unit ESF bus in **< 15 minutes** from the time of loss of both offsite and onsite AC power.

Basis:

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink.

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

The emergency buses of the affected unit can be powered from the unaffected unit through the crosstie breakers. Unit crosstie is considered an adequate source of offsite power when evaluating this EAL.

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

Escalation of the emergency classification level would be via IC CS6 or RS1.

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA1 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, CA2
2. 20E-0-4001 Station One Line Diagram
3. UFSAR 8.3.1
4. 1/2BwOA ELEC-3 Loss Of 4KV ESF Bus
5. 1/2BwOA ELEC-4 Loss Of Offsite Power Unit 1/2
6. 1/2BwCA-0.0 Loss Of All AC Power Unit 1/2
7. 1/2BwCA-0.1 Loss Of All AC Power Recovery Without SI Required Unit 1/2
8. 1/2BwCA-0.2 Loss Of All AC Power Recovery With SI Required Unit 1/2
9. 1/2BwCA-0.3 Response To Opposite Unit Loss Of All AC Power
10. BwOP AP-37 Unit Two SAT Crosstie To Unit One ESF Bus
11. BwOP AP-38, Unit One SAT Crosstie To Unit Two ESF Bus
12. Safety Evaluations of the Byron Station and Braidwood Station Responses to the Station Blackout (SBO) Rule (TAC NOS. 68522, 68523 AND 68515,68516)

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU1

Initiating Condition:

Loss of all but one AC power source to emergency buses for 15 minutes or longer.

Operating Mode Applicability:

5, 6, D

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. AC power capability to unit ESF buses reduced to only one of the following power sources for **$\geq$ 15 minutes.**
   - Affected unit SAT 142-1(242-1)
   - Affected unit SAT 142-2(242-2)
   - Emergency Diesel Generator DG 1A(2A)
   - Emergency Diesel Generator DG 1B(2B)
   - Unit crosstie breakers

   AND

2. Any additional single power source failure will result in a loss of **ALL** AC power to SAFETY SYSTEMS.

Basis:

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

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

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

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU1 (cont)

Basis (cont):

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

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

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

The subsequent loss of the remaining single power source would escalate the event to an Alert in accordance with IC CA1.

Basis Reference(s):

1. NEI 99-01 Rev 6 CU2
2. 20E-0-4001 Station One Line Diagram
3. UFSAR 8.3.1
4. 1/2BwOA ELEC-3 Loss Of 4KV ESF Bus
5. 1/2BwOA ELEC-4 Loss Of Offsite Power Unit 1/2
6. 1/2BwCA-0.0 Loss Of All AC Power Unit 1/2
7. 1/2BwCA-0.1 Loss Of All AC Power Recovery Without SI Required Unit 1/2
8. 1/2BwCA-0.2 Loss Of All AC Power Recovery With SI Required Unit 1/2
9. 1/2BwCA-0.3 Response To Opposite Unit Loss Of All AC Power
10. BwOP AP-37 Unit Two SAT Crosstie To Unit One ESF Bus
11. BwOP AP-38, Unit One SAT Crosstie To Unit Two ESF Bus
12. Safety Evaluations of the Byron Station and Braidwood Station Responses to the Station Blackout (SBO) Rule (TAC NOS. 68522, 68523 AND 68515, 68516)

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA2

Initiating Condition:

Hazardous event affecting SAFETY SYSTEM required for the current operating mode.

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- If it is determined that the conditions of CA2 are not met then assess the event via HU3, HU4, or HU6.

1. The occurrence of **ANY** of the following hazardous events:
   - Seismic event (earthquake)
   - Internal or external flooding event
   - High winds or tornado strike
   - FIRE
   - EXPLOSION
   - Other events with similar hazard characteristics as determined by the Shift Manager

   AND

2. **EITHER** of the following:
   a. Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM required by Technical Specifications for the current operating mode.

      OR

   b. The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure required by Technical Specifications for the current operating mode.

Basis:

FIRE: Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute FIRES. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

EXPLOSION: A rapid, violent and catastrophic failure of a piece of equipment due to combustion, chemical reaction or overpressurization. A release of steam (from high energy lines or components) or an electrical component failure (caused by short circuits, grounding, arcing, etc.) should not automatically be considered an explosion. Such

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA2 (cont)

Basis (cont):

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

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

VISIBLE DAMAGE: Damage to a component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

This IC addresses a hazardous event that causes damage to a SAFETY SYSTEM, or a structure containing SAFETY SYSTEM components, required for the current operating mode, "required", i.e. required to be operable by Technical Specifications for the current operating mode. This condition significantly reduces the margin to a loss or potential loss of a fission product barrier, and therefore represents an actual or potential substantial degradation of the level of safety of the plant. Manual or automatic electrical isolation of safety equipment due to flooding, in and of itself, does not constitute degraded performance and is classified under HU6.

EAL #2.a addresses damage to a SAFETY SYSTEM train that is required to be operable by Technical Specifications for the current operating mode, and is in operation since indications for it will be readily available. The indications of degraded performance should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

EAL #2.b addresses damage to a SAFETY SYSTEM component that is required to be operable by Technical Specifications for the current operating mode, and is not in operation or readily apparent through indications alone, or to a structure containing SAFETY SYSTEM components. Operators will make this determination based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage.

Escalation of the emergency classification level would be via IC CS6 or RS1.

If the EAL conditions of CA2 are not met then assess the event via HU3, HU4, or HU6.

Basis Reference(s):

1. NEI 99-01 Rev 6, CA6

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU3

Initiating Condition:

Loss of Vital DC power for 15 minutes or longer.

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

Voltage is **< 108 VDC** on required unit 125 VDC battery buses 111(211) and 112(212) for **≥ 15 minutes**.

Basis:

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses a loss of Vital DC power which compromises the ability to monitor and control operable SAFETY SYSTEMS when the plant is in the cold shutdown or refueling mode. In these modes, the core decay heat load has been significantly reduced, and coolant system temperatures and pressures are lower; these conditions rise the time available to restore a vital DC bus to service. Thus, this condition is considered to be a potential degradation of the level of safety of the plant.

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

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

Depending upon the event, escalation of the emergency classification level would be via IC CA6 or CA5, or an IC in Recognition Category R.

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU3 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, CU4
2. UFSAR 8.3.2.1.1
3. 20E-0-4001 Station One Line Diagram
4. BwAR 1/2-21-E10, 125V DC PNL 111/113(211/213) VOLT LOW
5. 1/2BwOA ELEC 1 Loss of DC Bus UNIT 1/2
6. BwAR 1/2-22-E10, 125V DC PNL 112/114 (212/214) VOLT LOW

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU4

Initiating Condition:

Loss of all onsite or offsite communications capabilities.

Operating Mode Applicability:

5, 6, D

Emergency Action Level (EAL):

1. Loss of **ALL** Table C1 **Onsite** communications capability affecting the ability to perform routine operations.

   OR

2. Loss of **ALL** Table C1 **Offsite** communication capability affecting the ability to perform offsite notifications.

   OR

3. Loss of **ALL** Table C1 **NRC** communication capability affecting the ability to perform NRC notifications.

Table C1 – Communications Capability

System	Onsite	Offsite	NRC
Radios	X		
Plant page	X		
Plant Telephone System	X		
Commercial Telephones	X	X	X
NARS		X	
ENS		X	X
HPN		X	X
Satellite phones		X	X

Basis:

This IC addresses a significant loss of on-site, offsite, or NRC communications capabilities. While not a direct challenge to plant or personnel safety, this event warrants prompt notifications to Offsite Response Organizations (OROs) and the NRC.

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

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU4 (cont)

Basis (cont):

EAL #1 Basis

Addresses a total loss of the communications methods used in support of routine plant operations.

EAL #2 Basis

Addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are listed in procedure EP-MW-114-100-F-01, Nuclear Accident Reporting System (NARS) Form.

EAL #3 Basis

Addresses a total loss of the communications methods used to notify the NRC of an emergency declaration.

Basis Reference(s):

1. NEI 99-01 Rev 6, CU5
2. EP-MW-124-1001 Facilities Inventories And Equipment Tests

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA5

Initiating Condition:

Inability to maintain the plant in cold shutdown.

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- A momentary UNPLANNED excursion above the Technical Specification cold shutdown temperature limit when heat removal function is available does not warrant classification.

1. UNPLANNED rise in RCS temperature **> 200ºF** for **> Table C2 duration**.

   OR

2. UNPLANNED RCS pressure rise **> 10 psig** as a result of temperature rise. (This EAL does not apply in solid plant conditions.)

<table>
<tr><th colspan="3">Table C2 – RCS Heat-up Duration Thresholds</th></tr>
<tr><th>RCS Status</th><th>Containment Closure Status</th><th>Heat-up Duration</th></tr>
<tr><td>Intact</td><td>Not Applicable</td><td>60 minutes*</td></tr>
<tr><td rowspan="2">Not Intact

OR

Reduced Inventory (<397 ft.)</td><td>Established</td><td>20 minutes*</td></tr>
<tr><td>Not Established</td><td>0 minutes</td></tr>
<tr><td colspan="3">* If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced, then EAL #1 is <u>not</u> applicable.</td></tr>
</table>

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA5 (cont)

Basis:

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

CONTAINMENT CLOSURE: The procedurally defined conditions or actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

RCS is intact when the RCS pressure boundary is in its normal condition for the Cold Shutdown mode of operation (e.g. no freeze seals, etc.).

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

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

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

The RCS Heat-up Duration Thresholds table also addresses a rise in RCS temperature with the RCS intact. The status of CONTAINMENT CLOSURE is not crµCial in this condition since the intact RCS is providing a high pressure barrier to a fission product release. The 60-minute time frame should allow sufficient time to address the temperature rise without a substantial degradation in plant safety.

Finally, in the case where there is a rise in RCS temperature, the RCS is not intact or is at reduced inventory , and CONTAINMENT CLOSURE is not established, no heat-up duration is allowed (i.e., 0 minutes). This is because 1) the evaporated reactor coolant may be released directly into the Containment atmosphere and subsequently to the environment, and 2) there is reduced reactor coolant inventory above the top of irradiated fuel.

EAL #2 Basis

Provides a pressure-based indication of RCS heat-up.

Escalation of the emergency classification level would be via IC CS6 or RS1.

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA5 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, CA3
2. Technical Specification Table 1.1-1
3. 1/2BwOP RC-4 Reactor Coolant System Drain
4. 1/2BwGP 100-1 Plant Heatup
5. 1/2BwGP 100-5, Plant Shutdown and Cool Down
6. 1/2BwGP 100-6, Refueling Outage
7. 1/2BwOS XPC-W1 Unit One (Two) Containment Penetration Status Weekly Surveillance
8. 1/2BwOSR 3.4.3.1 Reactor Coolant System Pressure/Temperature Limit Surveillance

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU5

Initiating Condition:

UNPLANNED rise in RCS temperature

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- A momentary UNPLANNED excursion above the Technical Specification cold shutdown temperature limit when heat removal function is available does not warrant classification.

1. UNPLANNED rise in RCS temperature **> 200ºF**.

   OR

2. Loss of the following for **≥15 minutes.**
   - **ALL** RCS temperature indications

     AND
   - **ALL** RCS level indications

Basis:

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

CONTAINMENT CLOSURE: The procedurally defined conditions or actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

This IC addresses an UNPLANNED rise in RCS temperature above the Technical Specification cold shutdown temperature limit, or the inability to determine RCS temperature and level, represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Director should also refer to IC CA5.

RCS is intact when the RCS pressure boundary is in its normal condition for the Cold Shutdown mode of operation (e.g. no freeze seals, etc.).

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

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU5 (cont)

Basis (cont):

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

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

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

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

Escalation to Alert would be via IC CA6 based on an inventory loss or IC CA5 based on exceeding plant configuration-specific time criteria.

Basis Reference(s):

1. NEI 99-01 Rev 6, CU3
2. Technical Specifications Table 1.1-1
3. 1/2BwOSR 0.1-6 Unit One(Two) Mode 6 Shiftly And Daily Operating Surveillance
4. BwOP RH-9 Pump Down of the Reactor Cavity to the RWSTs
5. BwOP RC-4 Reactor Coolant System Drain
6. 1/2BwOSR 3.3.3.1 Unit One(Two) Accident Monitoring Instrumentation Monthly Channel Checks
7. LCOAR - RCS Leakage Detection Instrumentation – Tech Spec LCO 3.4.15
8. LCOAR – RCS Operational Leakage – Tech Spec LCO 3.4.13
9. 1/2BwOSR 3.4.3.1 Reactor Coolant System Pressure/Temperature Limit Surveillance

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CG6

Initiating Condition:

Loss of Reactor Vessel / RCS inventory affecting fuel clad integrity with containment challenged.

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. a. RVLIS indicates **0% Plenum** for **≥ 30 minutes.**

   OR

   Reactor Vessel Refueling Level Indicators LT-046 and LT-049 **< 392 ft. el.** for **≥ 30 minutes.**

   AND

   b. **ANY** Containment Challenge Indication (Table C4)

OR

2. a. Reactor Vessel / RCS level **cannot** be monitored for **≥ 30 minutes.**

   AND

   b. Core uncovery is indicated by **ANY** of the following:

   - Table C3 indications of a sufficient magnitude to indicate core uncovery.

     OR

   - Erratic Source Range Neutron Monitor indication.

     OR

   - 1/2 RE-AR011 or 1/2 RE-AR12 Containment Fuel Handling Incident radiation monitors **> 3000 mR/hr.**

   AND

   c. Any Containment Challenge Indication (Table C4)

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CG6 (cont)

Emergency Action Level (EAL) (cont):

Table C3 – Indications of RCS Leakage
• UNPLANNED Containment Sump level rise* • UNPLANNED Auxiliary Bldg. Sump level rise* • UNPLANNED Tank level (rad waste) rise* • UNPLANNED rise in RCS makeup • Observation of leakage or inventory loss
*Rise in level is attributed to a loss of Reactor Vessel / RCS inventory.

Table C4 – Containment Challenge Indications
• Hydrogen Concentration in Containment $\geq$ 5% • UNPLANNED rise in containment pressure • CONTAINMENT CLOSURE **not** established*
* if CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute core uncovery time limit, then escalation to a General Emergency is not required.

Basis:

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

CONTAINMENT CLOSURE: The procedurally defined conditions or actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

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

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

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CG6 (cont)

Basis (cont):

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

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

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

In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive gas mixture in containment. If all installed

hydrogen gas monitors are out-of-service during an event leading to fuel cladding damage, it may not be possible to obtain a containment hydrogen gas concentration reading as ambient conditions within the containment will preclude personnel access.

During periods when installed containment hydrogen gas monitors are out-of-service, operators may use the other listed indications to assess whether or not containment is challenged.

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

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

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

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CG6 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, CG1
2. 1/2BwOS XPC-W1 Unit One (Two) Containment Penetration Status Weekly Surveillance
3. UFSAR E.17
4. BwOP RH-9 Pump Down of the Reactor Cavity to the RWSTs
5. BwOP RC-4 Reactor Coolant System Drain
6. UFSAR 6.2
7. 1/2BwOSR 0.1-4 Unit One (Two) Modes 4 Shiftly and Daily Operating Surveillance
8. 1/2BwOS RF-1 Unit One (Two) Containment Floor Drain Monitoring System Non-Routine Surveillance
9. 1/2BwOS XCB-R1 U0 and U1 MCR Meter Color Banding
10. 1/2BwGP 100-2 Plant Startup
11. 1/2BwGP 100-6T4 Defueled to Mode 6 Checklist
12. 1/2BwOSR 3.3.3.1 Unit One(Two) Accident Monitoring Instrumentation Monthly Channel Checks
13. 1/2BwFR-C.1, Response to Inadequate Core Cooling Unit 1/2
14. 1/2BwST-5 Containment
15. NES-G-14.02, Calculation No. BYR99-010 / BRW-99-0017-I
16. UFSAR stat Section 6.2.5.2.1
17. EP-EAL-0501, Estimation Of Radiation Monitor Readings Indicating Core Uncovery During Refueling

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CS6

Initiating Condition:

Loss of Reactor Vessel / RCS inventory affecting core decay heat removal capability.

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. With CONTAINMENT CLOSURE established **EITHER:**
   - RVLIS indicates **0% Plenum**

     OR
   - Reactor Vessel Refueling Level Indicators LT-046 and LT-049 **< 392 ft el.**

   OR
2. With CONTAINMENT CLOSURE **not** established **EITHER:**
   - RVLIS **≤ 15% Plenum**

     OR
   - Reactor Vessel Refueling Level Indicators LT-046 and LT-049 **< 393 ft. el.**

   OR
3. a. Reactor Vessel / RCS level **cannot** be monitored for **≥30 minutes.**

   AND

   b. Core uncovery is indicated by **ANY** of the following:
   - Table C3 indications of a sufficient magnitude to indicate core uncovery.

     OR
   - Erratic Source Range Neutron Monitor indication.

     OR
   - 1/2 RE-AR011 or 1/2 RE-AR12 Containment Fuel Handling Incident radiation monitors **> 3000 mR/hr.**

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CS6 (cont)

Emergency Action Level (EAL) (cont):

Table C3 – Indications of RCS Leakage
• UNPLANNED Containment Sump level rise* • UNPLANNED Auxiliary Bldg. Sump level rise* • UNPLANNED Tank level (rad waste) rise* • UNPLANNED rise in RCS makeup • Observation of leakage or inventory loss
*Rise in level is attributed to a loss of Reactor Vessel / RCS inventory.

Basis:

<u>CONTAINMENT CLOSURE</u>: The procedurally defined conditions or actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

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

The lost inventory may be due to a RCS component failure, a loss of configuration control or prolonged boiling of reactor coolant. These conditions entail major failures of plant functions needed for protection of the public and thus warrant a Site Area Emergency declaration.

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

Outage/shutdown contingency plans typically provide for re-establishing or verifying CONTAINMENT CLOSURE following a loss of heat removal or RCS inventory control functions.

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

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CS6 (cont)

Basis (cont):

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

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

Escalation of the emergency classification level would be via IC CG6 or RG1.

Basis Reference(s):

1. NEI 99-01 Rev 6, CS1
2. UFSAR E.17
3. UFSAR 6.2
4. NES-G-14.02, Calculation No. BYR99-010 / BRW-99-0017-I
5. UFSAR stat Section 6.2.5.2.1
6. EP-EAL-0501, Estimation of Radiation Monitor Readings Indicating Core Uncovery During Refueling
7. 1/2BwOSR 0.1-4 Unit One (Two) Modes 4 Shiftly and Daily Operating Surveillance
8. 1/2BwOS RF-1 Unit One (Two) Containment Floor Drain Monitoring System Non-Routine Surveillance
9. 1/2BwOS XCB-R1 U0 and U1 MCR Meter Color Banding
10. 1/2BwOSR 0.1-4, Unit One (Two) Modes 4 Shiftly and Daily Operating Surveillance
11. 1/2BwGP 100-2 Plant Startup
12. 1/2BwGP 100-6T4 Defueled to Mode 6 Checklist
13. 1/2BwOSR 3.3.3.1 Unit One (Two) Accident Monitoring Instrumentation Monthly Channel Checks
14. BwOP RH-9 Pump Down of the Reactor Cavity to the RWSTs
15. BwOP RC-4 Reactor Coolant System Drain
16. 1/2BwOS XPC-W1 Unit One (Two) Containment Penetration Status Weekly Surveillance

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA6

Initiating Condition:

Loss of Reactor Vessel / RCS inventory.

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. a. Loss of Reactor Vessel / RCS inventory as indicated RVLIS **< 37% Plenum.**

   OR

   b. Loss of Reactor Vessel / RSC inventory as indicated by LT-046 and LT-049 **< 393.4 ft. el.**

OR

2. a. Reactor Vessel / RCS level **cannot** be monitored for **≥ 15 minutes**.

   AND

   b. Loss of Reactor Vessel / RCS inventory per Table C3 indications.

Table C3 – Indications of RCS Leakage
• UNPLANNED Containment Sump level rise* • UNPLANNED Auxiliary Bldg. Sump level rise* • UNPLANNED Tank level (rad wase) rise* • UNPLANNED rise in RCS makeup • Observation of leakage or inventory loss
*Rise in level is attributed to a loss of Reactor Vessel / RCS inventory.

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CA6 (cont)

Basis:

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

This IC addresses conditions that are precursors to a loss of the ability to adequately cool irradiated fuel (i.e., a precursor to a challenge to the fuel clad barrier). This condition represents a potential substantial reduction in the level of plant safety.

A lowering of water level below indicated RVLIS **< 37% Plenum or** LT-046 and LT-049 indicating **< 393.4 ft. el.** indicates that operator actions have not been successful in restoring and maintaining reactor vessel/RCS water level. The heat-up rate of the coolant will rise as the available water inventory is reduced. A continuing drop in water level will lead to core uncovery.

Although related, EAL #1 is concerned with the loss of RCS inventory and not the potential concurrent effects on systems needed for decay heat removal (e.g., loss of a Residual Heat Removal suction point). A rise in RCS temperature caused by a loss of decay heat removal capability is evaluated under IC CA5.

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

The 15-minute duration for the loss of level indication was chosen because it is half of the Threshold duration specified in IC CS6

If the reactor vessel/RCS inventory level continues to lower, then escalation to Site Area Emergency would be via IC CS6.

Basis Reference(s):

1. NEI 99-01 Rev 6, CA1
2. UFSAR 6.2 & E.17
3. 1/2BwOA PRI-10
4. 1/2BwOS RF-1 Unit One (Two) Containment Floor Drain Monitoring System Non-Routine Surveillance
5. 1/2BwOS XCB-R1 U0 and U1 MCR Meter Color Banding
6. BwOP RH-9 Pump Down of the Reactor Cavity to the RWSTs
7. BwOP RC-4 Reactor Coolant System Drain
8. 1/2BwOSR 0.1-4 Unit One (Two) Modes 4 Shiftly and Daily Operating Surveillance

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU6

Initiating Condition:

UNPLANNED loss of Reactor Vessel / RCS inventory for 15 minutes or longer.

Operating Mode Applicability:

5, 6

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. UNPLANNED loss of reactor coolant results in the inability to restore and maintain Reactor Vessel / RCS level to **> procedurally established lower limit** for **$\geq$ 15 minutes**.

   OR

2. a. Reactor Vessel / RCS level **cannot** be monitored.

   AND

   b. Loss of Reactor Vessel / RCS inventory per Table C3 indications.

Table C3 – Indications of RCS Leakage
• UNPLANNED Containment Sump level rise* • UNPLANNED Auxiliary Bldg. Sump level rise* • UNPLANNED Tank level (rad waste) rise* • UNPLANNED rise in RCS makeup • Observation of leakage or inventory loss
*Rise in level is attributed to a loss of Reactor Vessel / RCS inventory.

Basis:

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

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

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU6 (cont)

Basis (cont):

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

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

The procedurally established lower limit is not an operational band established above the procedural limit to allow for operator action prior to exceeding the procedural limit, but it is the procedurally established lower limit.

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

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

Continued loss of RCS inventory may result in escalation to the Alert emergency classification level via either IC CA6 or CA5.

RECOGNITION CATEGORY
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS

CU6 (cont)

Basis Reference(s):

1. NEI 99-01, Rev. 6 CU1
2. UFSAR 6.2 & E.17
3. 1/2BwOSR 0.1-4 Unit One(Two) Modes 4 Shiftly and Daily Operating Surveillance
4. 1/2BwOS RF-1 Unit One(Two) Containment Floor Drain Monitoring System Non-Routine Surveillance
5. 1/2BwOS XCB-R1 U0 and U1 MCR Meter Color Banding
6. BwOP RH-9 Pump Down of the Reactor Cavity to the RWSTs
7. BwOP RC-4 Reactor Coolant System Drain
8. UFSAR 5.2
9. 1/2BwOSR 3.4.13.1 Unit One(Two) Reactor Coolant System Water Inventory Balance Surveillance
10. 1/2BwOL 3.4.15 LCOAR - Reactor Coolant System Leakage - Leakage Detection Systems
11. 1/2BwOA PRI-1 Excessive Primary Leakage Unit 1/2
12. 1/2BwOSR 0.1-4 Unit One(Two) Modes 6 Shiftly and Daily Operating Surveillance

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HG1

Initiating Condition:

HOSTILE ACTION resulting in loss of physical control of the facility.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

1. A notification from the Security Force that a HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA.

   AND

2. a. **ANY** Table H1 safety function **cannot** be controlled or maintained.

   OR

   b. Damage to spent fuel has occurred or is IMMINENT

Table H1 – Safety Functions
• Reactivity Control(ability to shut down the reactor and keep it shutdown) • Core Cooling (ability to cool the core) • RCS Heat Removal (ability to maintain heat sink)

Basis:

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

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

PROJECTILE: An object directed toward a NPP that could cause concern for its continued operability, reliability, or personnel safety.

PROTECTED AREA: An area that normally encompasses all controlled areas within the security protected area fence.

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

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HG1 (cont)

Basis (cont):

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

This IC addresses an event in which a HOSTILE FORCE has taken physical control of the facility to the extent that the plant staff can no longer operate equipment necessary to maintain key safety functions. It also addresses a HOSTILE ACTION leading to a loss of physical control that results in actual or IMMINENT damage to spent fuel due to 1) damage to a spent fuel pool cooling system (e.g., pumps, heat exchangers, controls, etc.) or, 2) loss of spent fuel pool integrity such that sufficient water level cannot be maintained.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

Basis Reference(s):

1. NEI 99-01, Rev. 6 HG1
2. Station Security Plan – Appendix C

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS1

Initiating Condition:

HOSTILE ACTION within the PROTECTED AREA.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

A notification from the Security Force that a HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA.

Basis:

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

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

PROJECTILE: An object directed toward a NPP that could cause concern for its continued operability, reliability, or personnel safety.

PROTECTED AREA: An area that normally encompasses all controlled areas within the security protected area fence.

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

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

This IC addresses the occurrence of a HOSTILE ACTION within the PROTECTED AREA. This event will require rapid response and assistance due to the possibility for damage to plant equipment.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS1 (cont)

Basis (cont):

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Site Area Emergency declaration will mobilize ORO resources and have them available to develop and implement public protective actions in the unlikely event that the attack is successful in impairing multiple safety functions.

This IC does not apply to a HOSTILE ACTION directed at an ISFSI PROTECTED AREA located outside the plant PROTECTED AREA; such an attack should be assessed using IC HA1. It also does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR § 73.71 or 10 CFR § 50.72.

Escalation of the emergency classification level would be via IC HG1.

Basis Reference(s):

1. NEI 99-01 Rev 6, HS1
2. Station Security Plan – Appendix C

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA1

Initiating Condition:

HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

1. A validated notification from NRC of an aircraft attack threat **< 30 minutes** from the site.

   OR

2. Notification by the Security Force that a HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLED AREA.

Basis:

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

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

PROJECTILE: An object directed toward a NPP that could cause concern for its continued operability, reliability, or personnel safety.

OWNER CONTROLLED AREA (OCA): The property associated with the station and owned by the company. Access is normally limited to persons entering for official business.

PROTECTED AREA: An area that normally encompasses all controlled areas within the security protected area fence.

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

This IC addresses the occurrence of a HOSTILE ACTION within the OWNER CONTROLLED AREA or notification of an aircraft attack threat. This event will require rapid response and assistance due to the possibility of the attack progressing to the PROTECTED AREA, or the need to prepare the plant and staff for a potential aircraft impact.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA1 (cont)

Basis (cont):

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Alert declaration will also heighten the awareness of Offsite Response Organizations, allowing them to be better prepared should it be necessary to consider further actions.

This IC does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR § 73.71 or 10 CFR § 50.72.

EAL #1 addresses the threat from the impact of an aircraft on the plant, and the anticipated arrival time is within 30 minutes. The intent of this EAL is to ensure that threat-related notifications are made in a timely manner so that plant personnel and OROs are in a heightened state of readiness. This EAL is met when the threat-related information has been validated in accordance with 0BwOA Security-1, Security Threat.

EAL #2 is applicable for any HOSTILE ACTION occurring, or that has occurred, in the OWNER CONTROLLED AREA. This includes any action directed against an ISFSI that is located outside the plant PROTECTED AREA.

The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may be provided by NORAD through the NRC.

In some cases, it may not be readily apparent if an aircraft impact within the OWNER CONTROLLED AREA was intentional (i.e., a HOSTILE ACTION). It is expected, although not certain, that notification by an appropriate Federal agency to the site would clarify this point. In this case, the appropriate federal agency is intended to be NORAD, FBI, FAA or NRC. The emergency declaration, including one based on other ICs/EALs, should not be unduly delayed while awaiting notification by a Federal agency.

Escalation of the emergency classification level would be via IC HS1.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA1 (cont)

Basis Reference(s):

1. NEI 99-01 Rev 6, HA1
2. Station Security Plan – Appendix C

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU1

Initiating Condition:

Confirmed SECURITY CONDITION or threat.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

1. Notification of a credible security threat directed at the site as determined per SY-AA-101-132, Security Assessment and Response to Unusual Activities.

   OR

2. A validated notification from the NRC providing information of an aircraft threat.

   OR

3. Notification by the Security Force of a SECURITY CONDITION that does **<u>not</u>** involve a HOSTILE ACTION.

Basis:

<u>SECURITY CONDITION</u>: Any Security Event as listed in the approved security contingency plan that constitutes a threat/compromise to site security, threat/risk to site personnel, or a potential degradation to the level of safety of the plant. A SECURITY CONDITION does not involve a HOSTILE ACTION

<u>SAFETY SYSTEM</u>: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

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

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

<u>PROJECTILE</u>: An object directed toward a NPP that could cause concern for its continued operability, reliability, or personnel safety.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU1 (cont)

Basis (cont):

This IC addresses events that pose a threat to plant personnel or SAFETY SYSTEM equipment, and thus represent a potential degradation in the level of plant safety. Security events which do not meet one of these EALs are adequately addressed by the requirements of 10 CFR § 73.71 or 10 CFR § 50.72. Security events assessed as HOSTILE ACTIONS are classifiable under ICs HA1, HS1 and HG1.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event. Classification of these events will initiate appropriate threat-related notifications to plant personnel and OROs.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

EAL #1 Basis

Addresses the receipt of a credible security threat. The credibility of the threat is assessed in accordance with SY-AA-101-132, Security Assessment and Response to Unusual Events..

EAL #2 Basis

Addresses the threat from the impact of an aircraft on the plant. The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may also be provided by NORAD through the NRC. Validation of the threat is performed in accordance with 0BwOA Security-1, Security Threat.

EAL #3 Basis

References Security Force because these are the individuals trained to confirm that a security event is occurring or has occurred. Training on security event confirmation and classification is controlled due to the nature of Safeguards and 10 CFR § 2.39 information.

Escalation of the emergency classification level would be via IC HA1.

Basis Reference(s):

1. NEI 99-01 Rev 6, HU1
2. Station Security Plan – Appendix C
3. NRC Safeguards Advisory 10/6/01
4. Letter from Mr. B. A. Boger (NRC) to Ms. Lynette Hendricks (NEI) dated 2/4/02
5. 0BwOA Security-1, Security Threat
6. SY-AA-101-132, Security Assessment and Response to Unusual Events

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS2

Initiating Condition:

Inability to control a key safety function from outside the Control Room.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

1. A Control Room evacuation has resulted in plant control being transferred from the Control Room to alternate locations per 1/2BwOA PRI-5, Control Room Inaccessibility.

   AND

2. Control of **ANY** Table H1 key safety function is <u>**not**</u> reestablished in **< 15 minutes**.

Table H1 – Safety Functions
• Reactivity Control(ability to shut down the reactor and keep it shutdown) • Core Cooling (ability to cool the core) • RCS Heat Removal (ability to maintain heat sink)

Basis:

The time period to establish control of the plant starts when either:

a. Control of the plant is no longer maintained in the Main Control Room

OR

b. The last Operator has left the Main Control Room.

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations, and the control of a key safety function cannot be reestablished in a timely manner. The failure to gain control of a key safety function following a transfer of plan control to alternate locations is a precursor to a challenge to any fission product barriers within a relatively short period of time.

The determination of whether or not “control” is established at the remote safe shutdown location(s) is based on Emergency Director judgment. The Emergency Director is expected to make a reasonable, informed judgment within 15 minutes whether or not the operating staff has control of key safety functions from the remote safe shutdown location(s).

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS2 (cont)

Basis (cont):

Escalation of the emergency classification level would be via IC FG1 or CG6.

Basis Reference(s):

1. NEI 99-01, Rev 6 HS6
2. 1/2BwOA PRI-5, Control Room Inaccessibility

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA2

Initiating Condition:

Control Room evacuation resulting in transfer of plant control to alternate locations.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

A Control Room evacuation has resulted in plant control being transferred from the Control Room to alternate locations per 1/2BwOA PRI-5, Control Room Inaccessibility.

Basis:

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations outside the Control Room. The loss of the ability to control the plant from the Control Room is considered to be a potential substantial degradation in the level of plant safety.

Following a Control Room evacuation, control of the plant will be transferred to alternate shutdown locations. The necessity to control a plant shutdown from outside the Control Room, in addition to responding to the event that required the evacuation of the Control Room, will present challenges to plant operators and other on-shift personnel. Activation of the ERO and emergency response facilities will assist in responding to these challenges.

Escalation of the emergency classification level would be via IC HS2.

Basis Reference(s):

1. NEI 99-01, Rev 6 HA6
2. 1/2BwOA PRI-5, Control Room Inaccessibility

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU3

Initiating Condition:

FIRE potentially degrading the level of safety of the plant.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Note:

- The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- Escalation of the emergency classification level would be via IC CA2 or MA5

1. A FIRE in **ANY** Table H2 area is **not** extinguished in **< 15-minutes** of **ANY** of the following FIRE detection indications:
   - Report from the field (i.e., visual observation)
   - Receipt of multiple (more than 1) fire alarms or indications
   - Field verification of a single fire alarm

   OR

2. a. Receipt of a single fire alarm in **ANY** Table H2 area (i.e., no other indications of a FIRE).

   AND

   b. The existence of a FIRE is **not** verified in **< 30 minutes** of alarm receipt.

   OR

3. A FIRE within the plant PROTECTED AREA not extinguished in **< 60-minutes** of the initial report, alarm or indication.

   OR

4. A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish.

Table H2 – Vital Areas
• Containment • Auxiliary Building • Fuel Handling Building • Main Steam Tunnels • RWST's • Condensate Storage Tanks • Lake Screen House

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU3 (cont)

Basis:

FIRE: Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute FIRES. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

PROTECTED AREA: An area that normally encompasses all controlled areas within the security protected area fence.

This IC addresses the magnitude and extent of FIRES that may be indicative of a potential degradation of the level of safety of the plant.

EAL #1 Basis

The intent of the 15-minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket). In addition to alarms, other indications of a FIRE could be a drop in fire main pressure, automatic activation of a suppression system, etc.

Upon receipt, operators will take prompt actions to confirm the validity of an initial fire alarm, indication, or report. For EAL assessment purposes, the emergency declaration clock starts at the time that the initial alarm, indication, or report was received, and not the time that a subsequent verification action was performed. Similarly, the fire duration clock also starts at the time of receipt of the initial alarms, indication or report.

EAL #2 Basis

This EAL addresses receipt of a single fire alarm, and the existence of a FIRE is not verified (i.e., proved or disproved) within 30-minutes of the alarm. Upon receipt, operators will take prompt actions to confirm the validity of a single fire alarm. For EAL assessment purposes, the 30-minute clock starts at the time that the initial alarm was received, and not the time that a subsequent verification action was performed.

A single fire alarm, absent other indication(s) of a FIRE, may be indicative of equipment failure or a spurious activation, and not an actual FIRE. For this reason, additional time is allowed to verify the validity of the alarm. The 30-minute period is a reasonable amount of time to determine if an actual FIRE exists; however, after that time, and absent information to the contrary, it is assumed that an actual FIRE is in progress.

If an actual FIRE is verified by a report from the field, then EAL #1 is immediately applicable, and the emergency must be declared if the FIRE is not extinguished within 15-minutes of the report. If the alarm is verified to be due to an equipment failure or a spurious activation, and this verification occurs within 30-minutes of the receipt of the alarm, then this EAL is not applicable and no emergency declaration is warranted.

EAL #3 Basis

In addition to a FIRE addressed by EAL #1 or EAL #2, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU3 (cont)

Basis (cont):

EAL #4 Basis

If a FIRE within the plant PROTECTED AREA is of sufficient size to require a response by an offsite firefighting agency (e.g., a local town Fire Department), then the level of plant safety is potentially degraded. The dispatch of an offsite firefighting agency to the site requires an emergency declaration only if it is needed to actively support firefighting efforts because the fire is beyond the capability of the Fire Brigade to extinguish. Declaration is not necessary if the agency resources are placed on stand-by, or supporting post-extinguishment recovery or investigation actions.

ISFSI is not specifically addressed in EAL #3 and #4 since it is within the plant PROTECTED AREA and is therefore covered under EALs #3 and #4.

<u>Basis-Related Requirements from Appendix R</u>

Appendix R to 10 CFR 50, states in part:

> Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."
>
> When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off.
>
> Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.

In addition, Appendix R to 10 CFR 50, requires, among other considerations, the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train (G.2.c). As used in EAL #2, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA2 or MA5.

Basis Reference(s):

1. NEI 99-01, Rev 6 HU4
2. UFSAR Section 3.2
3. Drawing S-01A Composite Site Plan
4. BwAP-1100, Fire Protection Procedures

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU4

Initiating Condition:

Seismic event greater than OBE levels.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Note:

- Escalation of the emergency classification level would be via IC CA2 or MA5
- For emergency classification if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in manner deemed appropriate by the Shift Manager or Emergency Director in $\leq$ **15 mins** of the event.

1. Seismic event **> Operating Basis Earthquake (OBE)** as indicated by seismic check at panel 0PA02J.

   OR

2. When Seismic Monitoring Equipment is **not** available:

   a. Control Room personnel feel an actual or potential seismic event.

   AND

   b. **ANY** one of the following confirmed in $\leq$ **15 mins** of the event:

   - The earthquake resulted in Modified Mercalli Intensity (MMI) $\geq$ **VI** and occurred $\leq$ **3.5 miles** of the plant.
   - The earthquake was magnitude $\geq$ **6.0**
   - The earthquake was magnitude $\geq$ **5.0** and occurred $\leq$ **125 miles** of the plant.

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE)[1]. An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE)[2] should have no significant impact on safety-related systems, structures and components; however, some time may be required for the plant staff to ascertain the actual post-event

[1] An OBE is vibratory ground motion for which those features of a nuclear power plant necessary for continued operation without undue risk to the health and safety of the public will remain functional.

[2] An SSE is vibratory ground motion for which certain (generally, safety-related) structures, systems, and components must be designed to remain functional.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY
HU4 (cont)

Basis (cont):

condition of the plant (e.g., performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event (e.g., typical lateral accelerations are in excess of 0.08g). The Shift Manager or Emergency Director may seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

EAL #2.b and the accompanying note is included to ensure that a declaration does not result from felt vibrations caused by a non-seismic source (e.g., a dropped load). The Shift Manager or Emergency Director may seek external verification if deemed appropriate (e.g., call to USGS, check internet source, etc.) however, the verification action must not preclude a timely emergency declaration. This guidance recognizes that it may cause the site to declare an Unusual Event while another site, similarly affected but with readily available OBE indications in the Control Room, may not.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA2 or MA5.

Basis Reference(s):

1. NEI 99-01, Rev 6 HU2
2. 0BwOA ENV-4 Earthquake
3. Annunciator 0-38-E5 Accelograph Accel High
4. US NRC Reg. Guide 1.166, Pre-Earthquake Planning and Immediate Nuclear Power Plant Operator Earthquake Actions.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA5

Initiating Condition:

Gaseous release impeding access to equipment necessary for normal plant operations, cooldown or shutdown.

Operating Mode Applicability:

4, 5, 6

Emergency Action Level (EAL):

Note:

- If the equipment in the listed room or area was already inoperable, or out of service, before the event occurred, then no emergency classification is warranted.

1. Release of a toxic, corrosive, asphyxiant or flammable gas in **ANY** Table H3 area.

Table H3
Areas with Entry Related Mode Applicability

Area	Entry Related Mode Applicability
Auxiliary Building 426' VCT Valve Aisle	Mode 4, 5, and 6
Auxiliary Building 401' Curved Wall Area Penetration Area	
Auxiliary Building 383' Remote Shutdown Panel Area	
Auxiliary Building 364' CV Pp areas Curved Wall Area	
Auxiliary Building 346' RH pump areas	

AND

2. Entry into the room or area is prohibited or impeded.

Basis:

This IC addresses an event involving a release of a hazardous gas that precludes or impedes access to equipment necessary to transition the plant from normal plant operation to cooldown and shutdown as specified in normal plant procedures. This

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA5 (cont)

Basis (cont):

condition represents an actual or potential substantial degradation of the level of safety of the plant.

Assuming all plant equipment is operating as designed, normal operation capable from the Main Control Room (MCR). The plant is also able to transition into a hot shutdown condition from the MCR, therefore Table H3 is a list of plant rooms or areas with entry-related mode applicability that contain equipment which require a manual/local action necessary to transition the plant from normal plant operation to cooldown and shutdown as specified in normal operating procedures (establish shutdown cooling), where if this action is not completed the plant would not be able to attain and maintain cold shutdown. This Table does not include rooms or areas for which entry is required solely to perform actions of an administrative or record keeping nature (e.g., normal rounds or routine inspections).

This Table does not include the Control Room since adequate engineered safety/design features are in place to preclude a Control Room evacuation due to the release of a hazardous gas.

An Alert declaration is warranted if entry into the affected room/area is, or may be, procedurally required during the plant operating mode in effect and the gaseous release preclude the ability to place shutdown cooling in service. The emergency classification is not contingent upon whether entry is actually necessary at the time of the release.

Evaluation of the IC and EAL do not require atmospheric sampling; it only requires the Emergency Director's judgment that the gas concentration in the affected room/area is sufficient to preclude or significantly impede procedurally required access. This judgment may be based on a variety of factors including an existing job hazard analysis, report of ill effects on personnel, advice from a subject matter expert or operating experience with the same or similar hazards. Access should be considered as impeded if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

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

- The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the gaseous release). For example, the plant is in Mode 1 when the gaseous release occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.
- The gas release is a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., fire suppression system testing).
- The action for which room/area entry is required is of an administrative or record keeping nature (e.g., normal rounds or routine inspections).

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA5 (cont)

Basis (cont):

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

An asphyxiant is a gas capable of reducing the level of oxygen in the body to dangerous levels. Most commonly, asphyxiants work by merely displacing air in an enclosed environment. This reduces the concentration of oxygen below the normal level of around 19%, which can lead to breathing difficulties, unconsciousness or even death.

This EAL does not apply to firefighting activities, that generate smoke or that automatically or manually activate a fire suppression system in an area.

The Operating Mode Applicability of this EAL has been revised from All Modes to modes 4, 5, and 6 due to the mode applicability of the areas of concern in Table H-3. In the future should the areas of concern in Table H-3 be revised then the Operating Mode Applicability of this EAL should be reevaluated.

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

Basis Reference(s):

1. NEI 99-01, Rev 6 HA5
2. UFSAR Section 3.2
3. ACIT 660892-12, Station Halon Discharge IDLH Evaluation

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU6

Initiating Condition:

Hazardous Event

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Note:

- EAL #4 does not apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.
- Escalation of the emergency classification level would be via IC CA2 or MA5

1. Tornado strike within the PROTECTED AREA.

   OR

2. Internal room or area flooding of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode.

   OR

3. Movement of personnel within the PROTECTED AREA is impeded due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release).

   OR

4. A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles.

Basis:

PROTECTED AREA: An area that normally encompasses all controlled areas within the security protected area fence.

SAFETY SYSTEM: A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related.

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

EAL #1 Basis

Addresses a tornado striking (touching down) within the Protected Area.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY
HU6 (cont)

Basis (cont):

EAL #2 Basis

Addresses flooding of a building room or area that results in operators isolating power to a SAFETY SYSTEM component due to water level or other wetting concerns. Classification is also required if the water level or related wetting causes an automatic isolation of a SAFETY SYSTEM component from its power source (e.g., a breaker or relay trip). To warrant classification, operability of the affected component must be required by Technical Specifications for the current operating mode.

EAL #3 Basis

Addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.

EAL #4 Basis

Addresses a hazardous event that causes an on-site impediment to vehicle movement and significant enough to prohibit the plant staff from accessing the site using personal vehicles. Examples of such an event include site flooding caused by a hurricane, heavy rains, up-river water releases, dam failure, etc., or an on-site train derailment blocking the access road.

This EAL is not intended to apply to routine impediments such as fog, snow, ice, or vehicle breakdowns or accidents, but rather to more significant conditions such as the Hurricane Andrew strike on Turkey Point in 1992, the flooding around the Cooper Station during the Midwest floods of 1993, or the flooding around Ft. Calhoun Station in 2011.

Escalation of the emergency classification level would be based on ICs in Recognition Categories R, F, M, H or C.

Basis Reference(s):

1. NEI 99-01, Rev 6 HU3

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HG7

Initiating Condition:

Other conditions exist which in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Basis:

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

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

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

PROJECTILE: An object directed toward a NPP that could cause concern for its continued operability, reliability, or personnel safety.

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a General Emergency.

Basis Reference(s):

1. NEI 99-01, Rev 6 HG7

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS7

Initiating Condition:

Other conditions exist which in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the site boundary.

Basis:

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

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

PROJECTILE: An object directed toward a NPP that could cause concern for its continued operability, reliability, or personnel safety.

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a Site Area Emergency.

Basis Reference(s):

1. NEI 99-01, Rev 6 HS7

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA7

Initiating Condition:

Other conditions exist which in the judgment of the Emergency Director warrant declaration of an ALERT.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

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

Basis:

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

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

PROJECTILE: An object directed toward a NPP that could cause concern for its continued operability, reliability, or personnel safety.

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an Alert.

Basis Reference(s):

1. NEI 99-01, Rev 6 HA7

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU7

Initiating Condition:

Other conditions exist which in the judgment of the Emergency Director warrant declaration of an UNUSUAL EVENT.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an UNUSUAL EVENT.

Basis Reference(s):

1. NEI 99-01, Rev 6 HU7

RECOGNITION CATEGORY
ISFSI MALFUNCTIONS

E-HU1

Initiating Condition

Damage to a loaded cask CONFINEMENT BOUNDARY.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

Emergency Action Level (EAL):

Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading:

1. HI-STORM (labeled as xxx-A3)
   - **> 40 mrem/hr** (gamma + neutron) on top of the spent fuel cask
     OR
   - **> 220 mrem/hr** (gamma + neutron) on the side of the spent fuel cask, excluding inlet and outlet ducts

   OR
2. HI-STORM (labeled as xxx-A9.1)
   - **> 60 mrem/hr** (gamma + neutron) on top of the spent fuel cask
     OR
   - **> 600 mrem/hr** (gamma + neutron) on the side of the spent fuel cask, excluding inlet and outlet ducts

Basis:

CONFINEMENT BOUNDARY: The irradiated fuel dry storage cask barrier(s) between areas containing radioactive substances and the environment.

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

This IC addresses an event that results in damage to the CONFINEMENT BOUNDARY of a storage cask containing spent fuel. It applies to irradiated fuel that is licensed for dry storage beginning at the point that the loaded storage cask is sealed. The word cask, as used in this EAL, refers to the storage container in use at the site for dry storage of irradiated fuel. The issues of concern are the creation of a potential or actual release path to the environment, degradation of any fuel assemblies due to environmental factors, and configuration changes which could cause challenges in removing the cask or fuel from storage.

The existence of “damage” is determined by radiological survey. The technical specification multiple of “2 times”, which is also used in Recognition Category R IC RU1, is used here to distinguish between non-emergency and emergency conditions. There are multiple Certificate of Compliance (CoC) Amendments issued at the station, to which the canisters were loaded to, and have different technical specification surface dose rate limits (A3 casks for EAL threshold #1 and A9.1 casks for EAL threshold

RECOGNITION CATEGORY
ISFSI MALFUNCTIONS

#2). While the technical specification limits are different, the station meets 10CFR72.104 dose limit requirements as referenced in the station 72.212 report. The emphasis for this classification is the degradation in the level of safety of the spent fuel cask and not the magnitude of the associated dose or dose rate. It is recognized that in the case of extreme damage to a loaded cask, the fact that the "on-contact" dose rate limit is exceeded may be determined based on measurement of a dose rate at some distance from the cask.

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

Basis Reference(s):

1. NEI 99-01, Rev 6 E-HU1
2. Certificate of Compliance No. 1014, Amendment No. 3, and 9.1 Appendix A

ATTACHMENT 4

Radiological Emergency Plan Annex Revision

EP-AA-1002, Revision 35, *"Exelon Nuclear Radiological Emergency Plan Annex for Byron Station"*

EXELON NUCLEAR

RADIOLOGICAL EMERGENCY PLAN ANNEX FOR BYRON STATION

Page Intentionally left Blank

Table of Contents

REVISION HISTORY

Revision 1; September 1984	Revision 12, July 8, 2002	
Revision 2; May 1986	Revision 13, October 4, 2002	
Revision 3; June 1987	Revision 14, November 15, 2002	
Revision 3b; May 1988	Revision 15, May 12, 2003	
Revision 3c; May 1989	Revision 16, December 2004	
Revision 3d; September 1989	Revision 17, January 2006	
Revision 4; January 1991	Revision 18, March 2006	
Revision 4a; April 1992	Revision 19, September 2006	
Revision 4b; November 1992	Revision 20, May 2007	
Revision 4c; February 1993	Revision 21, October 2007	
Revision 4d; December 1993	Revision 22, March 2008	
Revision 4e; January 1993	Revision 23, December 2008	
Revision 4f; November 1994	Revision 24, April 2009	
Revision 4h; November 1995	Revision 25, March 2010	
Revision 4i; December 1995	Revision 26, May 2010	
Revision 4k; June 1996	Revision 27, November 2010	
Revision 4l; February 1997	Revision 28, March 2011	
Revision 4m: January 5, 1998	Revision 29, May 2012	
Revision 4n: August 14, 1998	Revision 30, November 2012	
Revision 4p: October 16, 1998	Revision 31, December 2012	
Revision 5: May 13, 1999	Revision 32, June 2013	
Revision 6: June 23, 1999	Revision 33, June 2014	
Revision 7: January 8, 2001	Revision 34, December 2014	
Revision 8: October 8, 2001	Revision 35, November 2017	
Revision 9, October 31, 2001		
Revision 10, November 1, 2001		
Revision 11, January 3, 2002		

Section 1: Introduction

As required in the conditions set forth by the Nuclear Regulatory Commission (NRC) for the operating licenses for the Exelon Nuclear Stations, the management of Exelon recognizes its responsibility and authority to operate and maintain the nuclear power stations in such a manner as to provide for the safety of the general public.

The Exelon Emergency Preparedness Program consists of the Exelon Nuclear Standardized Emergency Plan (E-Plan), Station Annexes, emergency plan implementing procedures, and associated program administrative documents. The Exelon E-Plan outlines the basis for response actions that would be implemented in an emergency. Planning efforts common to all Exelon Nuclear stations are encompassed within the E-Plan.

This document serves as the Byron Station Emergency Plan Annex and contains information and guidance that is unique to the station. This includes facility geography location for a full understanding and representation of the station's emergency response capabilities. The Station Annex is subject to the same review and audit requirements as the Exelon Nuclear Standardized Emergency Plan.

1.1 Facility Description

The Byron Station, Units 1 and 2, are located in Northern Illinois, approximately 3.7 miles south-southwest of the City of Byron in Ogle County. This site is situated near the center of the county in a predominantly agricultural area. At its closest approach, the Rock River is approximately 1.5 miles west of the western site boundary and 2.2 miles west-southwest of the actual plant location. Byron Station occupies approximately 1288 acres of land. The station site is somewhat rectangular in shape, with the plant structures occupying the southeast portion of the site.

Figure 1-1 shows the general location of Byron Station. More specific information on station siting may be found in the Updated Final Safety Analysis Report (UFSAR).

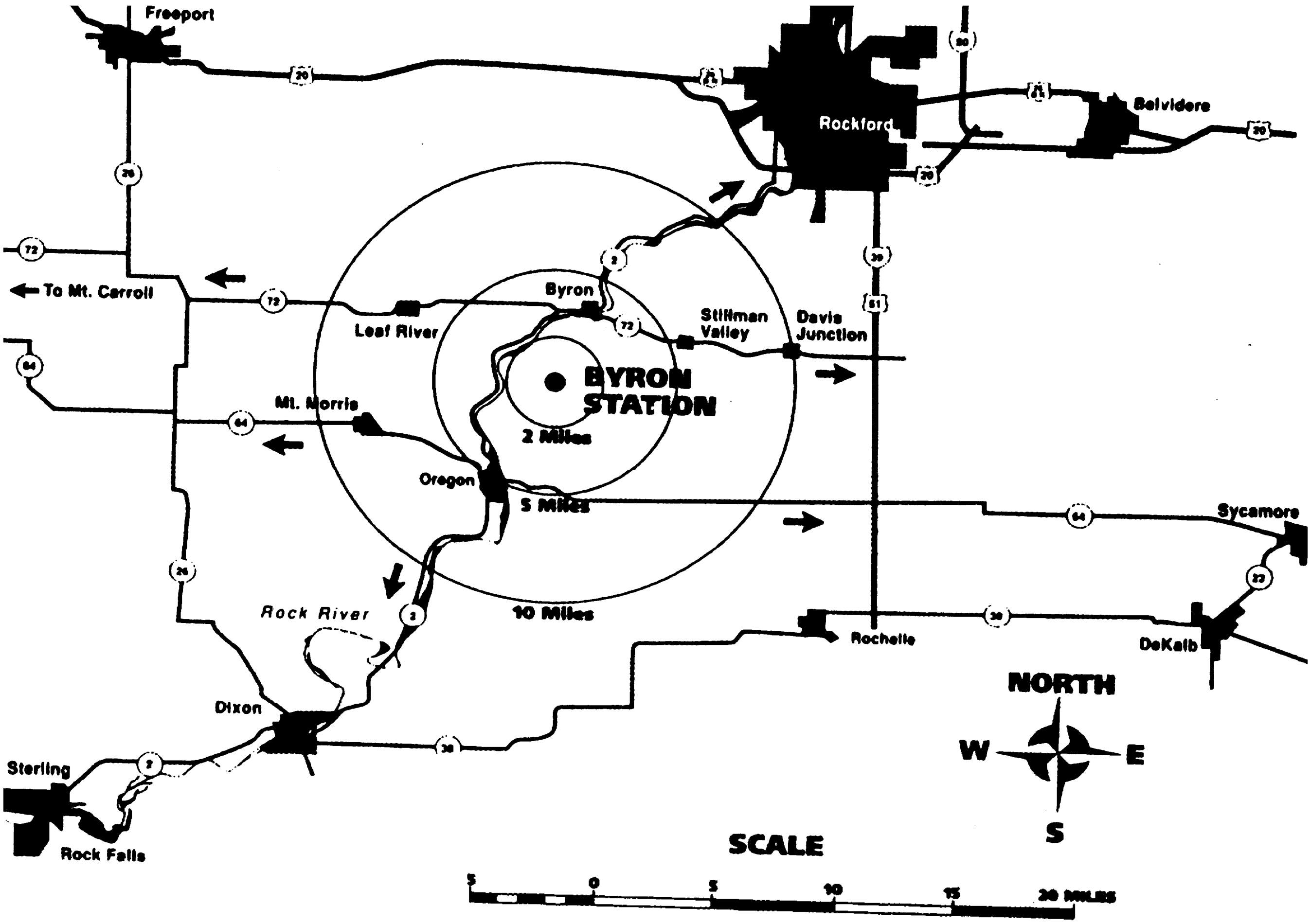
The plant consists of two identical pressurized water reactor (PWR) nuclear steam supply systems (NSSS) and turbine generators furnished by Westinghouse Electric Corporation. Each nuclear steam supply system is designed for a power output of 3645 MWt. Cooling for the plant is provided by two natural draft cooling towers for nonessential service cooling water and by mechanical draft cooling towers for essential service cooling water.

1.2 Emergency Planning Zone

The plume exposure Emergency Planning Zone (EPZ) for Byron Station is an area surrounding the station with a radius of about ten miles. (Exact boundaries are determined by the State of Illinois). Refer to Figure 1-1.

The ingestion pathway EPZ for Byron Station is an area surrounding the station with a radius of about 50 miles.

Figure 1-1: Byron Station Location and 10 Mile EPZ



Section 2: Organizational Control of Emergencies

This section describes the Emergency Response Organization (ERO) and its key positions. It outlines the staffing requirements which provide initial emergency response actions and provisions for timely augmentation of on-shift personnel when required. It also describes interfaces among Exelon Nuclear emergency response personnel and specifies the offsite support available to respond to the nuclear generating stations.

2.1 Shift Organization Staffing

Initial response to any emergency is by the normal plant organization present at the site. This organization includes positions that are onsite 24 hours per day and is described in Section B.1 of the Exelon Nuclear Standardized Radiological Emergency Plan. The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes following the declaration of an Alert or higher emergency classification as specified under Table 2-1. ERO activation is described in Section H.4 of the Exelon Nuclear Standardized Radiological Emergency Plan.

Table 2-1 outlines ERO positions required to meet minimum staffing and full augmentation of the on-shift complement at an Alert or higher classification, and the major tasks assigned to each position. Responsibilities for each position are described in Section B.5 of the Exelon Nuclear Standardized Radiological Emergency Plan.

2.2 Emergency Response Organization Block Diagram

Figures B-1a through B-1d of the Exelon Nuclear Standardized Radiological Emergency Plan illustrates the overall emergency response organization.

2.3 Non-Exelon Nuclear Support Groups

Exelon Nuclear has contractual agreements with several companies whose services would be available in the event of a radiological emergency. These agencies and their available services are listed in Appendix 3 of the Exelon Nuclear Standardized Emergency Plan.

Emergency response coordination with governmental agencies and other support organizations is discussed in Section A of the Exelon Nuclear Standardized Emergency Plan.

Agreements exist on file at Byron Station with several support agencies. These agencies and their support roles are listed in Appendix 2, Station Letters of Agreement.

Table 2-1: Minimum Staffing Requirements for the Exelon ERO

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
1. Plant Operations/Safe Shutdown and Assessment of Operational Aspects	Control Room Staff	Shift Manager	1			
		Shift Supervisor	1			
		Nuclear Station Operator	3			
		Non-Licensed Operator	4			
2. Emergency Direction and Control	Command and Control	Shift Emergency Director (CR)	1[(a)]			
		Station Emergency Director (TSC)		1		
		Corporate Emergency Director (EOF)		1		
3. Notification & Communication	Emergency Communications	Plant Shift Personnel	1			
		TSC Director (TSC)		1		
		EOF Director (EOF)		1		
		State/Local Communicator		1 (EOF)		1 (TSC)
		ENS Communicator		1 (TSC)		1 (EOF)
		HPN Communicator		1 (EOF)		1 (TSC)
	Plant Status	OPs Communicator (CR/TSC)				2
		Operations Advisor (EOF)				1
	In-Plant Team Control	Damage Control Comm. (CR/TSC/OSC)				3
	Technical Activities	Technical Communicator (TSC)				1
		Technical Advisor (EOF)				1
	Governmental	State Environs Communicator (EOF)				(b)
		EOC Communicator (EOF)				1
		State EOC Liaison (State EOC)				(b)
		County EOC Liaison (County EOC)				(b)
		Regulatory Liaison (EOF)				1
4. Radiological Assessment	Offsite Dose Assessment	RP Personnel	1			
		Dose Assessment Coordinator (EOF)		1		
		Dose Assessor (EOF)				1
		Radiation Controls Coordinator (TSC)				1
	Offsite Surveys	Environmental Coordinator (EOF)		1		
		Field Team Communicator (EOF)				1
		Offsite Field Team Personnel		4		(b)
	Onsite Surveys	Onsite Field Team Personnel		2		(b)
	In-plant Surveys	RP Personnel	1	2		(b)
	Chemistry	Chemistry Personnel	1	1		(b)
	RP Supervisory	Radiation Protection Manager(TSC/EOF)		2		

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
5. Plant System Engineering, Repair, and Corrective Actions	Technical Support	STA / Incident Assessor (CR)	1			
		Technical Manager (TSC)		1		
		Core Thermal/Hydraulic Engineer (TSC)		1		
		Mechanical Engineer (TSC)		1		
		Electrical Engineer (TSC)		1		
		SAMG Decision-Maker (TSC)		1[(a)]		
		SAMG Evaluator (TSC)		2[(a)]		
		Operations Manager (TSC)		1		
		Radiation Controls Engineer (TSC)				1
		Technical Support Manager (EOF)				1
	Repair and Corrective Actions	Mechanical Maintenance (OSC)	1[(a)]	2		(b)
		Electrical/I&C Maintenance (OSC)	1[(a)]	3		(b)
		Maintenance Manager (TSC)		1		
		OSC Director (OSC)		1		
		Assistant OSC Director (OSC)				1
		OPs Lead & Support Personnel (OSC)				(b)
6. In-Plant Protective Actions	Radiation Protection	RP Personnel	2[(a)]	4		(b)
7. Fire Fighting	--	Fire Brigade[(c)]	5			
8. 1st Aid and Rescue Operations	--	Plant Personnel	2[(a)]			(b)
9. Site Access Control and Personnel Accountability	Security & Accountability	Security Team Personnel	(d)	(d)		
		Security Coordinator (TSC)				1
	EOF Security	Security Coordinator (EOF)				1
10. Resource Allocation and Administration	Logistics	Logistics Manager (EOF)		1		
		Logistics Coordinator (TSC)				1
	Administration	Administrative Coordinator (EOF)				1
		Clerical Staff (TSC/EOF/JIC)				(b)
	Inter Facility Logs	Events Recorder (EOF/JIC)				2
	Facility Support	Computer Specialist (EOF)				1

Functional Area	Major Tasks	Emergency Positions		Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
11. Public Information	Media Interface	Corporate Spokesperson	(JIC)			1	
		Rad Protection Spokesperson	(JIC)				1
		Technical Spokesperson	(JIC)				1
	Information Development	Public Information Director				1	
		News Writer					1
	Media Monitoring and Rumor Control	Media Monitoring Staff					(b)
		Rumor Control Staff					(b)
	Facility Operation and Control	JIC Director	(JIC)			1	
		JIC Coordinator	(JIC)				1
		Administrative Coordinator	(JIC)				1
		Access Controls	(JIC)				1
		Facility Support Staff	(JIC)				(b)
			TOTAL:	**19**	**37**	**3**	**32[(b)]**

* Response time is based on optimum travel conditions.

(a) May be provided by personnel assigned other functions.

(b) Personnel numbers depend on the type and extent of the emergency.

(c) Fire Brigade per FSAR/Technical Specifications, as applicable.

(d) Function performed by on-shift security personnel.

Section 3: Classification of Emergencies

The Byron Emergency Action Levels and supporting information are re-located in EP-AA-1002, Addendum 3.

Section 4: Emergency Measures

Exelon Nuclear emergency response actions are the same for all nuclear stations and are thus covered by Section E of the Emergency Plan.

4.1 Notification of the Emergency Organization

The Emergency Director is responsible for notifying the State of Illinois Emergency Management Agency (IEMA) via NARS. Ogle County will also be notified via NARS; however, IEMA will maintain responsibility of county notification. If a General Emergency is the initiating event, the Emergency Director is also responsible for notifying the following offsite agencies:

- Ogle County

4.2 Assessment Actions

Throughout each emergency situation, continuing assessment will occur. Assessment actions at Byron Station may include an evaluation of plant conditions; inplant, onsite, and initial offsite radiological measurements; and initial estimates of offsite doses. Core damage information is used to refine dose assessments and confirm or extend initial protective action recommendations. Byron Station utilizes WCAP-14696-A, Revision 1, (1999) as the basis for the methodology for post-accident core damage assessment. This methodology utilizes real-time plant indications. In addition, Byron Station may use samples of plant fluids and atmospheres as inputs to the CDAM (Core Damage Assessment Methodology) program for core damage estimation.

4.3 Protective Actions for the Offsite Public

Protective actions concerning the public within the 10 mile EPZ involve prompt notification, evacuation and sheltering. Prompt notification involves the use of the permanently installed outdoor notification sirens located within the EPZ
To aid the Emergency Response Organization during a developing emergency situation, EP-AA-111, "Emergency Classification and Protective Action Recommendations" has been developed based on Section J.10.m of the Exelon Nuclear Standardized Emergency Plan.

4.3.1 Alert and Notification System (ANS) Sirens

The ANS consists of a permanently installed outdoor notification system within a ten mile radius around the station. The ten mile radius around the station is primarily an agricultural area with a population density below 2000 persons per square mile. The ANS as installed consists of mechanical and electronic sirens that will cover this entire area with a minimum sound level of 60 db. Additionally, the ANS will cover the heavily populated areas within the ten mile radius around the station with a minimum sound level of 70 db to ensure complete coverage.

Once the public has tuned to designated radio stations in an emergency, detailed instructional messages will be given to the public. State and local procedures provide for these messages.

Backup means of notification is achieved through Route Alerting, which is

contained within the State and respective counties' Radiological Emergency Response Plans and procedures. The means consists of utilizing vehicles with public address (PA) systems in the event the primary method of alerting and notification is unavailable. The backup method has the capability to alert and notify the public within the plume exposure pathway EPZ within a reasonable time, but does not need to meet the 15-minute design objective for the primary prompt public alert and notification system.

4.3.2 Evacuation Time Estimates

The ETE study used population data from the 2010 census which includes parts of two counties in Illinois (Ogle and Winnebago). The evacuation times are based on a detailed consideration of the EPZ roadway network and population distribution. The ETE Study, contained in EP-AA-1002 Addendum 2, Evacuation Time Estimates for the Byron Generating Station Plume Exposure Pathway Emergency Planning Zone, presents evacuation times for daytime and nighttime scenarios under various weather conditions for the evacuation of various areas around the Byron Station, once a decision has been made to evacuate.

4.4 Protective Actions for Onsite Personnel

Byron Station has a siren system to warn personnel of emergency conditions. Upon hearing a continuous two (2) minute siren, all personnel not having emergency assignments have been instructed to assemble in predesignated assembly areas. Refer to Figure 4-1. Station ERO personnel report to the Technical Support Center and Control Room personnel report to the Main Control Room. Radiation Protection, Chemistry and Operations personnel not assigned to the Main Control Room report to the Operations Support Center.

If a site evacuation of non-essential personnel is required by Section J of the Emergency Plan, personnel will be either relocated and monitored at the relocation centers or sent home if there is no release or radiological/safety concerns. The designated relocation centers for Byron Station are

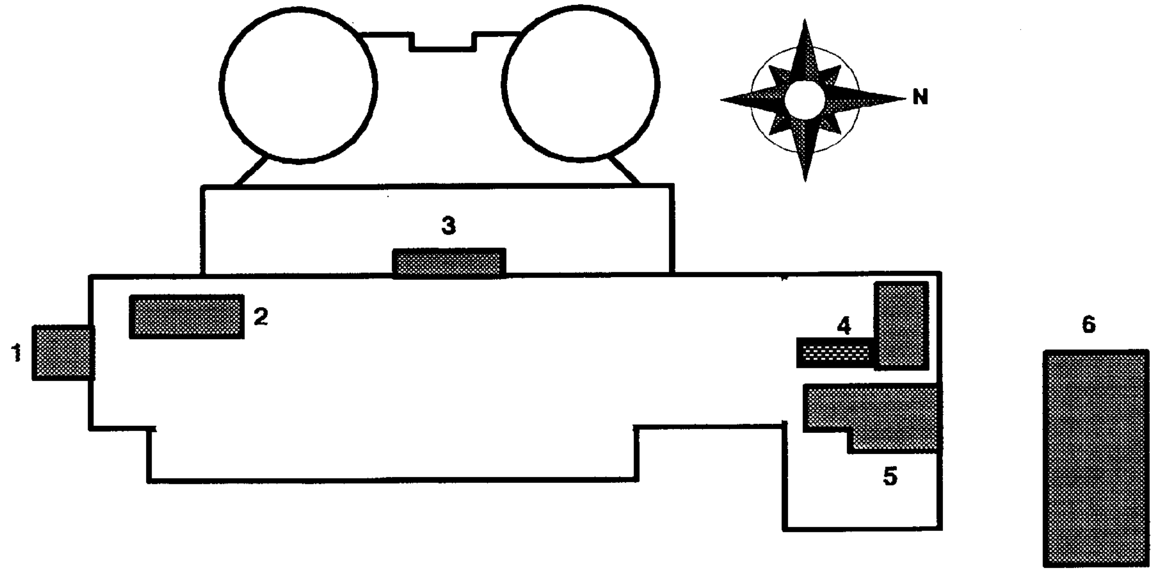
- Morrison Relocation Center, Morrison, Illinois
- Quad Cities Station, Cordova, Illinois

For evacuation routes, refer to EP-AA-113-F-18.

Traffic control for onsite areas will be handled by Byron Station personnel, if necessary.

Equipment and personnel would be available at the Morrison Relocation Center and Quad Cities Station for monitoring and decontamination of evacuated personnel. If major decontamination, follow-up, or bioassay samples are necessary, those persons would be sent to Quad Cities Station.

Figure 4-1: Byron Station Assembly Areas and Onsite Emergency Response Facilities



ASSEMBLY AREAS

1. TECHNICAL SUPPORT CENTER (TSC) EL 451'
2. UNIT ONE TURBINE BLDG. TRACKWAY EL 401'
3. CONTROL ROOM EL 451'
4. OPERATIONAL SUPPORT CENTER (OSC) EL 451'
5. MAINTENANCE SHOP EL 401'
6. SECURITY GATEHOUSE EL 401'

Section 5: Emergency Facilities and Equipment

5.1 Emergency Response Facilities

Refer to Figure 4-1 for the location of the Byron Station Control Room, Technical Support Center (TSC), and Operations Support Center (OSC) within the Station's Protected Area boundary.

5.1.1 Station Control Room

The Byron Station Control Room is the initial onsite center of emergency control and is located on the 451' elevation of the Auxiliary Building.

5.1.2 Technical Support Center (TSC)

Byron Station has designated a TSC which exists at the south end of the Turbine Building. The TSC fully meets the requirements of Section H.1.b of the Exelon Nuclear Standardized Emergency Plan.

5.1.3 Operations Support Center (OSC)

Byron Station has designated a primary Operation Support Center. The primary OSC is the Response Center and Meeting Room #1 on the 451' elevation of the Service Building. The OSC conforms to the requirements of Section H.1.c of the Emergency Plan and is the location to which operations support personnel will report during an emergency and from which they will be dispatched for assignments in support of emergency operations.

5.1.4 Alternative Facility

The Alternative Facility maintains the capability for staging the TSC/OSC emergency response organization personnel in the event of a hostile action. This alternative facility has the capability for communications with the emergency operations facility, control room, and plant security and the capability for engineering assessment activities, including damage control team planning and preparation. Consistent with NRC EPFAQ No. 2013-005, the EOF will satisfy the offsite notification responsibilities for the Alternative Facility. The Alternative Facility is located at 919 First Street, Dixon Illinois. **(CM-1, ref. AR 1362747.44)**

5.2 Assessment Resources

5.2.1 Onsite Meteorological Monitoring Instrumentation

A 250-foot meteorological tower has been erected on the site approximately 3400 feet southwest of the Byron Station reactor building, the major plant structure closest to the tower.

Wind speed, wind direction and temperature are measured at 30 feet and 250 feet above grade level. Temperature difference is determined between the 30-foot and 250-foot levels. A precipitation gauge is utilized to measure rain and snowfall at ground level near the base of the tower.

The onsite meteorological monitoring program is covered in the contract specification and vendor procedures of the meteorological monitoring

contractor. These data are used to generate wind roses and to provide estimates of airborne concentrations of gaseous effluents.

5.2.1.1 Instrumentation

The meteorological tower is instrumented with equipment that conforms with the recommendations of Regulatory Guide 1.23 and ANSI/ANS 2.5 (1984). The equipment is placed on booms oriented into the generally prevailing wind at the site. Equipment signals are brought to an instrument shack with controlled environmental conditions. The shack at the base of the tower houses the recording equipment, signal conditioners, etc., used to process and re-transmit the data to the end point users.

5.2.1.2 Meteorological Measurement Program During a Disaster

Cooperation between the corporate office and the meteorological contract assures that a timely restoration of any outage can be made. Emergency field visits to the site are made as quickly as possible after detection of a failure.

Should a disaster of sufficient magnitude occur to destroy the tower structure, a contract is maintained to have a temporary tower erected within 72 hours, weather conditions permitting. Further, the meteorological contractor maintains two levels of sensors (wind speed, wind direction and temperature) in a state of readiness for use on the temporary tower.

Additionally, Exelon Nuclear's existing instrumented towers at other nuclear sites provide a high density measurement network with multiple backup opportunities.

Meteorological data are available to the station Control Room, Technical Support Center, and Emergency Operations Facility for use in the Dose Projection Computer Model for estimating the environmental impact of unplanned releases of radioactivity from the station.

5.2.2 <u>Onsite Radiation Monitoring Equipment</u>

The onsite radiation monitoring capability includes an installed process, effluent, and area radiation monitoring system; post accident sampling capability; portable survey instrumentation; counting equipment for radiochemical analysis; and a personnel dosimetry program to record integrated exposure. Some onsite equipment is particularly valuable for accident situations and is described in the following subsections.

5.2.2.1 Radiation Monitoring System

Chapters 11 and 12 of the Byron UFSAR describe the radiation monitoring system (RMS) in detail. The installed RMS is designed to continuously monitor the containment atmosphere, plant effluents, and various inplant locations.

The system includes Control Room readouts and recorders for selected parameters that are monitored and an audible Control Room alarm when predetermined setpoints are exceeded. The system can be subdivided into process/effluent instrumentation and an area monitoring system.

- The process/effluent instrumentation consists of pumps, filter samplers, detectors, and associated electronics to determine noble gas, iodine, and particulate concentrations in plant cubicles or liquid and gaseous effluents. Several monitored effluent pathways have control functions which will terminate the release at a predetermined setpoint. These setpoints are premised on compliance with federal regulations.
- The area monitoring system provides information of existing radiation levels in various areas of the plant to ensure safe occupancy. It is equipped with Control Room and local readout and audible alarms to warn personnel of an increased radiation level.

Some onsite equipment is particularly valuable for accident situations and is described in the following sections.

5.2.2.2 Radiological Noble Gas Effluent Monitoring

Two General Atomic Company wide-range gas monitors (WRGM) are installed for sampling the auxiliary building vent stacks which are the final release points for gaseous effluents. The monitors have a range of 1 x 10-7 uCi/cc to 1 x 105 uCi/cc. Each monitor includes the following:

One isokinetic nozzle located in the vent stack, a sample conditioning skid to filter out radioiodine and particulate activity, the wide range gas detector assembly including three gas detectors of the low, mid, and high ranges, two sample pumps (high flow used in the low range mode and low flow used for the mid/high range), and an auxiliary pump skid which boosts flow when using the mid/high range of the WRGM.

The system also includes a microprocessor which utilizes digital processing techniques to analyze data and control monitor functions. Readouts are available in the control room with associated audible alarms. Two General Atomic Company RD-12 detectors are provided for each of the four main steamlines upstream of the safety and relief valves. The range of the monitor is 10^{-1} mR/hr to 10^{4} mR/hr. The monitors will be mounted external to the main steamline piping and corrections made for the loss of low energy gammas.

5.2.2.3 Radioiodine and Particulate Effluent Monitoring

The General Atomic Company wide range gas monitor includes a sampling rack for collection of the auxiliary building vent stack particulate and radioiodine samples. Filter holders and valves are provided to allow grab sample collection for isotopic analyses in the station's counting rooms. The sampling rack is shielded to minimize personnel exposure. The sampling media will be analyzed by a gamma ray spectrometer which utilizes a gamma spectrometer system detector. In addition, silver zeolite cartridges are available to further reduce the interference of noble gases.

5.2.2.4 High-Range Containment Radiation Monitors

Two high range containment radiation monitors are installed for each operating reactor. The monitors will detect and measure the radiation level within the reactor containment during and following an accident. The range of the monitors is 1 rad/hr to 10^7 Rads/hr.

5.2.2.5 In-plant Iodine Instrumentation

Effective monitoring of increasing iodine levels in buildings under accident conditions will include the use of portable instruments using silver zeolite as a sample media. Auxiliary counting room locations have been identified within the Turbine Building. It is expected that a sample can be obtained and analyzed for iodine content within a two-hour time frame.

5.2.3 Onsite Process Monitors

An adequate monitoring capability exists to properly assess the plant status for all modes of operation and is described in the Byron UFSAR. The operability of the post-accident instrumentation ensures information is available on selected plant parameters to monitor and assess important variables following an accident. Instrumentation is available to monitor the parameters and ranges given in Technical Specifications. Byron Station Emergency Operating Procedures aid personnel in recognizing inadequate core cooling using applicable instrumentation.

5.2.4 Onsite Fire Detection Instrumentation

The fire detection system is designed in accordance with applicable National Fire Protection Association (NFPA) Standards. The system is equipped with electrically supervised ionization smoke and heat detectors to quickly detect any fires and the instrumentation to provide local indication and Control Room annunciation. In addition to the smoke and heat detection systems, each fire protection carbon dioxide, halon, or water system is instrumented to inform the Control Room of its actuation or of system trouble. In the event that a portion of the fire detection instrumentation is inoperable, fire watches in affected areas may be required.

5.2.5 Facilities and Equipment for Offsite Monitoring

Consult Chapter 11 of the station specific Offsite Dose Calculation Manual (ODCM) for the most current location for fixed continuous air samplers and DLR locations. Byron Station maintains a supply of emergency equipment and supplies for offsite monitoring and sampling by environmental field teams.

5.2.6 Site Hydrological Characteristics

The hydrological characteristics of the Byron Station vicinity are described in the Byron UFSAR. The river screen house is the only structure that could be affected by flooding on the Rock River and is designed for a combined event flood, where a combined event flood is defined as a flood on the Rock River having a 1 x 10^{-6} annual probability of being exceeded at a 90% confidence level. All other Byron Station structures are 161 feet or more above the Probable Maximum Flood level of the Rock River.

The minimum design operating level of the essential service water makeup pumps is 3.8 feet lower than the water level for the 1-day 100 year low flow drought condition. In the unlikely event that emergency make-up water requirements cannot be satisfied by surface water withdrawals from the Rock River, groundwater wells will serve for makeup to the essential service water cooling towers.

Because of the site hydrological characteristics given above, plant operation should not be affected by Rock River water level conditions and therefore, hydrological monitors have not been installed. The Rock River is not used for any public water supply. There are no recorded plans for any future public water supply usage from the Rock River. The nearest surface water users downstream from Byron Station are on the Mississippi River over 115 miles away. This allows for sufficient mixing that makes permanently installed hydrological monitors unnecessary. In performing dose calculations from liquid releases, Byron Station uses a historical average river flow value, Fw, as a parameter in the liquid release model.

5.3 Protective Facilities and Equipment

The principal onsite assembly areas for Byron Station are the Machine Shop on the 401-foot elevation of the Service Building and the Unit #1 Turbine Building track-way. These areas are suitable because:

1. They are large open areas suitable for assembling a large number of people in a short time;
2. They can be easily exited if a site evacuation is deemed necessary following an assembly; and
3. They have a low probability of being affected by a serious accident involving the Reactor and its primary systems.

The offsite relocation centers for Byron Station are discussed in Section 4 of this annex. These locations are suitable, depending on the emergency condition. These locations are owned by Exelon; thus, personnel, supplies, and communications are readily available.

5.4 First Aid and Medical Facilities

Byron Station has an inplant first aid/decontamination room on the 426-foot elevation of the auxiliary building near the station laboratory complex. This room is provided with a sink, a shower, and a supply cabinet. First aid kits, stretchers, sinks, eyewashes, and emergency showers have been placed in strategic locations throughout the station.

Medical treatment given to injured persons at the station is of a "first aid" nature. When more professional care is needed, injured persons are transported to a local hospital or clinic. Mercyhealth Hospital - Rockton Avenue in Rockford, Illinois is the designated support hospital. Presence St. Joseph Medical Center in Joliet, Illinois is the backup medical.

Both hospitals agree in the event of a Radiological Event, including a hostile action based event, to ensure the capability for the evaluation of radiation exposure and uptake, including assurance that persons providing these services are adequately prepared to handle contaminated individuals and capable of providing medical support for any contaminated injured individual.

5.5 Law Enforcement Agencies

A Letter of Agreement is established for Local Law Enforcement to support Byron Station to respond to a Radiological Event including a Hostile Action Based Event, in conjunction with the National Incident Management System upon notification by the station in accordance with the established communications protocol.

5.6 Fire Fighting Organizations

A Letter of Agreement is established for the local Fire Department to respond to a Radiological Event, including a Hostile Action Based Event, in conjunction with the Mutual Aid Box Alarm System (MABAS) as requested via the 911 Dispatch System.

5.7 EMS Support

A Letter of Agreement is established for the Local Fire Department to provide Emergency Medical Services in respond to a Radiological Event including a Hostile Action Based Event, This includes transportation of patients from the Byron Station, including those who may have been exposed to radiation or may have injuries complicated by radioactive contamination, to Mercyhealth Hospital - Rockton Avenue by use of the communications via the 911 Dispatch System.

Appendix 1: NUREG-0654 Cross-Reference

Annex Section	NUREG-0654
1.0	Part I, Section A
1.1	Part I, Section C
1.2	Part I, Section D
Figure 1-1	Part I, Section D
2.0	Part II, Section A.4
2.1	Part II, Section A.3
3.0	Part II, Section D
4.1	Part II, Section E.1 & J.7
4.2	Part II, Section I.2 & 3
4.3	Part II, Section J.10.m
4.3.1	Part II, Section E.6
4.3.2	Part II, Section J.8
4.4	Part II, Section J.1-5
EP-AA-111	Part II, Section J.10.m
EP-AA-1002, Addendum 2	Part II, Section J.8 & 10.b
Figure 4-1	Part II, Section J.5
4.4	Part II, Section J.2 & 3
5.1	Part II, Section H.1 & G.3
5.2.1	Part II, Section H.5.a & 8
5.2.2	Part II, Section H.5.b & I.2
5.2.3	Part II, Section H.5.c
5.2.4	Part II, Section H.5.d
5.2.5	Part II, Section H.6.b & 7
5.2.6	Part II, Section H.5.a & 6.a
5.3	Part II, Section J.1-5
5.4	Part II, Section L.1 & 2

Appendix 2: Station Letters of Agreement

1. Byron Fire Protection District and Rescue – fire protection.
2. Mercyhealth Hospital - Rockton Avenue – medical services.
3. The Ogle County Sheriff's Office – law enforcement.
4. Presence St. Joseph Medical Center of Joliet, Illinois, acts as the back-up supporting medical facility for Byron Station.

ATTACHMENT 5

Radiological Emergency Plan Annex Revision

EP-AA-1003, Revision 28, *"Exelon Nuclear Radiological Emergency Plan Annex for Clinton Station"*

EXELON NUCLEAR

RADIOLOGICAL EMERGENCY PLAN ANNEX FOR CLINTON STATION

Table of Contents

REVISION HISTORY

Revision 0; March 2002	Revision 10; April 2007	Revision 20; April 2012
Revision 1; May 2002	Revision 11; October 2007	Revision 21; November 2012
Revision 2; August 2002	Revision 12; March 2008	Revision 22; December 2012
Revision 3; May 2003	Revision 13, December 2008	Revision 23; June 2013
Revision 4; August 2003	Revision 14; March 2009	Revision 24; June 2014
Revision 5; January 2004	Revision 15, March 2010	Revision 25; December 2014
Revision 6; December 2004	Revision 16; May 2010	Revision 26; July 2016
Revision 7; May 2005	Revision 17; September 2010	Revision 27: April 2017
Revision 8; January 2006	Revision 18; January 2011	Revision 28: November 2017
Revision 9; November 2006	Revision 19; March 2011	

Section 1: Introduction

As required in the conditions set forth by the Nuclear Regulatory Commission (NRC) for the operating licenses for the Exelon Nuclear Stations, the management of Exelon recognizes its responsibility and authority to operate and maintain the nuclear power stations in such a manner as to provide for the safety of the general public.

The Exelon Emergency Preparedness Program consists of the Exelon Nuclear Standardized Emergency Plan (Emergency Plan) Station Annexes, emergency plan implementing procedures, and associated program administrative documents. The Emergency Plan outlines the basis for response actions that would be implemented in an emergency. Planning efforts common to all Exelon Nuclear stations are encompassed within the Emergency Plan.

This document serves as the Clinton Station Annex and contains information and guidance that is unique to the station. This includes facility geography and location for a full understanding and representation of the station's emergency response capabilities. The Station Annex is subject to the same review and audit requirements as the Emergency Plan.

1.1 Facility Description

The Clinton Station, is located in approximately 6 miles east of Clinton, Illinois, in DeWitt County in Central Illinois. Clinton Station is operated by Exelon Nuclear.

The location can be defined by placing the station in the approximate center of a triangle formed by Bloomington, 22 miles to the north, Decatur, 22 miles to the south, and Champaign, 30 miles to the east. The reactor containment, the focal point for the Station, is located approximately 3 miles northeast of the confluence of the Salt Creek North Fork and the Salt Creek.

The site encompasses about 14,000 acres. This includes the Station of about 150 acres and a man-made, irregular U-shaped cooling reservoir of about 4,895 acres, known as Clinton Lake.

The surrounding area is mostly rural with no major population centers (greater than 25,000 people) or industrial complexes within a 10 mile radius of the Station. Recreational facilities are also limited in the area with Clinton Lake offering the largest variety.

The Clinton Station is a Boiling Water Reactor (BWR), the unit is rated at 3473 MWt. The rated electric output of the unit is 1062 MWe; from the General Electric (GE) turbine generator. The Nuclear Steam System Supplier (NSSS) was GE (Nuclear Energy Division). The entire plant, except for the NSSS, was designed by Sargent & Lundy (S&L) Engineers.

The containment system designed by Sargent & Lundy employs the drywell/pressure suppression features of the BWR-MARK III containment concept. The containment is a right cylindrical, reinforced concrete, steel-lined pressure vessel with a hemispherical dome.

The power generation complex includes several adjacent buildings, including an Auxiliary Building, Control Building (housing the Main Control Room), the Fuel Building, the Turbine Building, Diesel Generator and HVAC Building, the Radwaste Building, and the Service Building. Other buildings such as the gatehouse, circulating water screenhouse, makeup water pump house, warehouses, etc., are also located in the general plant area.

The Circulating Water Screen House located on the Clinton Lake, provides makeup water for the Clinton Station.

The ultimate heat sink for emergency core cooling is a submerged pond and intake flume of 590 acre-feet capacity that underlies the cooling lake and the natural grade of the site.

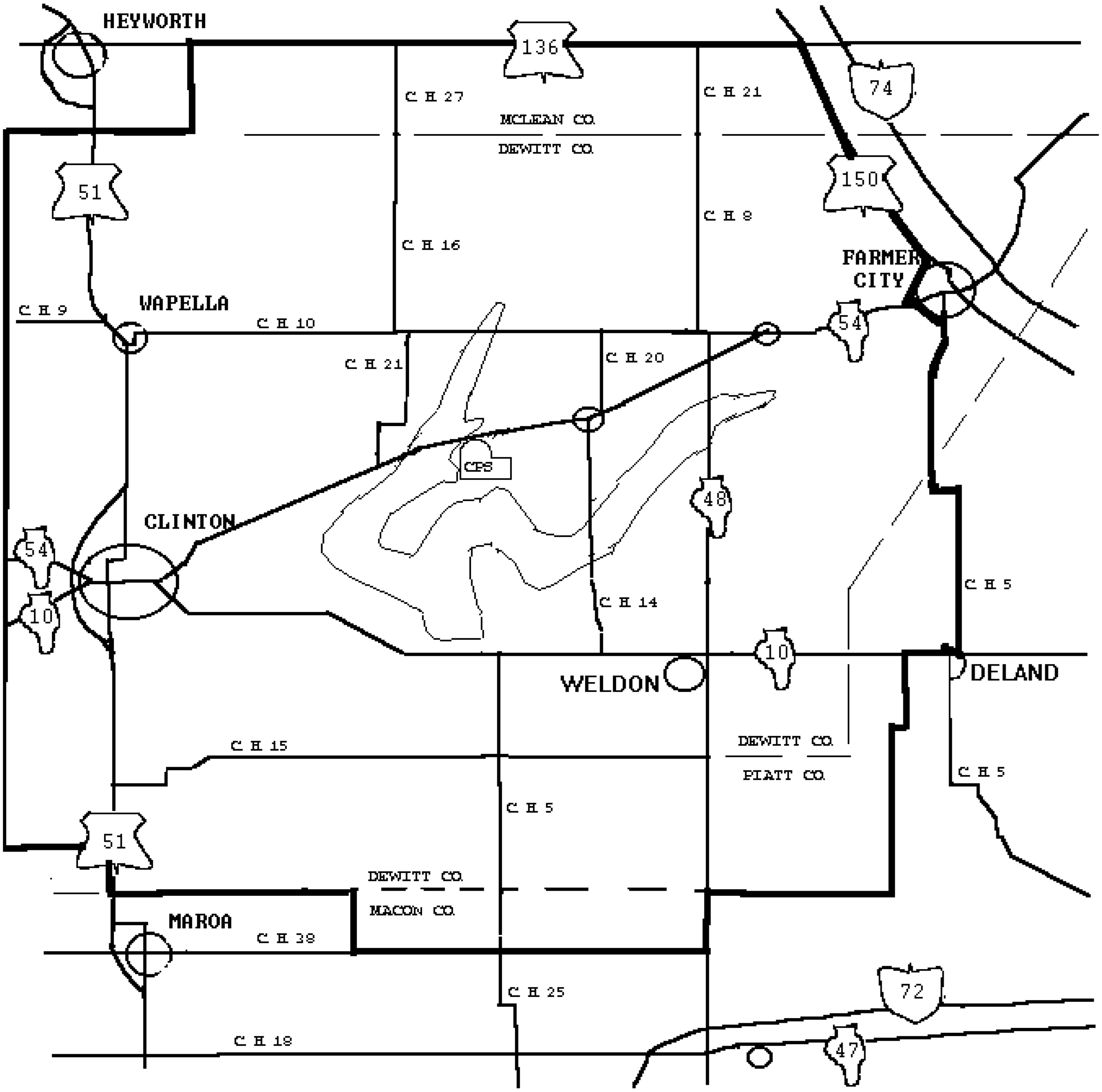
The Clinton Station utilizes a single vent stack of approximately 200 feet in height for the release of all gaseous waste. For more specific site location information, refer to the Station USAR.

1.2 Emergency Planning Zones

The plume exposure Emergency Planning Zone (EPZ) for Clinton Station shall be an area surrounding the Station with a radius of about ten miles (exact boundaries are determined by the State of Illinois). Refer to Figure 1-1.

The ingestion pathway EPZ for Clinton Station shall be an area surrounding the Station with a radius of about 50 miles.

Figure 1-1: Clinton Station Location and 10 Mile EPZ



Section 2: Organizational Control of Emergencies

This section describes the Emergency Response Organization (ERO) and its key positions. It outlines the staffing requirements which provide initial emergency response actions and provisions for timely augmentation of on-shift personnel when required. It also describes interfaces among Exelon Nuclear emergency response personnel and specifies the offsite support available to respond to the nuclear generating stations.

2.1 Shift Organization Staffing

Initial response to any emergency is by the normal plant organization present at the site. This organization includes positions that are onsite 24 hours per day and is described in Section B.1 of the Exelon Nuclear Standardized Radiological Emergency Plan. The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes of classification as specified under Table 2-1. ERO activation is described in Section H.4 of the Exelon Nuclear Standardized Radiological Emergency Plan.

Table 2-1 outlines ERO positions required to meet minimum staffing and full augmentation of the on-shift complement at an Alert or higher classification, and the major tasks assigned to each position. Responsibilities for each position are described in Section B.5 of the Exelon Nuclear Standardized Radiological Emergency Plan.

2.1.1 Incident Assessor

Clinton Station has the option of using an Incident Assessor in these cases where the STA qualification is held by others such as the Shift Manager. Upon declaration of an emergency, the Incident Assessor fulfills the role of the on-shift technical advisor and reports to the Shift Emergency Director (Shift Manager). The Incident Assessor shall function as an advisor to the Shift Manager on matters of safety and act as an on-shift technical advisor, and, if qualified, the Nuclear Engineer. The Incident Assessor is an ERO position that can be filled by an individual who is qualified as the Shift Technical Advisor or Incident Assessor.

As an advisor to the Shift Manager, the Incident Assessor shall have no authority to direct the activities of the shift during an emergency. The Incident Assessor shall be available for briefing individuals who are preparing to assume command authority. The Incident Assessor is required to be present in all modes. The Incident Assessor will be present within the Owner Controlled area when filling the Emergency Plan function.

2.2 Emergency Response Organization Block Diagram

Figures B-1a through B-1d of the Exelon Nuclear Standardized Radiological Emergency Plan illustrates the overall emergency response organization.

2.3 Non-Exelon Nuclear Support Groups

Exelon Nuclear has contractual agreements with several companies whose services would be available in the event of a radiological emergency. These agencies and their available services are listed in Appendix 3 of the Exelon Nuclear Radiological Emergency Plan.

Emergency response coordination with governmental agencies and other support organizations is discussed in Section A of the Exelon Nuclear Radiological Emergency Plan.

Agreements exist on file at Clinton Station with several support agencies. These agencies and their support roles are listed in Appendix 2, Station Letters of Agreement.

Table 2-1: Minimum Staffing Requirements

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
1. Plant Operations/Safe Shutdown and Assessment of Operational Aspects	Control Room Staff	Shift Manager	1			
		Shift Supervisor	1			
		Nuclear Station Operator	2			
		Non-Licensed Operator	1			
2. Emergency Direction and Control	Command and Control	Shift Emergency Director (CR)	1[a]			
		Station Emergency Director (TSC)		1		
		Corporate Emergency Director (EOF)		1		
3. Notification & Communication	Emergency Communications	Plant Shift Personnel	1			
		TSC Director (TSC)		1		
		EOF Director (EOF)		1		
		State/Local Communicator		1 (EOF)		1 (TSC)
		ENS Communicator		1 (TSC)		1 (EOF)
		HPN Communicator		1 (EOF)		1 (TSC)
	Plant Status	OPs Communicator (CR/TSC)				2
		Operations Advisor (EOF)				1
	In-Plant Team Control	Damage Control Comm. (CR/TSC/OSC)				3
	Technical Activities	Technical Communicator (TSC)				1
		Technical Advisor (EOF)				1
	Governmental	State Environs Communicator (EOF)				(b)
		EOC Communicator (EOF)				1
		State EOC Liaison (State EOC)				(b)
		County EOC Liaison (County EOC)				(b)
		Regulatory Liaison (EOF)				1
4. Radiological Assessment	Offsite Dose Assessment	RP Personnel	1			
		Dose Assessment Coordinator (EOF)		1		
		Dose Assessor (EOF)				1
		Radiation Controls Coordinator (TSC)				1
	Offsite Surveys	Environmental Coordinator (EOF)		1		
		Field Team Communicator (EOF)				1
		Offsite Field Team Personnel		4		(b)
	Onsite Surveys	Onsite Field Team Personnel		2		(b)
	In-plant Surveys	RP Personnel	1	2		(b)
	Chemistry	Chemistry Personnel	1	1		(b)
	RP Supervisory	Radiation Protection Manager(TSC/EOF)		2		

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
5. Plant System Engineering, Repair, and Corrective Actions	Technical Support	STA or Incident Assessor (CR)	1			
		Technical Manager (TSC)		1		
		Core Thermal/Hydraulic Engineer (TSC)		1		
		Mechanical Engineer (TSC)		1		
		Electrical Engineer (TSC)		1		
		SAMG Decision-Maker (TSC)		1[(a)]		
		SAMG Evaluator (TSC)		2[(a)]		
		Operations Manager (TSC)		1		
		Radiation Controls Engineer (TSC)				1
		Technical Support Manager (EOF)				1
	Repair and Corrective Actions	MM/Non-Licensed Operator (OSC)	1[(a)]	2		(b)
		Electrical/I&C Maintenance (OSC)	1	3		(b)
		Maintenance Manager (TSC)		1		
		OSC Director (OSC)		1		
		Assistant OSC Director (OSC)				1
		OPs Lead & Support Personnel (OSC)				(b)
6. In-Plant Protective Actions	Radiation Protection	RP Personnel	2[(a)]	4		(b)
7. Fire Fighting	--	Fire Brigade[(c)]	5			
8. 1st Aid and Rescue Operations	--	Plant Personnel	2[(a)]			(b)
9. Site Access Control and Personnel Accountability	Security & Accountability	Security Team Personnel	(d)	(d)		
		Security Coordinator (TSC)				1
	EOF Security	Security Coordinator (EOF)				1
10. Resource Allocation and Administration	Logistics	Logistics Manager (EOF)		1		
		Logistics Coordinator (TSC)				1
	Administration	Administrative Coordinator (EOF)				1
		Clerical Staff (TSC/EOF/JIC)				(b)
	Inter Facility Logs	Events Recorder (EOF/JIC)				2
	Facility Support	Computer Specialist (EOF)				1

Functional Area	Major Tasks	Emergency Positions		Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
11. Public Information	Media Interface	Corporate Spokesperson	(JIC)			1	
		Rad Protection Spokesperson	(JIC)				1
		Technical Spokesperson	(JIC)				1
	Information Development	Public Information Director				1	
		News Writer					1
	Media Monitoring and Rumor Control	Media Monitoring Staff					(b)
		Rumor Control Staff					(b)
	Facility Operation and Control	JIC Director	(JIC)			1	
		JIC Coordinator	(JIC)				1
		Administrative Coordinator	(JIC)				1
		Access Controls	(JIC)				1
		Facility Support Staff	(JIC)				(b)
			TOTAL:	**16**	**37**	**3**	**32[b]**

* Response time is based on optimum travel conditions.

[a] May be provided by personnel assigned other functions.

[b] Personnel numbers depend on the type and extent of the emergency.

[c] Fire Brigade per USAR/Technical Specifications, as applicable.

[d] Function performed by on-shift security personnel.

Section 3: Classification of Emergencies

The Clinton Emergency Action Levels and supporting information are located in EP-AA-1003, Addendum 3.

Section 4: Emergency Measures

4.1 Notification of the Emergency Organization

The Emergency Director is responsible for notifying the State of Illinois Emergency Management Agency (IEMA) via NARS. DeWitt County will also be notified via NARS: however, IEMA will maintain responsibility of county notification. If a General Emergency is the initiating event, the Emergency Director is also responsible for notifying the following local agencies:

- DeWitt County

4.2 Assessment Actions

Throughout each emergency situation, continuing assessment will occur. Assessment actions at Clinton Station may include an evaluation of plant conditions; inplant, onsite, and initial offsite radiological measurements; and initial estimates of offsite doses.

Core damage information is used to refine dose assessments and confirm or extend initial protective action recommendations. Clinton Station utilizes NEDC-33045P-A, Revision 0, (2001) as the basis for the methodology for post-accident core damage assessment. This methodology utilizes real-time plant indications. In addition Clinton Station may use samples of plant fluids and atmospheres as inputs to the CDAM (Core Damage Assessment Methodology) program for core damage estimation.

4.3 Protective Actions for the Offsite Public

Protective actions concerning the public within the 10 mile EPZ involve prompt notification, evacuation and sheltering. Prompt notification involves primarily the use of the permanently installed outdoor notification sirens located within the EPZ.

To aid the Emergency Response Organization personnel during a developing emergency situation, EP-AA-111, "Emergency Classification and Protective Action Recommendations" has been developed based on Section J.10.m of the Exelon Nuclear Radiological Emergency Plan.

4.3.1 Alert and Notification System (ANS) Sirens

The alert and notification system consists of a permanently installed outdoor notification system within the zero (0) to ten (10) mile radius around the station. The zero (0) to ten (10) mile radius around the station is primarily an agricultural area with a population density below 2000 persons per square mile. The alert and notification system as installed consists of mechanical and electronic sirens that will cover this entire area with a minimum sound level of 60 db. Additionally, the prompt notification system will cover the heavily populated areas within the zero (0) to ten (10) mile radius around the station with a minimum sound level of 70 db to ensure complete coverage.

Once the public has tuned to designated radio stations in an emergency, detailed instructional messages will be given to the public. State and local procedures provide for these messages.

Backup means of notification is achieved through Route Alerting, which is contained within the State and respective counties' Radiological Emergency Response Plans and procedures. The means consists of utilizing vehicles with public address (PA) systems in the event the primary method of alerting and notification is unavailable. The backup method has the capability to alert and notify the public within the plume exposure pathway EPZ within a reasonable time, but does not need to meet the 15-minute design objective for the primary prompt public alert and notification system.

4.3.2 Evacuation Time Estimates

The ETE study used population data from the 2010 census which includes parts of four counties in Illinois (DeWitt, Macon, McLean, and Piatt). The evacuation times are based on a detailed consideration of the EPZ roadway network and population distribution. The ETE Study, contained in EP-AA-1003 Addendum 2, Evacuation Time Estimates for the Clinton Power Station Plume Exposure Pathway Emergency Planning Zone, presents evacuation times for daytime and nighttime scenarios under various weather conditions for the evacuation of various areas around the Clinton Station, once a decision has been made to evacuate.

4.4 Protective Actions for Onsite Personnel

Clinton Station has a plant alarm system to warn personnel of emergency conditions. Upon hearing a continuous two (2) minute alarm, or receiving notification by other means of communication, all personnel not having emergency assignments have been instructed to assemble in a predesignated assembly area. The onsite assembly areas (Figure 4-1) are located in the:

- Service Building 1st floor, and
- 762' elevation of the Radwaste Building.

Accountability of site personnel is accomplished by the Station Security force.

If a site evacuation of non-essential personnel is required, personnel will be released to their homes or relocated and monitored at one of the following designated relocation centers for CPS are:

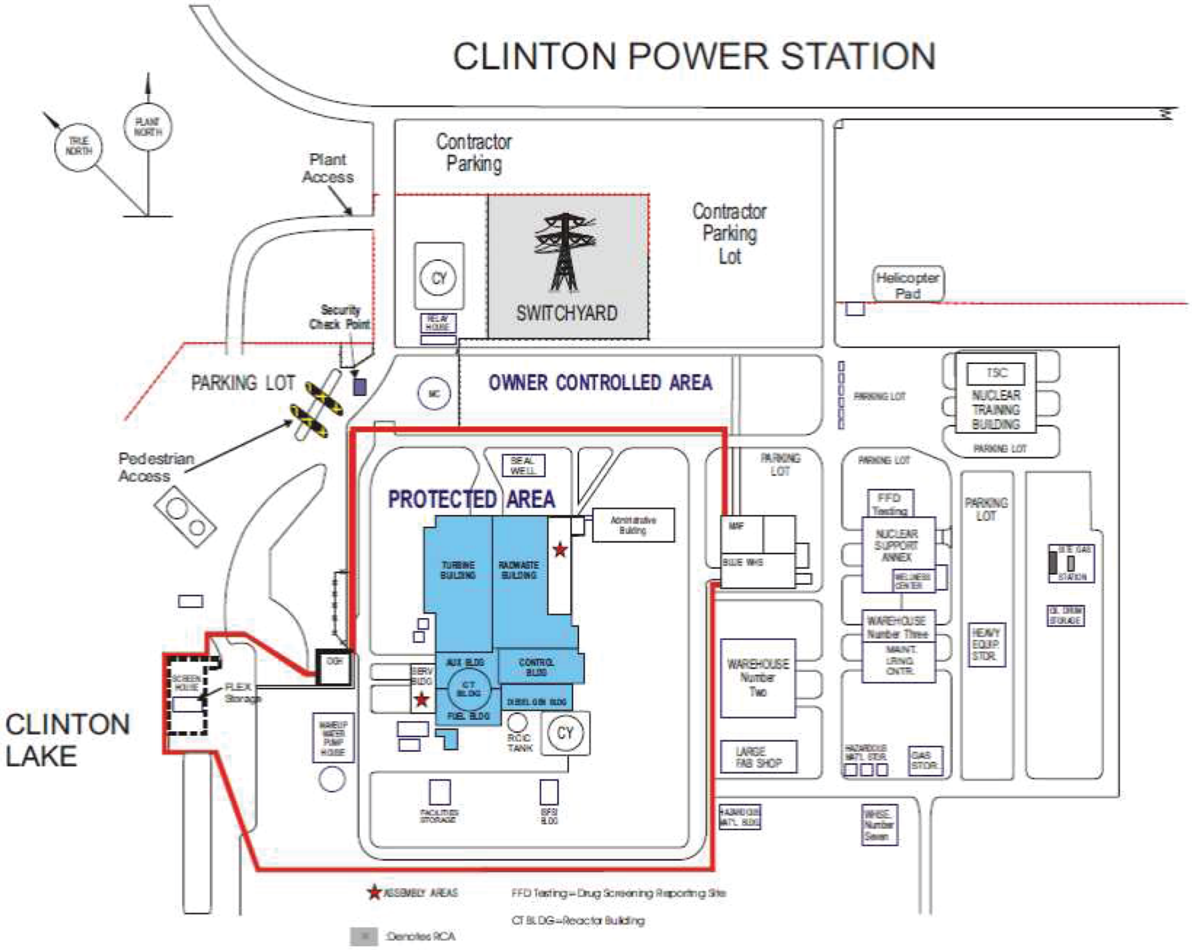
- ISU Horton Field House, Normal, Illinois
- Monticello High School, Monticello, Illinois
- Richland Community College, Decatur, Illinois

For evacuation routes, refer to EP-AA-113-F-22.

Traffic control for onsite areas will be the responsibility of the Station Security force. When a site evacuation is imminent, the Station Security force will post guards as necessary to assist in the evacuation.

Equipment and personnel would be available at all three locations for monitoring and decontamination of evacuated personnel. If major decontamination, follow-up or bioassay samples are necessary, those persons would be sent to either the Dresden or Braidwood Stations.

Figure 4-1: Onsite Assembly Areas



Section 5: Emergency Facilities and Equipment

5.1 Emergency Response Facilities

5.1.1 Station Main Control Room

The Main Control Room is the initial onsite center of emergency control and is located on the 800 foot elevation of the Control Building.

5.1.2 Technical Support Center (TSC)

Clinton Station has a designated TSC on the first floor of the Nuclear Training Building on the east side of the site. Standard air sampling equipment is used to monitor air-borne radioactivity levels in the TSC. The TSC fully meets the requirements of Section H.1.b of the E-Plan.

5.1.3 Operational Support Center (OSC)

A designated Operational Support Center (OSC) is located in the Outage Control Center (OCC) in the Admin Building. The OSC conforms to the requirements of Section H.1.c of the Exelon Nuclear Radiological Emergency Plan and is the location which operations support personnel will report during an emergency and from which they will be dispatched for assignments in support of emergency operations.

In the event that the OSC has to be abandoned, OSC personnel and functions shall be relocated to the RP Office area on the 737' elevation of the Radwaste Building.

5.1.4 Alternative Facility

The Alternative Facility maintains the capability for staging the TSC/OSC emergency response organization personnel in the event of a hostile action. This alternative facility has the capability for communications with the emergency operations facility, control room, and plant security and the capability for engineering assessment activities, including damage control team planning and preparation. Consistent with NRC EPFAQ No. 2013-005, the EOF will satisfy the offsite notification responsibilities for the Alternative Facility. The Alternative Facility is located at Maroa Fire Hall, 308 East Washington Street, Maroa Illinois. **(CM-1, ref. AR 1362747.44)**

5.2 Assessment Resources

5.2.1 Onsite Meteorological Monitoring Instrumentation

Clinton Station shall maintain meteorological instrumentation to ensure that sufficient meteorological data is available. This system shall provide measurements and calculations for the following parameters:

- Wind direction and speed at the 10-meter and 60-meter levels
- Standard deviation of wind direction fluctuations at all measured levels
- Vertical temperature difference for at least one layer (50 meters)
- Ambient temperature (10 meters and 60 meters)
- Dew point temperature (10 meters)

- Pasquill stability class used for diffusion estimates

A tower 199 feet high with two levels of instrumentation has been erected with the base at 735 feet above mean sea level. There are no trees, tall obstructions or significant topographical features in the immediate vicinity of the tower.

The tower is instrumented at the 33 foot (10 meter) and 198 foot (60 meter) levels. Heating and ventilation are thermostatically controlled in the equipment building located at the base of the tower to provide a controlled environment for the signal translating equipment.

Meteorological parameters measured are transmitted to the 781-foot level of the control building via a dedicated telephone line. There the signals are received and converted to electrical signals, and fed individually to a microprocessor and chart recorders. The microprocessor is part of the CPS Process Radiation Monitoring System. This system calculates 10-minute averages of the meteorological parameters, and stores hourly averages on floppy disk. The meteorological system shall be equipped with instrumentation and operated by procedures to maximize the availability of meteorological data.

An emergency generator with auto-transfer switch has been installed to supply electric service upon loss of the distribution circuit. Surge suppressors have been installed on the power circuits at the tower and the equipment building. Recorders shall be located in the Main Control Room. Digital information shall be available through CRT output in the Main Control Room, TSC, and EOF. A magnetic tape or other electronic medium shall be in use to archive the data. The capability shall exist for retrieving meteorological data for input to the dose assessment model should any component of the data acquisition system fail.

A backup meteorological tower is located at the CPS site and is instrumented at the 33 foot (10 meter) level. The meteorological parameters measured are wind speed and wind direction. Sigma Theta is calculated from the changes in wind direction. All three of these variables are available in the Main Control Room envelope on a computer display.

Administrative arrangements have been made with the National Weather Service (NWS) office in Lincoln, Illinois, to provide CPS with meteorological measurements and forecast information on a 24-hour basis, if requested. This letter of agreement is maintained on file. These measurements are representative of CPS meteorology due to the homogeneity of the local terrain. Thus, the NWS data will serve as a back-up to the meteorological data measurements.

5.2.2 Onsite Radiation Monitoring Equipment

Clinton Station shall maintain various radiological monitoring systems that will monitor processes, areas and effluents. The constant air monitors (CAM) shall provide ambient air monitoring for detecting airborne

particulate radiation, iodine, and noble gases in Station areas or cubicles. Area radiation monitoring (ARM) instruments provide a local visual and audible alarm if their high radiation set points are exceeded. The process radiation monitors (PRM) provide monitoring of Station HVAC exhaust, standby gas treatment, pre- and post-treatment air ejector off-gas, Station service water, shutdown service water, and liquid radwaste discharge effluents. These radiological monitoring systems ensure that sufficient radiological data are available for estimating the danger to personnel and the public as a result of an incident or abnormal occurrence. Further, an alarm and/or automatic action is initiated when the setpoint of the equipment is exceeded. Portable survey instruments are identified in Table 12.5.2 of the USAR and are available for in-plant and offsite monitoring.

A computer network located in the Main Control Room provides an operator interface with select field units of the RMS. The Central Server of the computer network polls select field units and provides the radiation/radioactivity levels, alarm status, and monitor status to other computers within this network.

Hardwired input from the Accident Range system stack monitors provide radiological control alarm status information to the SPDS display for purposes of concise monitoring of this critical safety function.

5.2.2.1 Area Radiation Monitoring System (AR System)

These are three types of area radiation monitors (ARM) in the AR system:

1) Analog ARM
2) Fixed digital ARM
3) Portable digital ARM

5.2.2.2 Analog Area Radiation Monitors

There are analog ARMs on each of the fuel handling platforms and on the containment polar crane. Each monitor has a single GM detector. These monitors are independent from the rest of the RMS and are provided for the operators' safety. There are also associated interlocks on the lifting mechanisms on the fuel handling platforms.

5.2.2.3 Fixed Digital Area Radiation Monitor

There are numerous fixed ARMs throughout the Station utilizing GM detectors. ARMs have a range of 10^{-1} to $2.2 \times 10^{+3}$ mR/hr. The microprocessor associated with each ARM is designed to accept input from a second, high range detector with a range from to 10 to 10^{+4} R/hr. These additional, high range detectors can be added, as necessary. Select micro-processors communicate directly with the Main Control Room RMS Unit. Local indication and annunciation are also provided on each individual

microprocessor. All ARMs have integral battery power backup which can provide eight hours of operation.

5.2.2.4 Portable Digital Area Radiation Monitor

The portable digital ARMs are identical to the fixed digital ARMs. An ARM can be used as a stand alone monitor as long as a 120 VAC power supply is available. The portable ARMs can be tied into the communication network and communicate directly with the CR RMS Computer Network.

5.2.2.5 Process Radiation Monitoring System (PR System)

Certain Station processes are monitored to detect radiation/radioactivity in excess of acceptable limits. The PR system consists of 4 types of monitors:

a) off-line liquid sampling monitors

b) off-line gas sampling monitors

c) constant air monitors (CAM)

d) ventilation duct monitors

5.2.2.6 Off-line Liquid Sampling Monitors

The off-line liquid sampling monitors monitor process lines which are either direct release paths to the environment or are used to detect inter-system leakage. The detector is a sodium iodide gamma scintillator. The monitors draw a sample of the process liquid, measure the radioactivity, and normally return the sample to the process stream. The monitors provide local and remote indication of radioactivity levels in the process streams and provide alarms when predetermined levels are exceeded.

5.2.2.7 Off-line Gas Sampling Monitor

The off-line gas sampling monitor functions in the same manner as a liquid monitor except the sampled media is a gas from the process stream. The monitor utilizes a GM detector. The pretreatment air ejector off-gas monitor is an example of a monitor in the PR system that falls into this category. This monitor monitors the air ejector off-gas system downstream of the air ejectors and prior to the charcoal adsorbers.

5.2.2.8 Constant Air Monitors (CAM)

There are two types of CAMs,

a) Fixed digital CAM

b) Portable digital CAM

CAMs are provided to monitor the ambient air surrounding the monitor or to monitor gases in a ventilation duct or process stream. Each CAM contains a fixed particulate filter, iodine collection charcoal cartridge and the associated equipment to draw and maintain a constant sample flow. Each CAM, with the exception of the standby gas treatment system (SGTS) PRM and the common station heating, ventilation, air conditioning (HVAC) exhaust PRM, and Post Treat Off Gas PRM contain the following detectors:

a) Three detectors for measuring airborne radioactivity:
   1) Particulate: beta-scintillation detector
   2) Iodine: sodium iodide gamma-scintillation detector, gain stabilized
   3) Noble gas: beta-scintillation detector

b) Two detectors measuring background radiation for subsequent subtraction for the appropriate channels:
   1) Gamma (external): GM tube detector
   2) Alpha (naturally occurring Rn and Th): alpha - scintillation detector

The SGTS, HVAC, and Post Treat Off Gas PRM contains an additional noble gas channel.

The ventilation air discharge from various buildings is continuously monitored for radioactivity in the air. The two gaseous discharge paths are the common station HVAC and SGTS stack. The monitoring of these effluents provides a record of the gross radioactivity discharged through these paths into the environs. Post treat monitors provide a record of gross radioactivity downstream of the charcoal bed.

The portable digital CAMs are identical to the fixed digital CAMs with the exception of a strip chart recorder and communication capability.

5.2.2.9 Ventilation Duct Monitors

With the exception of Main Control Room Air Intake PRM, the ventilation duct monitors monitor gross gamma radioactivity in the ventilation system. Each ventilation duct monitor consists of four directionally shielded GM tubes oriented such that they monitor the radiation level inside the ducts. Each GM tube has its own microprocessor. An alarm by one channel in each division initiates an isolation signal if radiation levels exceed a predetermined value.

The Main Control Room Air Intake PRM has two unshielded GM detectors on each of the air intakes. With the above exception, the Main Control Room Air Intake PRMs are identical to the remainder of the ventilation duct monitors. The Main Control Room habitability is discussed in the USAR.

5.2.2.10 Main Steam Line Radiation Monitors (MSLRM)

The main steam lines located in the steam tunnel (downstream of outer isolation valves) between the nuclear reactor and the main turbine are monitored continuously for gamma radiation for the purpose of detecting increased radiation levels caused by gross fuel failures This system is separate from the PR system.

5.2.2.11 Primary Containment Atmosphere Monitoring (High-Range Gross Gamma Radiation Monitoring and Hydrogen Monitoring)

The gross gamma monitoring subsystem, consisting of two high range (1 R/hr to 10^8 R/hr) radiation detectors, in both the containment and drywell, for monitoring gamma radiation resulting from the gross release of fission products from the reactor fuel. Each subsystem has two redundant channels of instrumentation that are physically separated and electrically independent. Each channel provides a local measurement and transmits the signals to the Main Control Room where a permanent record is made on seismically qualified recorders.

The purpose of the containment atmosphere monitoring system is to assess the degree of core damage during a beyond design-basis accident and confirm that random or deliberate ignition has taken place. The hydrogen monitoring system provides the signals necessary to indicate and alarm high hydrogen concentration in the containment and drywell resulting from radiolytic and chemical phenomena associated with an accident condition. If an explosive mixture that could threaten containment integrity exists during a beyond design-basis accident, then other severe accident management strategies, such as purging and/or venting, would need to be considered. The hydrogen monitors are provided to implement these severe accident management strategies.

5.2.2.12 Station Survey and Counting Equipment

The Station Counting Room contains Germanium gamma spectrometer systems and gas-flow proportional counters for alpha and beta analysis. An alternate power supply for the Counting Room is provided from an essential power bus. Additionally, during emergency situations, samples may be taken to an alternate facility.

5.2.3 Onsite Process Monitors

There are many methods available to Control Room personnel to monitor critical reactor and Station parameters. These parameters, regardless where they are monitored, can be used by Control Room personnel to assess abnormal Station conditions and, based on these indications and their trained judgment, declare and classify emergencies as conditions dictate. A description of the process monitors used to initiate emergency conditions is found below:

a) Vessel Pressure - Reactor vessel pressure is monitored and indicated in four ranges:

1. For monitoring vessel pressure during normal operating conditions

   Range: 0-1200 psig

2. Narrow range monitoring of reactor pressure during power operations

   Range: 850-1050 psig

3. Wide range monitoring of reactor pressure during pressure transients

   Range: 0-1500 psig

4. Narrow range monitoring of reactor pressure during accident/transient conditions.

   Range: 0-300 psig

b) Vessel Temperature - The reactor vessel temperature is measured in four areas:

1. Vessel Bottom Head
2. Vessel Head Flange
3. Bottom Head Drain
4. Shell Flange

c) Reactor Water Level - There are five ranges available to measure reactor water level. The five types of reactor water level instrumentation are described below:

1. Narrow Range
   - (a) Range: 0" to +60"
   - (b) Used for feedwater control level inputs and is most precise indication of normal water level.
   - (c) Calibrated to read correctly at normal operating temperature and pressure.
2. Wide Range
   - (a) Range: -160" to +60"
   - (b) Provides ECCS and Reactor Protection System actuation and/or trip signals.
   - (c) Calibrated at normal operating temperature and pressure.
3. Shutdown Range
   - (a) Range: 0" to +400"
   - (b) Used for following level during flood up.
   - (c) Calibrated to read correctly when cold (120F) and 0 psig.
4. Upset Range
   - (a) Range: 0" to +180"
   - (b) Used following abnormal level increases during transient conditions.
   - (c) Calibrated to read correctly at normal operating temperature and pressure.

5. Fuel Zone

   (a) Range: Information Scale, -150" to +50" (Referenced to the top of active fuel); Second Scale Common Referenced to Wide Range, -310” to –110”.

   (b) Used by operators during accident/transients to take emergency operating procedure actions.

d) Flow Rates - Flow rates are monitored at many points in the reactor. The following is a list of critical flow rates available to the operator:

Recirculation Loop Flow	Total Steam Line Flow
Total Core Flow	ECCS Injection Flows
Steam Line Flow	Feedwater Flow

e) Containment/Drywell Temperature and Pressure - Temperature and pressure data for the containment and drywell are available to the Main Control Room operators.

5.2.4 Onsite Fire Detection Instrumentation

The fire protection system is designed to provide an adequate supply of water or other chemicals to points throughout the plant where fire protection may be required. Diversified fire-alarm and fire-suppression type systems are selected to suit the particular areas being protected or the hazards which could be encountered. The fire protection water is drawn from the ultimate heat sink that is sized to include 900,000 gallons of water for fire protection. The fire protection system consists of two 100% capacity diesel-driven fire pumps (primary fire protection system water supply), one connection to the plant service water, a dedicated pressure maintenance jockey pump, and the associated piping, valves, and hydrants.

Chemical fire-fighting systems, such as CO2 and Halon 1301, are also provided in areas, where water systems are not practical to suppress fires. Appropriate instrumentation and controls are provided for the proper operation of the fire detection, annunciation, and fire-fighting systems.

The fire-protection system is discussed in detail in USAR Subsection 9.5.1 and in the Clinton Station Fire Protection Evaluation Report, located in the USAR, Appendix E.

5.2.5 Facilities and Equipment for Offsite Monitoring

Consult the station specific Offsite Dose Calculation Manual (ODCM) for the most current location for fixed continuous air samplers and Dosimeter of Legal Record (DLR) locations. These fixed air samplers and DLR locations are maintained by Clinton Power Station personnel.

5.2.6 Site Hydrological Characteristics

The hydrological characteristics of the Clinton Station vicinity are described in Section 2.4 of the USAR. The site is located 6 miles east of the city of Clinton, DeWitt County in central Illinois. The site and its environs consist primarily of the generating station, Clinton Lake, woodlands, pasture land, cultivated farmland, and the recreational areas. The condenser cooling water is provided from the U-shaped cooling lake (Clinton Lake) that has been formed by construction of a dam just downstream from the confluence of North Fork of Salt Creek with Salt Creek. Clinton Lake has a surface area at normal lake level (690 feet mean sea level) of approximately 4895 acres with an average depth of about 15.6 feet. Clinton Lake is totally within the site property boundary. The station facilities and the 3.4-mile discharge flume occupy about 150 acres and 130 acres, respectively. The station is located between the two fingers of the lake with a station grade elevation of 736 feet and plant floor elevation of 737 feet. The station circulating water screen house is located on the North Fork finger of the lake with the circulating water discharging back into the Salt Creek finger through a discharge flume.

5.2.6.1 Flood Design Considerations

The cooling lake is designed to withstand the effects of a probable maximum storm occurring over the entire drainage basin above the dam site.

Results of the hydrologic analyses discussed in USAR Subsections 2.4.3 and 2.4.8 show that a probable maximum flood runoff into the lake routed through the spillways will raise the lake water level to elevation 708.8 feet at the dam site. The backwater effect along the North Fork finger will raise the probable maximum flood water level at the station site to elevation 708.9 feet. Superimposing the wind wave effect due to a sustained 40 mph wind acting on the probable maximum water level will result in wave run-up elevations of 711.9 feet and 713.8 feet for significant waves and maximum (1%) waves, respectively, at the station site. The station's Seismic Category I structures with grade elevation of 736 feet will not be affected by the probable maximum flood design conditions. The circulating water screen house is designed to withstand the effects of probable maximum flood.

The maximum run-up elevation at the dam for significant waves due to a sustained 40 mph wind acting on the probable maximum water level is elevation 711.0 feet. The top of the dam is at elevation 711.8 feet. In the Salt Creek basin, there are no existing or proposed dams upstream from the Clinton Station; therefore flood waves induced from dam failures that affect the safety-related structures are considered impossible.

Massive landslide from the valley walls into the cooling lake caused by a seismic disturbance is not possible because of lack of susceptible topographic and geological features. Thick glacial till available in the site precludes the possibility of massive landslides that can produce flood waves greater in magnitude than the probable maximum flood conditions and coincident wind wave effects.

Flooding due to tsunami is not possible at the site.

Based on considerations and studies made, the probable maximum flood condition in the lake is considered the controlling event. All the safety-related structures are protected against this event.

5.3 Protective Facilities and Equipment

The on-site assembly area is the Service Building 1st floor and the 762' elevation of the Radwaste Building as described in Section 4 of this Annex.

5.4 First Aid and Medical Facilities

Clinton Power Station has an inplant decontamination room located on the 737' of the Radwaste building. This room is provided with a sink and shower for decontamination purposes.

First aid kits, stretchers, sinks, eyewashes, and emergency showers have been placed in strategic locations throughout the station.

Medical treatment given to injured persons at the station is of a "first aid" nature. When more professional care is needed, injured persons are transported to a local hospital or clinic. Warner Hospital in Clinton, Illinois is the primary supporting medical facility. Decatur Memorial Hospital in Decatur, Illinois is the supporting Trauma Center.

Both hospitals agree in the event of a Radiological Event, including a hostile action based event, to ensure the capability for the evaluation of radiation exposure and uptake, including assurance that persons providing these services are adequately prepared to handle contaminated individuals and capable of providing medical support for any contaminated injured individual.

5.5 Law Enforcement Agencies

A Letter of Agreement is established for Local Law Enforcement to support Clinton Station to respond to a Radiological Event, including a Hostile Action Based Event, in conjunction with the National Incident Management System

upon notification by the station in accordance with the established communications protocol.

5.6 Fire Fighting Organizations

A Letter of Agreement is established for the Local Fire Department to respond to a Radiological Event, including a Hostile Action Based Event, and to initiate a request for Mutual Aid if additional resources are required as requested via the 911 Dispatch System.

5.7 Medical Transportation

A Letter of Agreement is established for Local Ambulance Department to provide Emergency Medical Services in response to a Radiological Event, including a Hostile Action Based Event.

This includes transportation of patients from the Clinton Power Station, including those who may have been exposed to radiation or may have injuries complicated by radioactive contamination to either Warner Hospital and/or Decatur Memorial Hospital by use of communications via the 911 Dispatch system.

Appendix 1: NUREG-0654 Cross-Reference

Annex Section	NUREG-0654	Annex Section	NUREG-0654
1.0	Part I, Section A	EP-AA-111	Part II, Section J.10.m
1.1	Part I, Section C		
1.2	Part I, Section D	Figure 4-1	Part II, Section J.5
1.3	Part II, Section A.1	4.4	Part II, Section J.2 & 3
Figure 1-1	Part I, Section D	Table 4-1	Part II, Section J.10.b
2.0	Part II, Section A.4	5.1	Part II, Section H.1 & G.3
2.1	Part II, Section A.3	5.2.1	Part II, Section H.5.a & 8
		5.2.2	Part II, Section H.5.b & I.2
3.0	Part II, Section D	5.2.3	Part II, Section H.5.c
		5.2.4	Part II, Section H.5.d
4.1	Part II, Section E.1 & J.7	5.2.5	Part II, Section H.6.b & 7
4.2	Part II, Section I.2 & 3	5.2.6	Part II, Section H.5.a & 6.a
4.3	Part II, Section J.10.m	5.3	Part II, Section J.1-5
4.3.1	Part II, Section E.6	5.4	Part II, Section L.1 & 2
4.3.2	Part II, Section J.8		
4.4	Part II, Section J.1-5		

Appendix 2: Station Letters of Agreement

1. DeWitt County Sheriff's Office - law enforcement
2. Warner Hospital of Clinton - medical services
3. Decatur Memorial Hospital - medical services
4. Clinton Fire Department - fire protection
5. Clinton Ambulance Department / DeWitt County EMS - ambulance services
6. Sargent & Lundy – technical services
7. Horton Field House – relocation center
8. Monticello High School – relocation center
9. Richland Community College – relocation center
10. National Weather Service – weather forecasts
11. Maroa Countryside Fire Protection District – property lease

ATTACHMENT 6

Radiological Emergency Plan Annex Revision

EP-AA-1004, Revision 36, *"Exelon Nuclear Radiological Emergency Plan Annex for Dresden Station"*

EXELON NUCLEAR

RADIOLOGICAL EMERGENCY PLAN ANNEX FOR DRESDEN STATION

Table of Contents

REVISION HISTORY

Revision 0; July 1980	Revision 15; September 12, 2002	
Revision 1; April 1981	Revision 16; July 31, 2003	
Revision 2; June 1982	Revision 17; August 27, 2003	
Revision 3; September 1984	Revision 18, December 2004	
Revision 4; March 1986	Revision 19, May 2005	
Revision 5; February 1987	Revision 20, December 2005	
Revision 6; January 1991	Revision 21, November 2006	
Revision 6a; July 1992	Revision 22, February 2007	
Revision 6b; August 1992	Revision 23, October 2007	
Revision 6c; November 1992	Revision 24, March 2008	
Revision 6d; April 1993	Revision 25, October 2008	
Revision 6e; December 1993	Revision 26, March 2010	
Revision 6f; January 1994	Revision 27, October 2010	
Revision 6g; January 1995	Revision 28, March 2011	
Revision 6i; February 1996	Revision 29, June 2012	
Revision 6j; June 1996	Revision 30, September 2012	
Revision 6k; January 1997	Revision 31, November 2012	
Revision 6l; February 1997	Revision 32, December 2012	
Revision 6m; May 1997	Revision 33, June 2013	
Revision 6n; January 5, 1998	Revision 34, June 2014	
Revision 6p; August 14, 1998	Revision 35, December 2014	
Revision 7; May 13, 1999	Revision 36, November 2017	
Revision 8; February 11, 2000		
Revision 9; May 22, 2000		
Revision 10; January 8, 2001		
Revision 11; May 3, 2001		
Revision 12; October 8, 2001		
Revision 13; October 31, 2001		
Revision 14; January 3, 2002		

Section 1: Introduction

As required in the conditions set forth by the Nuclear Regulatory Commission (NRC) for the operating licenses for the Exelon Nuclear Stations, the management of Exelon recognizes its responsibility and authority to operate and maintain the nuclear power stations in such a manner as to provide for the safety of the general public.

The Exelon Emergency Preparedness Program consists of the Exelon Nuclear Standardized Emergency Plan (Emergency Plan), Station Annexes, Emergency Plan Implementing Procedures, and associated program administrative documents. The Emergency Plan outlines the basis for response actions that would be implemented in an emergency. Planning efforts common to all Exelon Nuclear stations are encompassed within the Emergency Plan.

This document serves as the Dresden Station Annex and contains information and guidance that is unique to the station. This includes facility geography and location for a full understanding and representation of the station's emergency response capabilities. The Station Annex is subject to the same review and audit requirements as the Emergency Plan.

1.1 Facility Description

Dresden Station, Units 1, 2 and 3, is located in the Goose Lake Township of Grundy County in northeastern Illinois. Unit 1 is in permanent shutdown (see Figure 1-1).

The plant consists of three Boiling Water Reactor (BWR) Nuclear Steam Supply Systems (NSSS) and turbine generators provided by General Electric Company. Unit 1 is a dual cycle boiling water reactor designed for a power output of 700 MWt and has officially been retired as of August 31, 1984. Units 2 and 3 are equipped with nuclear steam supply systems (NSSS) designed for a power output of 2957 MWt.

The station property consists of a 953 acre tract of land with boundaries generally following the Illinois River to the north, the Kankakee River on the south and east and the Elgin, Joliet and Eastern Railway right-of-way on the west. Exelon is the sole owner of the 953 acre tract subject only to an easement of the U.S. Government for an access road to Dresden Island Lock and Dam maintained and operated by the U.S. Corps. of Engineers. This road traverses the site from north to south ~ 0.8 mile west of the plant.

In addition to ownership of the 953 acre tract, Exelon Nuclear also leases approximately 17 acres in two narrow strips of river frontage located near the northeast corner of the site from the State of Illinois. The terms of the lease provide that these "buffer" strips shall remain idle.

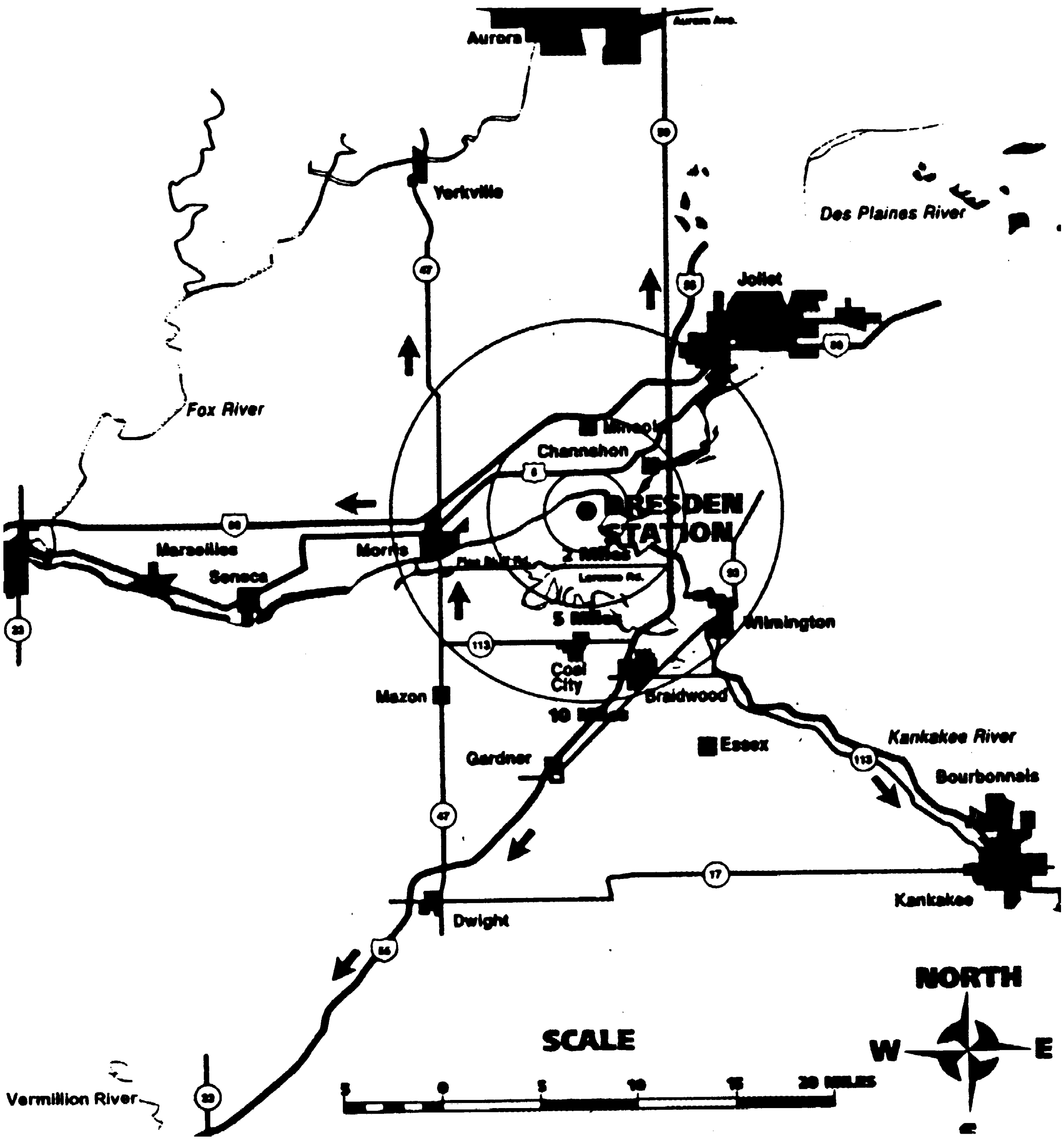
For more specific site location information, refer to the Station UFSAR.

1.2 Emergency Planning Zone

The plume exposure Emergency Planning Zone (EPZ) for Dresden Station is an area surrounding the Station with a radius of about ten miles. (Exact boundaries are determined by the State of Illinois). Refer to Figure 1-1.

The ingestion pathway EPZ for Dresden Station is an area surrounding the station with a radius of about 50 miles.

Figure 1-1: Dresden Station Location and 10 Mile EPZ



Section 2: Organizational Control of Emergencies

This section describes the Emergency Response Organization (ERO) and its key positions. It outlines the staffing requirements which provide initial emergency response actions and provisions for timely augmentation of on-shift personnel when required. It also describes interfaces among Exelon Nuclear emergency response personnel and specifies the offsite support available to respond to the nuclear generating stations.

2.1 Shift Organization Staffing

Initial response to any emergency is by the normal plant organization present at the site. This organization includes positions that are onsite 24 hours per day and is described in Section B.1 of the Exelon Nuclear Standardized Radiological Emergency Plan. The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes of the declaration of an Alert or higher emergency classification as specified under Table 2-1. ERO activation is described in Section H.4 of the Exelon Nuclear Standardized Radiological Emergency Plan.

Table 2-1 outlines ERO positions required to meet minimum staffing and full augmentation of the on-shift complement at an Alert or higher classification, and the major tasks assigned to each position. Responsibilities for each position are described in Section B.5 of the Exelon Nuclear Standardized Radiological Emergency Plan.

2.2 Emergency Response Organization Block Diagram

Figures B-1a through B-1d of the Exelon Nuclear Standardized Radiological Emergency Plan illustrates the overall emergency response organization.

2.3 Non-Exelon Nuclear Support Groups

Exelon Nuclear has contractual agreements with several companies whose services would be available in the event of a radiological emergency. These agencies and their available services are listed in Appendix 3 of the Emergency Plan.

Emergency response coordination with governmental agencies and other support organizations is discussed in Section A of the Emergency Plan.

Agreements exist on file at Dresden Station with several support agencies. These agencies and their support roles are listed in Appendix 2, Station Letters of Agreement.

Table 2-1: Minimum Staffing Requirements

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
1. Plant Operations/Safe Shutdown and Assessment of Operational Aspects	Control Room Staff	Shift Manager	1			
		Shift Supervisor	2			
		Nuclear Station Operator	4			
		Non-Licensed Operator	3			
2. Emergency Direction and Control	Command and Control	Shift Emergency Director (CR)	1[a]			
		Station Emergency Director (TSC)		1		
		Corporate Emergency Director (EOF)		1		
3. Notification & Communication	Emergency Communications	Plant Shift Personnel	1			
		TSC Director (TSC)		1		
		EOF Director (EOF)		1		
		State/Local Communicator		1 (EOF)		1 (TSC)
		ENS Communicator		1 (TSC)		1 (EOF)
		HPN Communicator		1 (EOF)		1 (TSC)
	Plant Status	OPs Communicator (CR/TSC)				2
		Operations Advisor (EOF)				1
	In-Plant Team Control	Damage Control Comm. (CR/TSC/OSC)				3
	Technical Activities	Technical Communicator (TSC)				1
		Technical Advisor (EOF)				1
	Governmental	State Environs Communicator (EOF)				(b)
		EOC Communicator (EOF)				1
		State EOC Liaison (State EOC)				(b)
		County EOC Liaison (County EOC)				(b)
		Regulatory Liaison (EOF)				1
4. Radiological Assessment	Offsite Dose Assessment	RP Personnel	1			
		Dose Assessment Coordinator (EOF)		1		
		Dose Assessor (EOF)				1
		Radiation Controls Coordinator (TSC)				1
	Offsite Surveys	Environmental Coordinator (EOF)		1		
		Field Team Communicator (EOF)				1
		Offsite Field Team Personnel		4		(b)
	Onsite Surveys	Onsite Field Team Personnel		2		(b)
	In-plant Surveys	RP Personnel	1	2		(b)
	Chemistry	Chemistry Personnel	1	1		(b)
	RP Supervisory	Radiation Protection Manager(TSC/EOF)		2		

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
5. Plant System Engineering, Repair, and Corrective Actions	Technical Support	STA / Incident Assessor (CR)	1			
		Technical Manager (TSC)		1		
		Core Thermal/Hydraulic Engineer (TSC)		1		
		Mechanical Engineer (TSC)		1		
		Electrical Engineer (TSC)		1		
		SAMG Decision-Maker (TSC)		1[(a)]		
		SAMG Evaluator (TSC)		2[(a)]		
		Operations Manager (TSC)		1		
		Radiation Controls Engineer (TSC)				1
		Technical Support Manager (EOF)				1
	Repair and Corrective Actions	Mechanical Maintenance (OSC)	1[(a)]	2		(b)
		Electrical/I&C Maintenance (OSC)	1[(a)]	3		(b)
		Maintenance Manager (TSC)		1		
		OSC Director (OSC)		1		
		Assistant OSC Director (OSC)				1
		OPs Lead & Support Personnel (OSC)				(b)
6. In-Plant Protective Actions	Radiation Protection	RP Personnel	2[(a)]	4		(b)
7. Fire Fighting	--	Fire Brigade[(c)]	5			
8. 1st Aid and Rescue Operations	--	Plant Personnel	2[(a)]			(b)
9. Site Access Control and Personnel Accountability	Security & Accountability	Security Team Personnel	(d)	(d)		
		Security Coordinator (TSC)				1
	EOF Security	Security Coordinator (EOF)				1
10. Resource Allocation and Administration	Logistics	Logistics Manager (EOF)		1		
		Logistics Coordinator (TSC)				1
	Administration	Administrative Coordinator (EOF)				1
		Clerical Staff (TSC/EOF/JIC)				(b)
	Inter Facility Logs	Events Recorder (EOF/JIC)				2
	Facility Support	Computer Specialist (EOF)				1

Functional Area	Major Tasks	Emergency Positions		Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
11. Public Information	Media Interface	Corporate Spokesperson	(JIC)			1	
		Rad Protection Spokesperson	(JIC)				1
		Technical Spokesperson	(JIC)				1
	Information Development	Public Information Director				1	
		News Writer					1
	Media Monitoring and Rumor Control	Media Monitoring Staff					(b)
		Rumor Control Staff					(b)
	Facility Operation and Control	JIC Director	(JIC)			1	
		JIC Coordinator	(JIC)				1
		Administrative Coordinator	(JIC)				1
		Access Controls	(JIC)				1
		Facility Support Staff	(JIC)				(b)
			TOTAL:	**20**	**37**	**3**	**32[(b)]**

* Response time is based on optimum travel conditions.

(a) May be provided by personnel assigned other functions.

(b) Personnel numbers depend on the type and extent of the emergency.

(c) Fire Brigade per FSAR/Technical Specifications, as applicable.

(d) Function performed by on-shift security personnel.

The Dresden Emergency Action Levels and supporting information are re-located in EP-AA-1004, Addendum 3.

Section 4: Emergency Measures

Exelon Nuclear emergency response actions are the same for all nuclear stations and are thus covered by Section E of the Emergency Plan.

4.1 Notification of the Emergency Organization

The Emergency Director is responsible for notifying the State of Illinois Emergency Management Agency (IEMA) via NARS. Grundy County, Kendall County, and Will County will also be notified via NARS; however, IEMA will maintain responsibility of county notification. At the Dresden Station, if a General Emergency is the initiating event, the Emergency Director is also responsible for notifying the following local agencies:

- Grundy County
- Kendall County
- Will County

4.2 Assessment Actions

Throughout each emergency situation, continuing assessment will occur. Assessment actions at Dresden Station may include an evaluation of plant conditions; in-plant, onsite, and initial offsite radiological measurements; and initial estimates of offsite doses. Core damage information is used to refine dose assessments and confirm or extend initial protective action recommendations. Dresden Station utilizes NEDC-33045P-A, Revision 0, (2001) as the basis for the methodology for post-accident core damage assessment. This methodology utilizes real-time plant indications. In addition, Dresden Station may use samples of plant fluids and atmospheres as inputs to the CDAM (Core Damage Assessment Methodology) program for core damage estimation.

4.3 Protective Actions for the Offsite Public

To aid the Emergency Response Organization during a developing emergency situation, EP-AA-111, "Emergency Classification and Protective Action Recommendations" has been developed based on Section J.10.m of the Emergency Plan.

4.3.1 Alert and Notification System (ANS) Sirens

This ANS consists of a permanently installed outdoor notification system within a ten mile radius around the station. The ten-mile radius around the station is a mix of agriculture and industry with a relatively low population distribution. The ANS, as installed, consists of mechanical and electronic sirens that will cover this entire area with a minimum sound level of 60 db. Additionally, the ANS will cover the heavily populated areas within the ten-mile radius around the station with a minimum sound level of 70 db to ensure complete coverage.

The ANS sirens are controlled and monitored on a daily basis, by a computerized telemetry system. The daily monitoring assures early failure detection and therefore maximizes system operability and reliability.

Backup means of notification is achieved through Route Alerting, which is contained within the State and respective counties' Radiological Emergency Response Plans and procedures. The means consists of utilizing vehicles with public address (PA) systems in the event the primary method of alerting and notification is unavailable. The backup method has the capability to alert and notify the public within the plume exposure pathway EPZ within a reasonable time, but does not need to meet the 15-minute design objective for the primary prompt public alert and notification system.

4.3.2 Evacuation Time Estimates

The ETE study used population data from the 2010 census which includes parts of three counties in Illinois (Will, Kendall and Grundy). The evacuation times are based on a detailed consideration of the EPZ roadway network and population distribution. The ETE Study, contained in EP-AA-1004 Addendum 2, Evacuation Time Estimates for the Dresden Generating Station Plume Exposure Pathway Emergency Planning Zone, presents evacuation times for daytime and nighttime scenarios under various weather conditions for the evacuation of various areas around the Dresden Station, once a decision has been made to evacuate.

4.4 Protective Actions for Onsite Personnel

Dresden Station has a siren system to assemble personnel during emergency conditions. Upon hearing a continuous two (2) minute siren, all personnel not having emergency assignments have been instructed to assemble in predesignated assembly areas. Refer to Figure 4-1.

Assembly of site personnel, for purposes of accountability and possible evacuation, is initiated per the requirements of Section J of the Emergency Plan. Accountability of site personnel is handled by the Dresden Station security force.

If a site evacuation of non-essential personnel is required by Section J of the Emergency Plan, personnel will be either relocated and monitored at the Relocation Centers or sent home if there is no release or radiological or safety concerns. The designated relocation centers for Dresden Station are:

- Mazon Relocation Center, Mazon, Illinois
- LaSalle County Nuclear Power Station, LaSalle Co. Illinois
- Braidwood Station, Braceville, Illinois

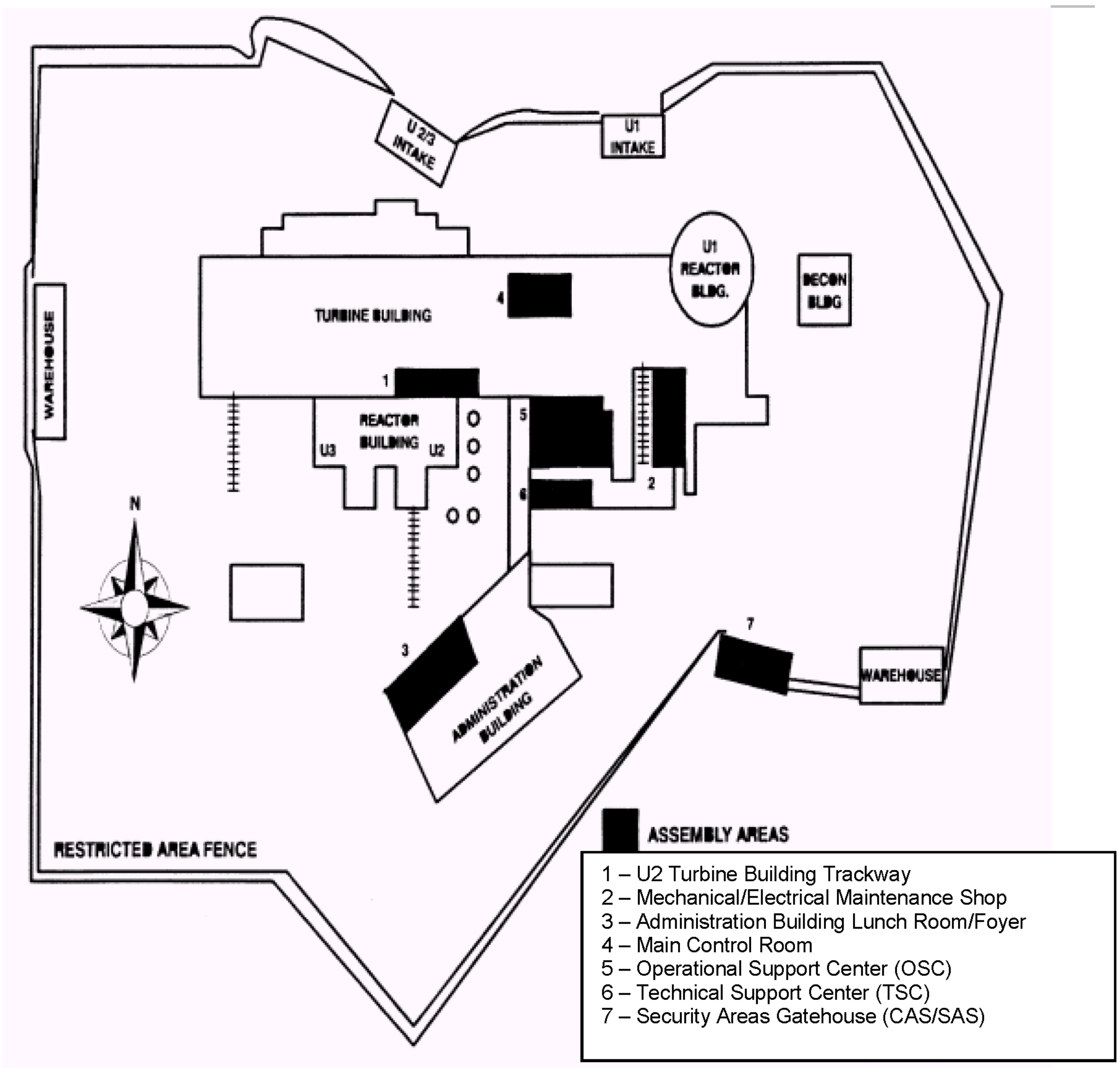
For evacuation routes, refer to EP-AA-113-F-19.

Traffic control for onsite areas will be handled by the Dresden Nuclear Power Station security force, if necessary.

Equipment and personnel would be available at LaSalle County Station, Braidwood Station, and the Mazon Relocation Center for monitoring and decontamination of evacuated personnel. If major decontamination, follow-up, or bioassay samples are necessary, those persons would be sent to LaSalle County Station or Braidwood Station.

Other emergency measures common to all nuclear stations are discussed in the Emergency Plan.

Figure 4-1: Dresden Onsite Assembly Areas and Emergency Response Facilities



Section 5: Emergency Facilities and Equipment

5.1 Emergency Response Facilities

Refer to Figure 4-1 for the location of the Dresden Station Control Room, Technical Support Center (TSC), and Operations Support Center (OSC) within the Station's Protected Area boundary.

5.1.1 Station Control Room

The Dresden Station Control Room is the initial onsite center of emergency control. The Dresden Station Units 2 and 3 Control Rooms are located at the 534' level at the east end of the Unit 2/3 Turbine Building.

5.1.2 Technical Support Center (TSC)

A Technical Support Center is located on the southwest corner of the Service Building at Elevation 518'. The TSC fully meets the requirements of Section H.1.b of the E-Plan.

5.1.3 Operational Support Center (OSC)

The Operational Support Center is located in the Radiation Protection Area and the Work Control Area. The OSC conforms to the requirements of Section H.1.c of the Emergency Plan and is the location to which operations support personnel will report during an emergency and from which they will be dispatched for assignments in support of emergency operations.

5.1.4 Alternative Facility

The Alternative Facility maintains the capability for staging the TSC/OSC emergency response organization personnel in the event of a hostile action. This alternative facility has the capability for communications with the emergency operations facility, control room, and plant security and the capability for engineering assessment activities, including damage control team planning and preparation. Consistent with NRC EPFAQ No. 2013-005, the EOF will satisfy the offsite notification responsibilities for the Alternative Facility. The Alternative Facility is located at 960 North Rt. 47 Morris, Illinois. **(CM-1, ref. AR 1362747.44)**

5.2 Assessment Resources

5.2.1 Onsite Meteorological Monitoring Instrumentation

The meteorological tower, located approximately 3000 ft. west of the reactor building, is 400 ft. high and is instrumented at three levels. The 35 ft., 150 ft. and 300 ft. levels correspond to the elevations of the possible points of airborne effluent release. Wind speed and wind direction are measured at all three elevations. Ambient temperature is measured at the 35 ft. level and differential temperatures referenced to 35 ft. are measured at 150 ft. and 300 ft. Precipitation is also measured at the site.

The onsite meteorological monitoring program is covered in the contract specification and vendor procedures of the meteorological monitoring contractor. These data are used to generate wind roses and to provide estimates of airborne concentrations of gaseous effluents.

5.2.1.1 Instrumentation

The meteorological tower is instrumented with equipment that conforms to the recommendations of Regulatory Guide 1.23 and ANSI/ANS 2.5 (1984). The equipment is placed on booms oriented into the generally prevailing wind at the site. Equipment signals are brought to an instrument building with controlled environmental conditions. The building at the base of the tower houses the analog and digital recording equipment, signal conditioners, and other equipment used to process and re-transmit the data to the end point users.

5.2.1.2 Meteorological Measurement Program During a Disaster

Cooperation between the corporate office and the meteorological contractor assures that a timely restoration of any outage can be made. Emergency field visits to the site are made as quickly as possible after detection of a failure.

Should a disaster of sufficient magnitude occur to destroy the tower structure, a contract is maintained to have a temporary tower erected within 72 hours, weather conditions permitting. Further, the meteorological contractor maintains two levels of sensors (wind speed, wind direction and temperature) in a state of readiness for use on the temporary tower.

Additionally, Exelon Nuclear's existing instrumentated towers at other nuclear sites provide a measurement network with multiple backup opportunities.

Meteorological data is available to the station Control Room, Technical Support Center, and Emergency Operations Facility for use in the Dose Assessment Computer Model for estimating the environmental impact of unplanned releases of radioactivity from the station.

5.2.2 Onsite Radiation Monitoring Equipment

5.2.2.1 Radiation Monitoring System

Onsite radiation monitoring systems at Dresden can be categorized into four systems:

- A process radiological monitoring and sample system;
- An effluent radiological monitoring and sampling system;
- An airborne radioactive monitoring system;
- An area radiation monitoring system; and
- A supply of portable survey and counting equipment.

5.2.2.2 Radiological Noble Gas Effluent Monitoring

A wide range monitor is installed in the effluent stream that enters the main chimneys and the reactor building vents. These wide range monitors have a range of $1x10^{-7}$ uCi/cc to $1x10^{5}$ uCi/cc.

The method of converting instrument readings to release rates will be determined after the energy responses of the detector are obtained. Due to system design, the monitors give an estimate of a release. Actual releases will be determined by periodically collecting grab samples, counting the samples collected and calculating the releases.

5.2.2.3 Radioiodine and Particulate Effluent Monitoring

Effluent sampling media are analyzed in the Station counting room. Silver based cartridges are available to reduce the interference of noble gases.

5.2.2.4 High-Range Containment Radiation Monitors

Two high range containment radiation monitors are installed on each of Dresden's units. The range of these monitors is from 1 R/hr to 10^{8} R/hr.

5.2.2.5 In-plant Iodine Instrumentation

Dresden Station has the capability to sample and determine iodine concentrations in the plant using charcoal cartridges and gamma ray spectroscopy. Portable monitors may be used to measure increasing levels of iodine during emergency conditions.

5.2.3 Onsite Process Monitors

Adequate monitoring capability exists to properly assess the plant status for the modes of operation. The operability of the post-accident instrumentation ensures information is available on selected plant parameters to monitor and assess important variables following an accident. Instrumentation is available to monitor the parameters and ranges given in the Dresden Station Technical Specifications.

Station procedures have been developed which would aid personnel in recognizing inadequate core cooling using applicable instrumentation.

5.2.4 Onsite Fire Detection Instrumentation

Dresden Station has a fire protection system that is designed to quickly detect any fires; annunciating locally and in the Control Room. The fire detection system is designed to applicable National Fire Protection Association (NFPA) standards. The majority of the detectors consist of electrically supervised ionization smoke detectors.

5.2.5 Facilities and Equipment for Offsite Monitoring

Consult the Offsite Dose Calculation Manual (ODCM) for the most current location for fixed continuous air samplers and DLR.

5.2.6 Site Hydrological Characteristics

The hydrological characteristics of Dresden Station are described in Section 2.4 of the Dresden UFSAR. The Dresden site at the confluence of the DesPlaines and Kankakee rivers is at the location considered to divide the upper and lower parts of the Illinois River system. The normal river pool elevation controlled at the adjacent Dresden Island Lock and Dam is nominally 505 feet. In December 1982, the Dresden site was subjected to flood waters that exceeded 509 feet establishing a maximum historical flood elevation. Nominal ground elevation is about 516 feet at the location of the principal structures of Units 2 and 3, and design plant grade is 517 feet. Consequently the probability of flooding critical areas of the site is remote.

Spillway capacity at the Dresden Island Lock and Dam is well in excess of the estimated maximum instantaneous flow of the Illinois River. The site elevation is well above the vast valley storage area upstream from the dam.

River system flow data applicable to the site are more than adequate to meet the cooling water requirements of the two operating units, to assure the availability of sufficient quantities of water for dilution of all radioactive liquid wastes discharged into the Illinois River within the limits in 10 CFR 20, and to reduce concentrations to approximately one one-thousandth of the maximum permissible concentration in the river below the point of discharge from the station.

The closest point downstream of the station where the Illinois River is used as a source of domestic water is Peoria which is 100 miles downstream. At this point the combined effects of dilution, mixing, radioactive decay, and deposition of radioactivity on the river bottom will have rendered the contribution of radioactivity by the station negligible in relation to that present in the Illinois River from other sources.

5.2.6.1 Probable Maximum Flood on Streams and Rivers

Since the site probable maximum flood (PMF) elevation of 528'-0" is above the plant grade (elevation 517'0") and above the lowest opening leading to safety-related equipment (elevation 509'-0"), the safe operation of the plant during the PMF is accomplished via implementation of the flood emergency procedures.

5.2.6.2 Potential Dike and Dam Failures, Seismically Induced

An earth dam of the type specified usually does not collapse in its entirety. A break occurs and widens as the water washes through the break. This tends to prolong the time it would take to empty the lake; nevertheless, instantaneous dike losses have been considered since the dikes are not constructed to Class I criteria.

The Dresden lock and dam are concrete structures that are operated and maintained by the U.S. Army Corps of Engineers. Operations response procedures are in place to deal with loss of the cooling lake and/or the lock and dam.

5.2.6.3 Ice Effects

An 8-foot diameter deicing line connects the discharge canal headworks and the crib house forebay. Its high point is in the headworks at elevation 495'-0" and its low point is in the forebay at elevation 489'-0". A slide gate valve is used to isolate the deicing line when not in use.

5.2.6.4 Cooling Lake

The purpose of the cooling lake is to provide adequate cooling of the circulating and service water before discharge to the Illinois River. The water discharged to the river must meet state requirements. The lake is connected to the intake and discharge canals for Units 2 and 3 by two canals (the "hot" and "cold"

canals). The level of the lake is maintained by a concrete spillway located adjacent to the lift station and between the cold canal and the north end of the lake. The spillway is equipped with weir gates that can be lowered to block some of the spillover to maintain the level of the lake. The weir gates can be manually operated if necessary. Operations response procedures are in place regarding loss of lake level control and/or loss of the lift station.

A discussion of the groundwater resources and aquifers in the vicinity of Dresden Station is discussed in the Final Environmental Statement.

5.3 Protective Facilities and Equipment

The onsite assembly areas for Dresden Station are described in Section 4 of this annex. The offsite evacuation assembly areas for Dresden Station are discussed in Section 4 of this annex. These areas are outside the plume exposure Emergency Planning Zone and equipped with monitoring, decontamination and bioassay capabilities.

5.4 First Aid and Medical Facilities

Dresden Station has an inplant decon room located in a room adjacent to the Radiation Protection Office. This room is provided with a sink, decontamination shower, and a supply cabinet.

First aid kits, stretchers, sinks, eyewashes, and emergency showers have been placed in strategic locations throughout the station.

Medical treatment given to injured persons at the station is of a "first aid" nature. When more professional care is needed, injured persons are transported to a local hospital or clinic. Morris Hospital in Morris, Illinois is the Dresden Station primary supporting medical facility for radioactively contaminated injured persons. Presence St. Joseph Medical Center in Joliet, Illinois is the backup medical facility. Both hospitals agree in the event of a Radiological Event, including a hostile action based event, to ensure the capability for the evaluation of radiation exposure and uptake, including assurance that persons providing these services are adequately prepared to handle contaminated individuals and capable of providing medical support for any contaminated injured individual

5.5 Law Enforcement Agencies

A Letter of Agreement is established for Local Law Enforcement to support Dresden Station to respond to a Radiological Event, including a Hostile Action Based Event, in conjunction with the National Incident Management System upon notification by the station in accordance with the established communications protocol

5.6 Fire Fighting Organizations

A Letter of Agreement is established for the Local Fire Department to respond to a Radiological Event, including a Hostile Action Based Event, in conjunction with the Mutual Aid Box Alarm System (MABAS). Coordination of activities will be in accordance with the Unified Command Structure

5.7 EMS Support

A Letter of Agreement is established for the Local Fire Department to provide Emergency Medical Services in response to a Radiological Event, including a Hostile Action Based Event. This includes transportation of patients from the Dresden Station, including those who may have been exposed to radiation or may have injuries complicated by radioactive contamination, to Morris Hospital or to Presence St. Joseph’s Medical Center in Joliet upon request through established protocols

Appendix 1: NUREG-0654 Cross-Reference

Annex Section	NUREG-0654
1.0	Part I, Section A
1.1	Part I, Section C
1.2	Part I, Section D
Figure 1-1	Part I, Section D
2.0	Part II, Section A.4
2.1	Part II, Section A.3
3.0	Part II, Section D
4.1	Part II, Section E.1 & J.7
4.2	Part II, Section I.2 & 3
4.3	Part II, Section J.10.m
4.3.1	Part II, Section E.6
4.3.2	Part II, Section J.8
4.4	Part II, Section J.1-5
EP-AA-111	Part II, Section J.10.m
Figure 4-1	Part II, Section J.5
4.4	Part II, Section J.2 & 3
EP-AA-1004, Addendum 2	Part II, Section J.8
EP-AA-1004, Addendum 2	Part II, Section J.10.b
5.1	Part II, Section H.1 & G.3
5.2.1	Part II, Section H.5.a & 8
5.2.2	Part II, Section H.5.b & I.2
5.2.3	Part II, Section H.5.c
5.2.4	Part II, Section H.5.d
5.2.5	Part II, Section H.6.b & 7
5.2.6	Part II, Section H.5.a & 6.a
5.3	Part II, Section J.1-5
5.4	Part II, Section L.1 & 2

Appendix 2: Station Letters of Agreement

1. US Army Corps of Engineers - provide information regarding failure of or problems with the Dresden Lock and Dam.
2. Will County Sheriff's Office - provides services of law enforcement.
3. Grundy County Sheriff - services of law enforcement.
4. Morris Hospital of Morris, Illinois, acts as the primary supporting medical facility for Dresden Station.
5. Presence St. Joseph Medical Center of Joliet, Illinois, acts as the back-up supporting medical facility for Dresden Station.
6. General Electric Midwest Fuel Reprocessing Plant - Health Physics support - instrumentation and limited technical assistance.
7. Coal City Fire Protection and Ambulance District - Fire protection and advanced life support for transportation of accident victims.

ATTACHMENT 7

Radiological Emergency Plan Annex Revision

EP-AA-1005, Revision 40, *"Exelon Nuclear Radiological Emergency Plan Annex for LaSalle Station"*

EXELON NUCLEAR

RADIOLOGICAL EMERGENCY PLAN ANNEX FOR LASALLE STATION

Page Intentionally Left Blank

Table of Contents

REVISION HISTORY

Revision 0: July 1980	Revision 22, September, 2006	
Revision 1: April 1981	Revision 23, not implemented	
Revision 2: December 1981	Revision 24, May 2007	
Revision 3: October 1984	Revision 25, October 2007	
Revision 4: March 1986	Revision 26, March 2008	
Revision 5: February 1987	Revision 27, October 2008	
Revision 6: March 1991	Revision 28, February 2009	
Revision 6a: November 1992	Revision 29, June 2009	
Revision 6b: March 1993	Revision 30, March 2010	
Revision 6c: December 1993	Revision 31, October 2010	
Revision 6d: January 1994	Revision 32, April 2011	
Revision 6e: October 1994	Revision 33, February 2012	
Revision 6f: December 1995	Revision 34, November 2012	
Revision 6g: January 1996	Revision 35, December 2012	
Revision 6h: February 1996	Revision 36, June 2013	
Revision 6i: June 1996	Revision 37, June 2014	
Revision 6j: February 1997	Revision 38, December 2014	
Revision 6k: January 5, 1998	Revision 39, April 2016	
Revision 6l: August 14, 1998	Revision 40, November 2017	
Revision 7; May 13, 1999		
Revision 8; January 8, 2001		
Revision 9; May 7, 2001		
Revision 10; October 8, 2001		
Revision 11; October 31, 2001		
Revision 12; January 3, 2002		
Revision 13; July 22, 2002		
Revision 14; September 09, 2002		
Revision 15; June 30, 2003		
Revision 16; August 27, 2003		
Revision 17, December 2004		
Revision 18, May 2005		
Revision 19, September 2005		
Revision 20, January, 2006		
Revision 21, March, 2006		

Section 1: Introduction

As required in the conditions set forth by the Nuclear Regulatory Commission (NRC) for the operating licenses for the Exelon Nuclear Stations, the management of Exelon recognizes its responsibility and authority to operate and maintain the nuclear power stations in such a manner as to provide for the safety of the general public.

The Exelon Emergency Preparedness Program consists of the Exelon Nuclear Standardized Emergency Plan (Emergency Plan), Station Annexes, emergency plan implementing procedures, and associated program administrative documents. The Emergency Plan outlines the basis for response actions that would be implemented in an emergency. Planning efforts common to all Exelon Nuclear stations are encompassed within the Emergency Plan.

This document serves as the LaSalle Station Annex and contains information and guidance that is unique to the station. This includes facility geography and location for a full understanding and representation of the station's emergency response capabilities. The Station Annex is subject to the same review and audit requirements as the Emergency Plan.

1.1 Facility Description

The LaSalle Station, Units 1 and 2, is located in Brookfield Township of LaSalle County in northeastern Illinois.

It is approximately 55 direct-line miles southwest of Chicago and 20 miles west of Dresden Station. The plant is on flat terrain about 220 feet above the Illinois River channel which traverses north central Illinois some 3 1/2 miles to the north of the site. Figure LA 1-1 shows the site location.

The LaSalle Station utilizes two single cycle forced circulation Boiling Water Reactors (BWR), each rated at 3546 MWt. The design electrical rating of each unit is 1190 MWe; the net output is 1154 MWe from each General Electric (GE) turbine generator. The Nuclear Steam System Supplier (NSSS) was GE (Nuclear Energy Division). The entire plant, except for the NSSS, was designed by Sargent & Lundy (S & L) Engineers.

The containment design employs the BWR Mark II concept of over/under pressure suppression with multiple downcomers connecting the reactor drywell to the water filled pressure suppression chamber. The primary containment is a steel lined, post-tensioned, concrete enclosure, housing the reactor and the suppression pool. This primary containment is entirely enclosed in the reinforced concrete reactor building that is the secondary containment structure.

The power generation complex includes several contiguous buildings, including two Reactor Buildings, an Auxiliary Building (housing the Control Room), the Turbine Building, Diesel Generator Buildings, the Radwaste Building, the Service Building, and the Offgas Building. Other buildings such as the gatehouse, warehouses, etc., are also located in the general plant area.

A Lake Screen House on the intake flume is located about 800 feet east of the main building complex. A small river screen house, located on the Illinois River, provides makeup water to the cooling lake for the LaSalle Station.

Condenser cooling for the station is provided from a perched cooling lake of 2058 acres. The ultimate heat sink for emergency core cooling is a submerged pond and intake flume of 458 acre-feet capacity that underlies the cooling lake and the natural grade of the site.

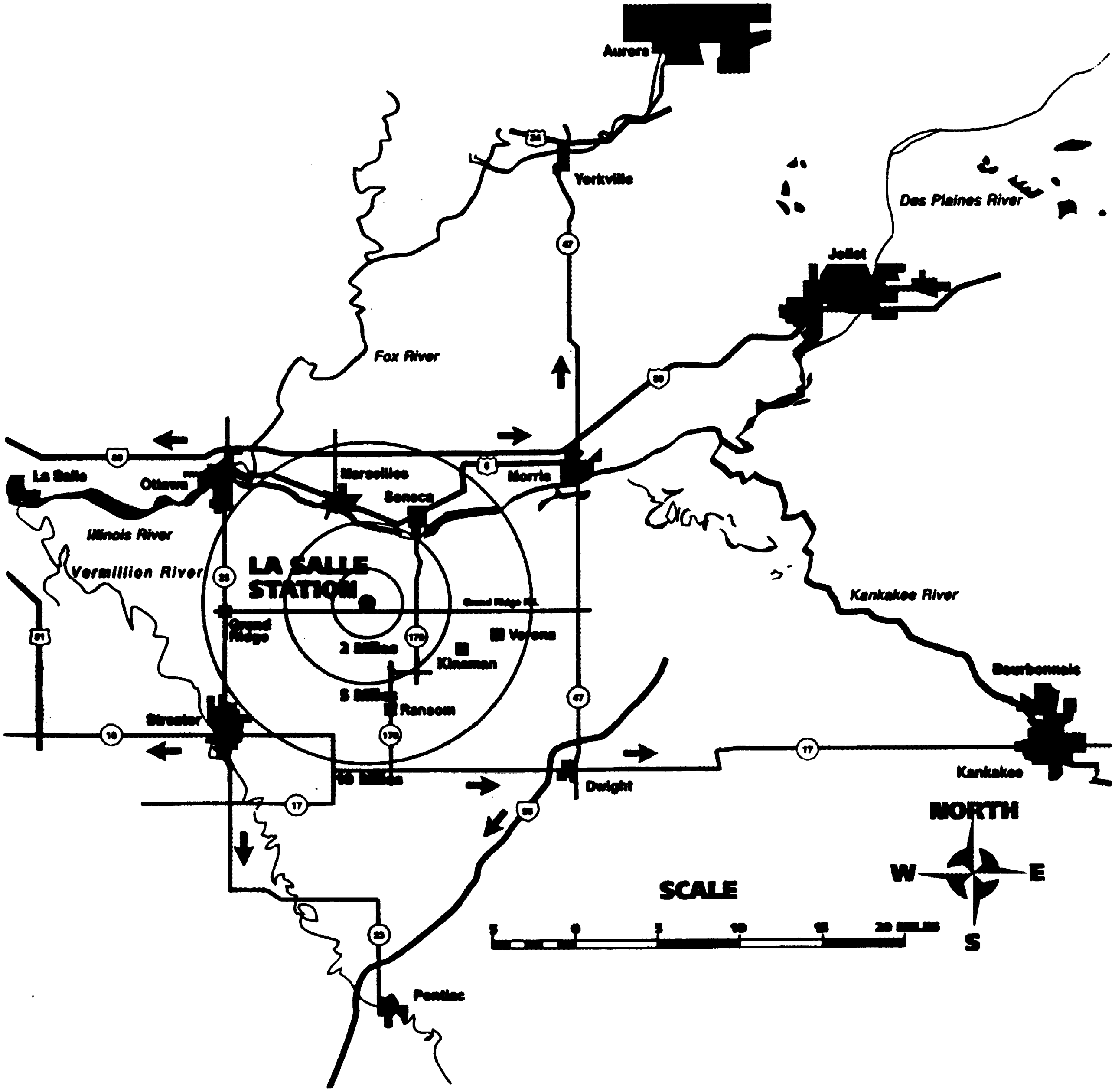
The LaSalle Station utilizes a single vent stack for elevated release of all gaseous waste. Liquid radwaste is stored for decay prior to release to the Illinois River or concentrated to solid waste for controlled disposal at regulated storage sites. For more specific site location information, refer to the Station UFSAR.

1.2 Emergency Planning Zone

The plume exposure Emergency Planning Zone (EPZ) for LaSalle Station is an area surrounding the Station with a radius of about ten miles. (Exact boundaries are determined by the State of Illinois). Refer to Figure 1-1.

The ingestion pathway EPZ for LaSalle Station is an area surrounding the Station with a radius of about 50 miles.

Figure 1-1: LaSalle Station Location and 10 Mile EPZ



Section 2: Organizational Control of Emergencies

This section describes the Emergency Response Organization (ERO) and its key positions. It outlines the staffing requirements which provide initial emergency response actions and provisions for timely augmentation of on-shift personnel when required. It also describes interfaces among Exelon Nuclear emergency response personnel and specifies the offsite support available to respond to the nuclear generating stations.

2.1 Shift Organization Staffing

Initial response to any emergency is by the normal plant organization present at the site. This organization includes positions that are onsite 24 hours per day and is described in Section B.1 of the Exelon Nuclear Standardized Radiological Emergency Plan. The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 minutes following the declaration of an Alert or higher emergency classification as specified under Table 2-1. ERO activation is described in Section H.4 of the Exelon Nuclear Standardized Radiological Emergency Plan.

Table 2-1 outlines ERO positions required to meet minimum staffing and full augmentation of the on-shift complement at an Alert or higher classification, and the major tasks assigned to each position. Responsibilities for each position are described in Section B.5 of the Exelon Nuclear Standardized Radiological Emergency Plan.

2.2 Emergency Response Organization Block Diagram

Figures B-1a through B-1d of the Exelon Nuclear Standardized Radiological Emergency Plan illustrates the overall emergency response organization.

2.3 Non-Exelon Nuclear Support Groups

Exelon Nuclear has contractual agreements with several companies whose services would be available in the event of a radiological emergency. These agencies and their available services are listed in Appendix 3 of the Emergency Plan.

Emergency response coordination with governmental agencies and other support organizations is discussed in Section A of the Emergency Plan.

Agreements exist on file at LaSalle Station with several support agencies. These agencies and their support roles are listed in Appendix 2, Station Letters of Agreement.

Table 2-1: Minimum Staffing Requirements

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing		Full Augmentation
				*60 Minute Augmentation	Other On-Call	
1. Plant Operations/Safe Shutdown and Assessment of Operational Aspects	Control Room Staff	Shift Manager	1			
		Shift Supervisor	1			
		Nuclear Station Operator	3			
		Non-Licensed Operator	3			
2. Emergency Direction and Control	Command and Control	Shift Emergency Director (CR)	1[a]			
		Station Emergency Director (TSC)		1		
		Corporate Emergency Director (EOF)		1		
3. Notification & Communication	Emergency Communications	Plant Shift Personnel	1			
		TSC Director (TSC)		1		
		EOF Director (EOF)		1		
		State/Local Communicator		1 (EOF)		1 (TSC)
		ENS Communicator		1 (TSC)		1 (EOF)
		HPN Communicator		1 (EOF)		1 (TSC)
	Plant Status	OPs Communicator (CR/TSC)				2
		Operations Advisor (EOF)				1
	In-Plant Team Control	Damage Control Comm. (CR/TSC/OSC)				3
	Technical Activities	Technical Communicator (TSC)				1
		Technical Advisor (EOF)				1
	Governmental	State Environs Communicator (EOF)				(b)
		EOC Communicator (EOF)				1
		State EOC Liaison (State EOC)				(b)
		County EOC Liaison (County EOC)				(b)
		Regulatory Liaison (EOF)				1
4. Radiological Assessment	Offsite Dose Assessment	RP Personnel	1			
		Dose Assessment Coordinator (EOF)		1		
		Dose Assessor (EOF)				1
		Radiation Controls Coordinator (TSC)				1
	Offsite Surveys	Environmental Coordinator (EOF)		1		
		Field Team Communicator (EOF)				1
		Offsite Field Team Personnel		4		(b)
	Onsite Surveys	Onsite Field Team Personnel		2		(b)
	In-plant Surveys	RP Personnel	1	2		(b)
	Chemistry	Chemistry Personnel	1	1		(b)
	RP Supervisory	Radiation Protection Manager(TSC/EOF)		2		

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
5. Plant System Engineering, Repair, and Corrective Actions	Technical Support	STA / Incident Assessor (CR)	1			
		Technical Manager (TSC)		1		
		Core Thermal/Hydraulic Engineer (TSC)		1		
		Mechanical Engineer (TSC)		1		
		Electrical Engineer (TSC)		1		
		SAMG Decision-Maker (TSC)		1[a]		
		SAMG Evaluator (TSC)		2[a]		
		Operations Manager (TSC)		1		
		Radiation Controls Engineer (TSC)				1
		Technical Support Manager (EOF)				1
	Repair and Corrective Actions	Mechanical Maintenance (OSC)	1[a]	2		(b)
		Electrical/I&C Maintenance (OSC)	1[a]	3		(b)
		Maintenance Manager (TSC)		1		
		OSC Director (OSC)		1		
		Assistant OSC Director (OSC)				1
		OPs Lead & Support Personnel (OSC)				(b)
6. In-Plant Protective Actions	Radiation Protection	RP Personnel	2[a]	4		(b)
7. Fire Fighting	--	Fire Brigade[c]	5			
8. 1st Aid and Rescue Operations	--	Plant Personnel	2[a]			(b)
9. Site Access Control and Personnel Accountability	Security & Accountability	Security Team Personnel	(d)	(d)		
		Security Coordinator (TSC)				1
	EOF Security	Security Coordinator (EOF)				1
10. Resource Allocation and Administration	Logistics	Logistics Manager (EOF)		1		
		Logistics Coordinator (TSC)				1
	Administration	Administrative Coordinator (EOF)				1
		Clerical Staff (TSC/EOF/JIC)				(b)
	Inter Facility Logs	Events Recorder (EOF/JIC)				2
	Facility Support	Computer Specialist (EOF)				1

Functional Area	Major Tasks	Emergency Positions		Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
11. Public Information	Media Interface	Corporate Spokesperson	(JIC)			1	
		Rad Protection Spokesperson	(JIC)				1
		Technical Spokesperson	(JIC)				1
	Information Development	Public Information Director				1	
		News Writer					1
	Media Monitoring and Rumor Control	Media Monitoring Staff					(b)
		Rumor Control Staff					(b)
	Facility Operation and Control	JIC Director	(JIC)			1	
		JIC Coordinator	(JIC)				1
		Administrative Coordinator	(JIC)				1
		Access Controls	(JIC)				1
		Facility Support Staff	(JIC)				(b)
			TOTAL:	**18**	**37**	**3**	**32[(b)]**

* Response time is based on optimum travel conditions.

(a) May be provided by personnel assigned other functions.

(b) Personnel numbers depend on the type and extent of the emergency.

(c) Fire Brigade per FSAR/Technical Specifications, as applicable.

(d) Function performed by on-shift security personnel.

Section 3: Classification of Emergencies

The LaSalle Emergency Action Levels and supporting information are re-located in EP-AA-1005, Addendum 3.

Section 4: Emergency Measures

Exelon Nuclear emergency response actions are the same for all nuclear stations and are thus covered by Section E of the Emergency Plan.

4.1 Activation and Notification of the Emergency Organization

The Emergency Director is responsible for notifying the State of Illinois Emergency Management Agency (IEMA) via NARS. LaSalle County and Grundy County will also be notified via NARS; however, IEMA will maintain responsibility of county notification. At the LaSalle Station, if a General Emergency is the initiating event, the Emergency Director is also responsible for notifying the following offsite agencies:

- LaSalle County
- Grundy County

4.2 Assessment Actions

Throughout each emergency situation, continuing assessment will occur. Assessment actions at LaSalle Station may include an evaluation of plant conditions; in-plant, onsite, and initial offsite radiological measurements; and initial estimates of offsite doses. Core damage information is used to refine dose assessments and confirm or extend initial protective action recommendations. LaSalle Station utilizes NEDC-33045P-A, Revision 0, (2001) as the basis for the methodology for post-accident core damage assessment. This methodology utilizes real-time plant indications. In addition, LaSalle Station may use samples of plant fluids and atmospheres as inputs to the CDAM (Core Damage Assessment Methodology) program for core damage estimation.

4.3 Protective Actions for the Offsite Public

To aid the Emergency Response Organization during a developing emergency situation, EP-AA-111, "Emergency Classification and Protective Action Recommendations" has been developed based on Section J.10.m of the Emergency Plan.

4.3.1 Alert and Notification System (ANS) Sirens

The ANS consists of a permanently installed outdoor notification system within the ten mile radius around the station. The ten mile radius around the station is primarily an agricultural area with a population density below 2000 persons per square mile. The ANS as installed consists of mechanical and electronic sirens which will cover this entire area with a minimum sound level of 60 db. Additionally, the ANS will cover the heavily populated areas within the ten mile radius around the station with a minimum sound level of 70 db to ensure complete coverage.

Once the public has tuned to designated radio stations in an emergency, detailed instructional messages will be given to the public. State and local procedures provide for these messages.

Backup means of notification is achieved through Route Alerting, which is contained within the State and respective counties' Radiological Emergency Response Plans and procedures. The means consists of utilizing vehicles with public address (PA) systems in the event the primary method of alerting and notification is unavailable. The backup method has the capability to alert and notify the public within the plume exposure pathway EPZ within a reasonable time, but does not need to meet the 15-minute design objective for the primary prompt public alert and notification system.

4.3.2 Evacuation Time Estimates

The ETE study used population data from the 2010 census which includes parts of two counties in Illinois (LaSalle and Grundy). The evacuation times are based on a detailed consideration of the EPZ roadway network and population distribution. The ETE Study, contained in EP-AA-1005 Addendum 2, Evacuation Time Estimates for the LaSalle County Generating Station Plume Exposure Pathway Emergency Planning Zone, presents evacuation times for daytime and nighttime scenarios under various weather conditions for the evacuation of various areas around the LaSalle Station, once a decision has been made to evacuate.

4.4 Protective Actions for Onsite Personnel

LaSalle Station has a siren system to warn personnel of emergency conditions. Upon hearing a continuous two (2) minute siren, or receiving notification by other means of communication, all personnel not having emergency assignments have been instructed to assemble in a predesignated assembly area. The onsite assembly area for LaSalle Station is the Service Building Trackway on 710' elevation of the South Service Building. Refer to Figure 4-1. Accountability of site personnel is accomplished by the Station Security force.

If a site evacuation of non-essential personnel is required, personnel will be released to their homes or relocated and monitored at a relocation center.

The designated relocation centers for LaSalle Station are:

- Mazon Relocation Center, Mazon, Illinois
- Dresden Station, Morris, Illinois

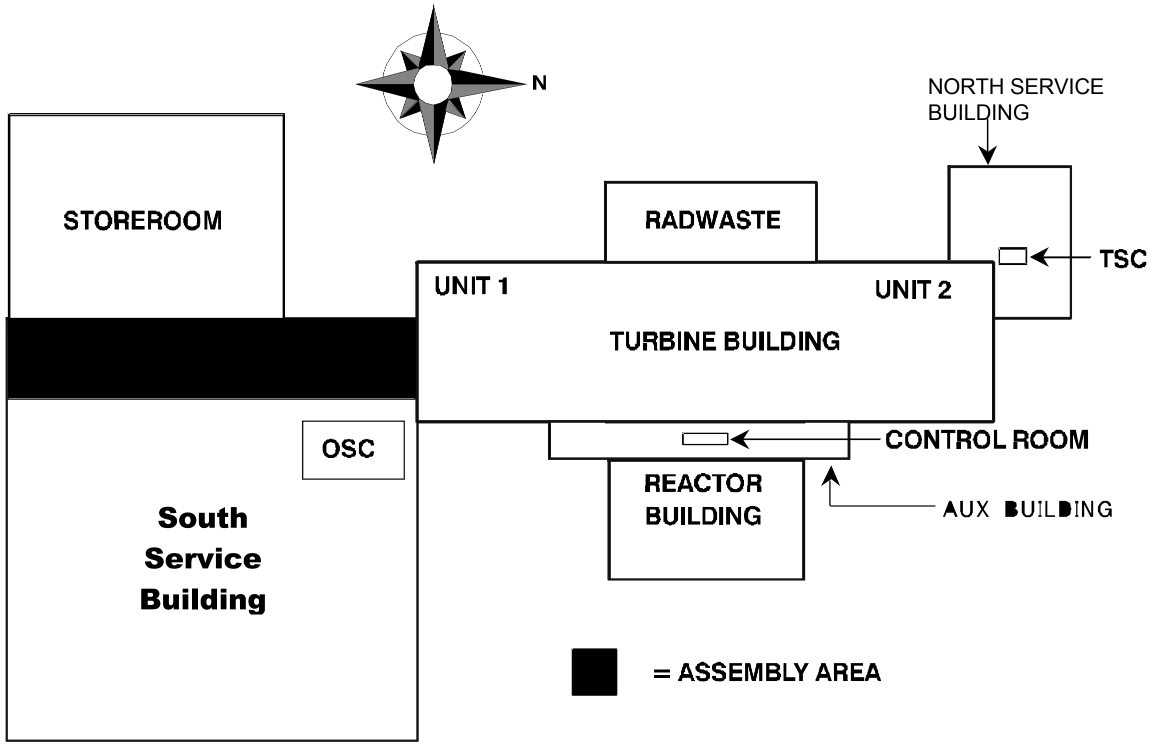
For evacuation routes, refer to EP-AA-113-F-20.

Traffic control for onsite areas will be the responsibility of the Station Security force. When a site evacuation is imminent, the Station Security force will post guards as necessary to assist in the evacuation.

Equipment and personnel would be available at the Mazon Relocation Center and Dresden Station for monitoring and decontamination of evacuated personnel. If major decontamination, follow-up or bioassay samples are necessary, those persons would be sent to Dresden and Braidwood Stations.

Other emergency measures are common to all nuclear stations and are thus discussed in the Emergency Plan.

Figure 4-1: LaSalle Onsite Assembly Areas and Emergency Response Facilities



Section 5: Emergency Facilities and Equipment

5.1 Emergency Response Facilities

Refer to Figure 4-1 for the location of the LaSalle Station Control Room, Technical Support Center (TSC), and Operations Support Center (OSC) within the Station's Protected Area boundary.

5.1.1 Station Control Room

The LaSalle Station Control Room is the initial onsite center of emergency control and is located on the 768' elevation of the Auxiliary Building.

5.1.2 Technical Support Center (TSC)

LaSalle Station has a designated TSC in the upper basement level (Elevation 694) of the North Service Building. Standard air sampling equipment is used to monitor air-borne radioactivity levels in the TSC. The TSC fully meets the requirements of Section H.1.b of the Emergency Plan.

5.1.3 Operational Support Center (OSC)

LaSalle Station has a designated Operational Support Center (OSC). The OSC is located on the ground floor of the South Service Building. The OSC conforms to the requirements of Section H.1.c of the Emergency Plan and is the location to which operations support personnel will report during an emergency and from which they will be dispatched for assignments in support of emergency operations.

5.1.4 Alternative Facility

The Alternative Facility maintains the capability for staging the TSC/OSC emergency response organization personnel in the event of a hostile action. This alternative facility has the capability for communications with the emergency operations facility, control room, and plant security and the capability for engineering assessment activities, including damage control team planning and preparation. Consistent with NRC EPFAQ No. 2013-005, the EOF will satisfy the offsite notification responsibilities for the Alternative Facility. The Alternative Facility is located at 960 North Rt. 47 Morris, Illinois. **(CM-1, ref. AR 1362747.44)**

5.2 Assessment Resources

5.2.1 Onsite Meteorological Monitoring Instrumentation

A 400 foot meteorological tower has been erected on the site on ground approximately final plant grade, 710 MSL. The tower is 180 feet from the nearest building which is approximately 30 feet tall. It is approximately 75 feet outside of and to the southeast of the protected area. The turbine building is approximately 134 feet tall, and the reactor building is approximately 185 feet tall.

The tower is instrumented at three levels. Wind speed and wind direction are measured at 33 feet, 200 feet and 375 feet. Ambient temperature is measured at the 33 feet level and differential temperatures referenced to 33 feet are measured at 200 feet and 375 feet. Precipitation is also measured nearby. The 375 feet level corresponds to the elevation of the possible point of airborne release.

The onsite meteorological monitoring program is covered in the contract specification and vendor procedures of the meteorological monitoring contractor. These data are used to generate wind roses and to provide estimates of airborne concentrations of gaseous effluents.

5.2.1.1 Instrumentation

The meteorological tower is instrumented with equipment that conforms with the system accuracy recommendations of Regulatory Guide 1.23 and ANSI/ANS 2.5 (1984). The equipment is placed on booms oriented normal to the general prevailing wind at the site. Equipment signals are brought to an instrument building with controlled environmental conditions. The building at the base of the tower houses the recording equipment, signal conditioners, etc., used to process and re-transmit the data to the end point users.

5.2.1.2 Meteorological Measurement Program During a Disaster

Cooperation between the corporate office and the meteorological contractor assures that a timely restoration of any outage can be made. Emergency field visits to the site are made as quickly as possible after detection of a failure.

Should a disaster of sufficient magnitude occur to destroy the tower structure, a contract is maintained to have a temporary tower erected within 72 hours, weather conditions permitting. Further, the meteorological contractor maintains two levels of sensors (wind speed, wind direction and temperature) in a state of readiness for use on the temporary tower.

Additionally, Exelon Nuclear's existing instrumentated towers at other nuclear sites provide a measurement network with multiple backup opportunities.

Meteorological data is available to the station Control Room, Technical Support Center, and Emergency Operations Facility for use in the Dose Assessment Computer Model for estimating the environmental impact of unplanned releases of radioactivity from the station.

5.2.2 Onsite Radiation Monitoring Equipment

Chapters 11 and 12 of the LaSalle Station UFSAR describe in detail the LaSalle Station radiation monitoring systems and equipment. The systems and equipment can be categorized into five (5) groups:

- A process radiological monitoring and sampling system;
- An effluent radiological monitoring and sampling system;
- An airborne radioactive monitoring system;
- An area radiation monitoring system; and
- Portable survey and counting equipment.

Some on-site equipment is particularly valuable for accident situations and is described in the following sections.

5.2.2.1 Radiological Noble Gas Effluent Monitoring

A General Atomic wide-range monitor is installed in the effluent stream which enters the LaSalle Station vent stack. A separate monitor is installed for the Standby Gas vent stack (contained inside the station vent stack). These wide-range monitors have a range of $1x10^{-7}$ uCi/cc to $1x10^{5}$ uCi/cc.

Instrument readings are available in the Control Room. The range of indication is 10^{1} to 10^{13} uCi/sec. Calibration factors for converting instrument responses to release rates are determined from energy response testing performed during calibration. The factors are then entered into the system microprocessor data base.

5.2.2.2 Radioiodine and Particulate Effluent Monitoring

Effluent sampling media are analyzed in the Station counting room by a Germanium isotopic analysis. The iodine cartridges are reverse-blown for at least ten minutes to reduce the level of entrapped noble gases or as otherwise directed by the Chemistry Supervisor. In addition, silver zeolite cartridges are to be used to further reduce the interference of noble gases.

5.2.2.3 High-Range Containment Radiation Monitors

The purpose of the containment atmosphere and gross gamma monitoring system is to provide the signals necessary to indicate and alarm high hydrogen concentration, high oxygen concentration, or high gross

gamma radiation in the drywell following a loss-of-coolant-accident (LOCA).

The containment atmosphere monitoring subsystem monitors hydrogen and oxygen in the drywell resulting from radiolytic and chemical phenomena associated with an accident condition. The gross gamma monitoring subsystem, consisting of two high range (1 R/hr. to 10^8 R/hr.) containment radiation detectors, monitors gamma radiation resulting from the gross release of fission products from the reactor fuel. Each subsystem has two redundant channels of instrumentation that are physically separated and electrically independent.

Each channel provides a local measurement and transmits the signals to the control room where a permanent record is made on seismically qualified recorders.

5.2.2.4 In-plant Iodine Instrumentation

LaSalle Station has the capability to sample and determine iodine concentrations in the plant using charcoal or silver zeolite cartridges and gamma ray spectroscopy. Portable monitors may be used to measure increasing levels of iodine during emergency conditions.

5.2.3 Onsite Process Monitors

Adequate monitoring capability exists to properly assess the plant status for all modes of operation. The operability of the postaccident instrumentation ensures information is available on selected plant parameters to monitor and assess important variables following an accident.

- Post-accident instrumentation is available to monitor:
- Reactor Vessel Pressure
- Reactor Vessel Water Level
- Suppression Chamber Water Level
- Suppression Chamber Water Temperature
- Suppression Chamber Air Temperature
- Drywell Pressure
- Drywell Temperature
- Containment Hydrogen Concentration
- Containment Gross Gamma Radiation

Station procedures have been developed which would aid personnel in recognizing inadequate core cooling using the above existing instrumentation.

5.2.4 Onsite Fire Detection Instrumentation

LaSalle Station has a fire protection system that is designed to quickly detect any fires; annunciating locally and in the Control Room. The fire detection system is designed to applicable National Fire Protection Association (NFPA) standards. The majority of the detectors consist of electrically supervised ionization smoke detectors. The system is normally powered from 120 VAC with automatic transfer to 125VDC on loss of power. In the event that a portion of the fire detection instrumentation is inoperable, increasing the frequency of fire watches in affected areas is required.

A further description of the LaSalle Station fire protection system can be found in Chapter 9 of the LaSalle Station UFSAR.

5.2.5 Facilities and Equipment for Offsite Monitoring

Consult the station specific Offsite Dose Calculation Manual (ODCM) for the most current location for fixed continuous air samplers and Dosimeter of Legal Record (DLR) locations.

5.2.6 Site Hydrological Characteristics

The hydrological characteristics of the LaSalle Station vicinity are described in Section 2.4 of the LaSalle Station UFSAR. The LaSalle Station and the cooling lake cover an area of approximately 3,060 acres. The station is located approximately 5.0 miles south of the Illinois River. The cooling lake is approximately 2 miles south of the Illinois River at its closest point.

The terrain around the plant site is gently rolling, with ground surface elevations vary from 700 feet to 724 feet MSL, which is 217 feet above the normal pool elevation in the Illinois River. The plant grade and floor elevations are 710 feet and 710.5 feet MSL respectively. The plant floor is 188 feet above a postulated probable maximum flood (PMF) with coincident wind waves in the Illinois River. The station site may therefore be characterized as "flood proof" or "dry" regarding floods in the Illinois River. Safety-related structures at the plant site are similarly unaffected by wave run-up due to winds coincident with a postulated probable maximum water level in the cooling lake. The elevation of the perimeter road around the plant buildings (including all the safety-related structures) is 709 feet MSL or above.

The river screen house and the outfall structure, both non-safety-related structures, are the only plant facilities that are potentially affected by

floods in the Illinois River. The river screen house is capable of withstanding a 100-year flood in the Illinois River.

5.2.6.1 Flood Design Considerations

In the event of a seismically induced dam failure, it is unlikely that the resulting flood stage would exceed the Illinois River PMF stage at the site. Breaching of the peripheral dikes of the cooling lake at the time of a postulated seismic event would cause the impounded water to discharge directly into local creeks that meet the Illinois River. Since the plant grade is set at elevation 710 feet MSL, and the plant floor is at elevation 710.5 feet MSL, there is no likelihood of flooding of the plant facilities due to this phenomenon.

Since cooling of the power plant condensers is accomplished by pumping from the cooling lake and not from the Illinois River directly, plant safety is not affected by postulated blockage of the Illinois River or by any other concurrent flooding condition.

Although ice formation takes place on all rivers in the Illinois River basin, flooding caused by ice jams is a rare event. Ice jam formation does not exist in the Illinois River near the site, since the river is approximately 800 feet wide and is kept navigable by dredging when required. The lake screen house is protected against icing in the lake by provision of warming lines near the screen house.

Makeup water is pumped from the Illinois River using three pumps with a total capacity of 90,000 gpm. The rate of pumping varies depending upon the plant operating load level and the weather conditions. It is designed to maintain a constant lake level and a total dissolved solids (TDS) level of less than 750 ppm in the blowdown. The minimum operating lake level is 697.75 feet MSL. Lake level is continuously monitored in the main control room of the power plant. Safety-related facilities at the plant site are unaffected by the probable maximum water level in the lake with coincident wind wave activity. In the event that the cooling lake level drops to an elevation of 690 feet MSL or lower, the nuclear reactors are shut down as described in Subsection 5.2.6.

Due to the considerable width of the Illinois River and the well-developed flood plain, there is little likelihood that rock falls, ice jams, or subsidence would completely divert the flow from the river screen house location.

5.2.6.2 Groundwater Use and Protection

The discussion of regional groundwater hydrology includes the hydrogeologic systems within a 25-mile radius circle centered at the LaSalle Station, Units 1 and 2. The discussion of site groundwater hydrology includes the hydrogeologic systems within the LSCS property lines.

Groundwater will be used to supply the water requirements for the following plant systems: makeup demineralizer; potable supply. Groundwater will be obtained from two deep wells in the Cambrian-Ordovician Aquifer. Each well is equipped with a deep well submersible pump with a rated capacity of 300 gpm. The water will be stored in a 350,000 - gallon, ground level tank prior to distribution to the demineralizer and domestic systems. Groundwater for public use within 10 miles of the site is obtained predominantly from wells in the Cambrian-Ordovician Aquifer.

An accidental spill of radioactive materials would have no effect on the public groundwater supplies. The principal aquifer in the area is overlain by approximately 350 feet of impervious till and underlying shales.

5.3 Protective Facilities and Equipment

The on-site assembly area for LaSalle Station is the Service Building Trackway on 710' elevation of the South Service Building as described in Section 6.4 of this annex. This area is suitable because:

1. It is an open area suitable for assembling large numbers of people in a short period of time;

2. It is relatively close to the Main Access Facility; and

3. It has a relatively low probability of being affected by a serious accident involving the NSSS.

The offsite relocation centers for LaSalle Station are discussed in Section 4 of this annex. All three centers are suitable because:

1. They are outside the LaSalle Station plume exposure pathway emergency planning zone; and

2. The relocation centers are owned by Exelon Nuclear, therefore, personnel, supplies and communication equipment are readily available.

5.4 First Aid and Medical Facilities

LaSalle Station has an inplant first aid/decontamination room on the ground floor of the Auxiliary Building near the station laboratory complex. This room is provided with a sink, a portable first aid table, a shower, and a supply cabinet.

First aid kits, stretchers, sinks, eyewashes, and emergency showers have been placed in strategic locations throughout the station.

Medical treatment given to injured persons at the station is of a "first aid" nature. When more professional care is needed, injured persons are transported to a local hospital or clinic. Morris Hospital in Morris, Illinois is the LaSalle Station primary supporting medical facility. Presence St. Joseph Medical Center in Joliet, Illinois is the backup medical facility. Morris Hospital and Presence St. Joseph Medical Center agree in the event of a Radiological Event, including a hostile action based event, to ensure the capability for the evaluation of radiation exposure and uptake, including assurance that persons providing these services are adequately prepared to handle contaminated individuals and capable of providing medical support for any contaminated injured individual.

5.5 Law Enforcement Agencies

A Letter of Agreement is established for Local Law Enforcement to support LaSalle Station to respond to a Radiological Event, including a Hostile Action Based Event, in conjunction with the National Incident Management System upon notification by the station in accordance with the established communications protocol.

5.6 Fire Fighting Organizations

A Letter of Agreement is established for the Local Fire Departments to respond to a Radiological Event, including a Hostile Action Based Event, in conjunction with the Mutual Aid Box Alarm System (MABAS) as requested via the establish communications protocol.

5.7 EMS Support

A Letter of Agreement is established for the Local Ambulance Service to provide Emergency Medical Services in response to a Radiological Event, including a Hostile Action Based Event. This includes transportation of patients from the LaSalle Station, including those who may have been exposed to radiation or may have injuries complicated by radioactive contamination, to Morris Hospital and Presence St. Joseph Medical Center by use of communications via the 911 Dispatch system.

Appendix 1: NUREG-0654 Cross-Reference

Annex Section	NUREG-0654
1.0	Part I, Section A
1.1	Part I, Section C
1.2	Part I, Section D
Figure 1-1	Part I, Section D
2.0	Part II, Section A.4
2.1	Part II, Section A.3
3.0	Part II, Section D
4.1	Part II, Section E.1 & J.7
4.2	Part II, Section I.2 & 3
4.3	Part II, Section J.10.m
4.3.1	Part II, Section E.6
4.3.2	Part II, Section J.8
EP-AA-111	Part II, Section J.10.m
Figure 4-1	Part II, Section J.5
4.4	Part II, Section J.2 & 3
EP-AA-1005, Addendum 2	Part II, Section J.8
EP-AA-1005, Addendum 2	Part II, Section J.10.b
5.1	Part II, Section H.1 & G.3
5.2.1	Part II, Section H.5.a & 8
5.2.2	Part II, Section H.5.b & I.2
5.2.3	Part II, Section H.5.c
5.2.4	Part II, Section H.5.d
5.2.5	Part II, Section H.6.b & 7
5.2.6	Part II, Section H.5.a & 6.a
5.3	Part II, Section J.1-5
5.4	Part II, Section L.1 & 2

Appendix 2: Station Letters of Agreement

1. LaSalle County Sheriff's Department - law enforcement
2. Morris Hospital in Morris, Illinois - medical services
3. Marseilles Fire Protection District - fire protection
4. Seneca Fire Department - fire protection services
5. Seneca Ambulance - ambulance services
6. Marseilles Area Ambulance Service
7. Presence St. Joseph Medical Center

ATTACHMENT 8

Radiological Emergency Plan Annex Revision

EP-AA-1006, Revision 40, *"Exelon Nuclear Radiological Emergency Plan Annex for Quad Cities Station"*

EXELON NUCLEAR

RADIOLOGICAL EMERGENCY PLAN ANNEX FOR QUAD CITIES STATION

Table of Contents

REVISION HISTORY

Revision 0; 04/80	Revision 8N; 01/98	Revision 34, 12/12	
Revision 1; 07/80	Revision 8P; 07/98	Revision 35, 6/13	
Revision 2; 04/81	Revision 9; 05/99	Revision 36, 6/14	
Revision 3; 04/82	Revision 10; 01/00	Revision 37, 12/14	
Revision 4; 04/83	Revision 11; 01/01	Revision 38, 11/16	
Revision 5; 12/84	Revision 12; 10/01	Revision 39, 7/17	
Revision 5A; 03/85	Revision 13; 10/01	Revision 40, 11/17	
Revision 6; 03/86	Revision 14; 01/02		
Revision 7; 02/87	Revision 15; 07/02		
Revision 7A; 12/87	Revision 16; 09/02		
Revision 7B; 08/88	Revision 17; 06/03		
Revision 7C; 05/89	Revision 18; 08/03		
Revision 7D; 12/89	Revision 20, Canceled		
Revision 8; 09/94	Revision 21, 10/05		
Revision 8A; 01/95	Revision 22, 12/05		
Revision 8B; 03/95	Revision 23, 04/06		
Revision 8C; 09/95	Revision 24, 04/07		
Revision 8D; 12/93	Revision 25, 10/07		
Revision 8E; 12/93	Revision 26, 03/08		
Revision 8F; 01/94	Revision 27, 12/08		
Revision 8G; 04/94	Revision 28, 03/10		
Revision 8H; 10/94	Revision 29, 06/10		
Revision 8I; 12/95	Revision 30, 01/11		
Revision 8J; 12/95	Revision 31, 03/11		
Revision 8K; 04/96	Revision 32, 06/12		
Revision 8L; 05/96	Revision 33, 11/12		

Section 1: Introduction

As required in the conditions set forth by the Nuclear Regulatory Commission (NRC) for the operating licenses for the Exelon Nuclear Stations, the management of Exelon recognizes its responsibility and authority to operate and maintain the nuclear power stations in such a manner as to provide for the safety of the general public.

The Exelon Emergency Preparedness Program consists of the Exelon Nuclear Standardized Emergency Plan (Emergency Plan), Station Annexes, emergency plan implementing procedures, and associated program administrative documents. The Emergency Plan outlines the basis for response actions that would be implemented in an emergency. Planning efforts common to all Exelon Nuclear stations are encompassed within the Emergency Plan.

This document serves as the Quad Cities Station Annex and contains information and guidance that is unique to the station. This includes facility geography location for a full understanding and representation of the station's emergency response capabilities. The Station Annex is subject to the same review and audit requirements as the Emergency Plan.

1.1 Facility Description

The Quad Cities Station, Units 1 and 2, is located in Cordova Township of Rock Island County in northwestern Illinois. The station is located on the east bank of the Mississippi River three miles north of Cordova, Illinois. Cooling water for the plant is provided by the Mississippi River, with the water being returned to the river by diffuser pipes. The plant consists of two boiling water reactors (BWR), nuclear steam supply systems (NSSS), and turbine generators furnished by General Electric Company. The steam supply system is designed for a power output of 2957 MWt for each of the two units.

The Quad Cities Station area consists of approximately 126 acres (with a radius of about 1/4-mile about the Units 1/2 chimney) and is owned and controlled by Mid American Energy Company and Exelon Nuclear as tenants in common.

For more specific site location information, refer to the Updated Final Safety Analysis Report (UFSAR) for Quad Cities Station, Units 1 and 2.

1.2 Emergency Planning Zones

The Plume Exposure Emergency Planning Zone (EPZ) for Quad Cities Station is an area surrounding the station with a radius of about ten miles, (exact boundaries are determined by the States of Illinois and Iowa). Refer to Figure 1-1.

The Ingestion Pathway Emergency Planning Zone (EPZ) for Quad Cities Station is an area surrounding the Station with a radius of about 50 miles.

1.3 State of Iowa

Much of the Plume Exposure EPZ for the Quad Cities Station lies within the State of Iowa. The State of Iowa has developed an "Iowa Emergency Plan." This section provides a summary of the essential elements of the Iowa Emergency Plan, outlining the specific responsibilities of certain "key" Iowa State Agency players in a response operational mode. Basic descriptions for the Iowa State agencies responsible for actions in the event of a nuclear power station are as follows:

1.3.1 Iowa Emergency Management Division (IEMD)

IEMD coordinates all activities of State agencies and departments, all local governments, and the utility in support of emergency response activities. These activities are coordinated from the Iowa State EOC in Des Moines.

1.3.2 The Iowa Commissioner of Public Health

The Iowa Department of Public Health alerts the State Hygienic Lab when emergency action conditions are reported by a commercial nuclear power reactor, which impacts upon the public health and safety in Iowa, and when emergency team response has been determined to be necessary or imminent. They perform necessary calculations and evaluate the impact of existing and projected radioactivity releases in terms of public health risk. They translate the evaluation of existing and projected environmental contamination and resulting dose into terms of alternative protective actions. They recommend appropriate protective actions to the Governor's Office, IEMD and other State agencies as appropriate.

1.3.3 University Hygienic Lab (UHL)

The UHL, located in Iowa City, Iowa conducts and coordinates all field surveillance and monitoring activities directed toward measuring radiation exposure and radioactivity contamination in the environment resulting from an accident at a commercial nuclear power reactor; provides and coordinates laboratory support of all environmental sampling and radiological monitoring activities during a nuclear emergency; communicates all relevant data and protective action recommendations to the State Department of Public Health; provides radiological laboratory support for environmental samples analysis; and provides recommendations for decontamination of contaminated area.

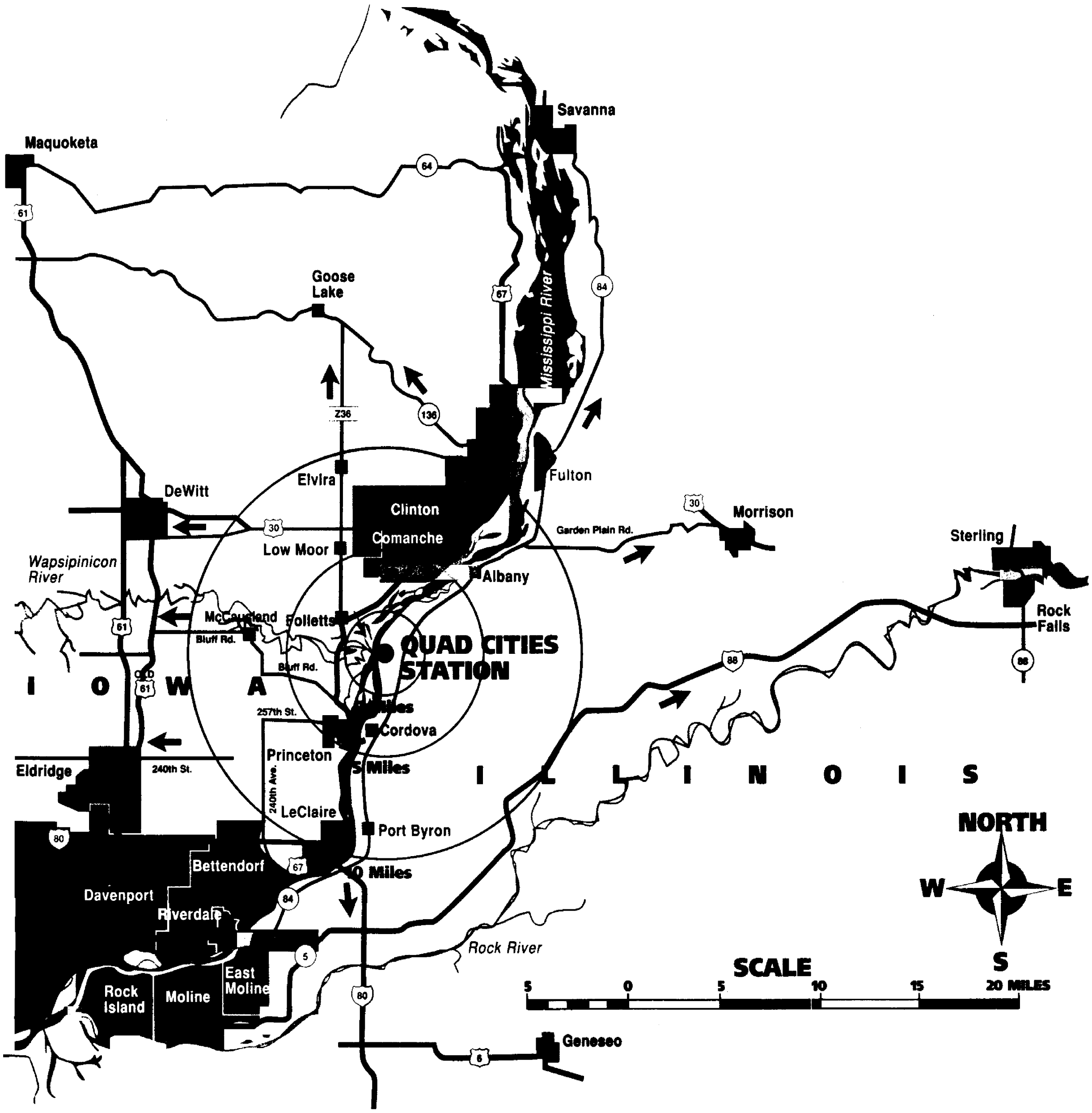
1.3.4 Clinton County

Clinton County will provide a coordinated local government response in conjunction with the State of Iowa, from the County Emergency Operations Center (EOC) in Clinton, IA.

1.3.5 Scott County

Scott County will provide a coordinated local government response in conjunction with the State of Iowa, from the County Emergency Operations Center (EOC) in Davenport, IA.

Figure 1-1: Quad Cities Station Location And 10 Mile EPZ



Section 2: Organizational Control of Emergencies

This section describes the Emergency Response Organization (ERO) and its key positions. It outlines the staffing requirements which provide initial emergency response actions and provisions for timely augmentation of on-shift personnel when required. It also describes interfaces among Exelon Nuclear emergency response personnel and specifies the offsite support available to respond to the nuclear generating stations.

2.1 Shift Organization Staffing

Initial response to any emergency is by the normal plant organization present at the site. This organization includes positions that are onsite 24 hours per day and is described in Section B.1 of the Exelon Nuclear Standardized Radiological Emergency Plan. The Normal Shift Organization will be augmented, in an emergency, with designated/additional Emergency Response Organization (ERO) personnel within 60 following the declaration of an Alert or higher emergency classification as specified under Table 2-1. ERO activation is described in Section H.4 of the Exelon Nuclear Standardized Radiological Emergency Plan.

Table 2-1 outlines ERO positions required to meet minimum staffing and full augmentation of the on-shift complement at an Alert or higher classification, and the major tasks assigned to each position. Responsibilities for each position are described in Section B.5 of the Exelon Nuclear Standardized Radiological Emergency Plan.

2.2 Emergency Response Organization Block Diagram

Figures B-1a through B-1d of the Exelon Nuclear Standardized Radiological Emergency Plan illustrates the overall emergency response organization.

2.3 Non-Exelon Nuclear Support Groups

Exelon Nuclear has contractual agreements with several companies whose services would be available in the event of a radiological emergency. These agencies and their available services are listed in Appendix 3 of the Emergency Plan.

Emergency response coordination with governmental agencies and other support organizations is discussed in Section A of the Emergency Plan.

Agreements exist on file at Quad Cities Station with several support agencies. These agencies and their support roles are listed in Appendix 2, Station Letters of Agreement.

Table 2-1: Minimum Staffing Requirements

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
1. Plant Operations/Safe Shutdown and Assessment of Operational Aspects	Control Room Staff	Shift Manager	1			
		Shift Supervisor	2			
		Nuclear Station Operator	4			
		Non-Licensed Operator	4			
2. Emergency Direction and Control	Command and Control	Shift Emergency Director (CR)	1[(a)]			
		Station Emergency Director (TSC)		1		
		Corporate Emergency Director (EOF)		1		
3. Notification & Communication	Emergency Communications	Plant Shift Personnel	1			
		TSC Director (TSC)		1		
		EOF Director (EOF)		1		
		State/Local Communicator		1 (EOF)		1 (TSC)
		ENS Communicator		1 (TSC)		1 (EOF)
		HPN Communicator		1 (EOF)		1 (TSC)
	Plant Status	OPs Communicator (CR/TSC)				2
		Operations Advisor (EOF)				1
	In-Plant Team Control	Damage Control Comm. (CR/TSC/OSC)				3
	Technical Activities	Technical Communicator (TSC)				1
		Technical Advisor (EOF)				1
	Governmental	State Environs Communicator (EOF)				(b)
		EOC Communicator (EOF)				1
		State EOC Liaison (State EOC)				(b)
		County EOC Liaison (County EOC)				(b)
		Regulatory Liaison (EOF)				1
4. Radiological Assessment	Offsite Dose Assessment	RP Personnel	1			
		Dose Assessment Coordinator (EOF)		1		
		Dose Assessor (EOF)				1
		Radiation Controls Coordinator (TSC)				1
	Offsite Surveys	Environmental Coordinator (EOF)		1		
		Field Team Communicator (EOF)				1
		Offsite Field Team Personnel		4		(b)
	Onsite Surveys	Onsite Field Team Personnel		2		(b)
	In-plant Surveys	RP Personnel	1	2		(b)
	Chemistry	Chemistry Personnel	1	1		(b)
	RP Supervisory	Radiation Protection Manager(TSC/EOF)		2		

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
5. Plant System Engineering, Repair, and Corrective Actions	Technical Support	STA / Incident Assessor (CR)	1			
		Technical Manager (TSC)		1		
		Core Thermal/Hydraulic Engineer (TSC)		1		
		Mechanical Engineer (TSC)		1		
		Electrical Engineer (TSC)		1		
		SAMG Decision-Maker (TSC)		1[a]		
		SAMG Evaluator (TSC)		2[a]		
		Operations Manager (TSC)		1		
		Radiation Controls Engineer (TSC)				1
		Technical Support Manager (EOF)				1
	Repair and Corrective Actions	Mechanical Maintenance (OSC)	1[a]	2		(b)
		Electrical/I&C Maintenance (OSC)	1[a]	3		(b)
		Maintenance Manager (TSC)		1		
		OSC Director (OSC)		1		
		Assistant OSC Director (OSC)				1
		OPs Lead & Support Personnel (OSC)				(b)
6. In-Plant Protective Actions	Radiation Protection	RP Personnel	2[a]	4		(b)
7. Fire Fighting	--	Fire Brigade[c]	5			
8. 1st Aid and Rescue Operations	--	Plant Personnel	2[a]			(b)
9. Site Access Control and Personnel Accountability	Security & Accountability	Security Team Personnel	(d)	(d)		
		Security Coordinator (TSC)				1
	EOF Security	Security Coordinator (EOF)				1
10. Resource Allocation and Administration	Logistics	Logistics Manager (EOF)		1		
		Logistics Coordinator (TSC)				1
	Administration	Administrative Coordinator (EOF)				1
		Clerical Staff (TSC/EOF/JIC)				(b)
	Inter Facility Logs	Events Recorder (EOF/JIC)				2
	Facility Support	Computer Specialist (EOF)				1

Functional Area	Major Tasks	Emergency Positions		Minimum Shift Size	Minimum Staffing *60 Minute Augmentation	Minimum Staffing Other On-Call	Full Augmentation
11. Public Information	Media Interface	Corporate Spokesperson	(JIC)			1	
		Rad Protection Spokesperson	(JIC)				1
		Technical Spokesperson	(JIC)				1
	Information Development	Public Information Director				1	
		News Writer					1
	Media Monitoring and Rumor Control	Media Monitoring Staff					(b)
		Rumor Control Staff					(b)
	Facility Operation and Control	JIC Director	(JIC)			1	
		JIC Coordinator	(JIC)				1
		Administrative Coordinator	(JIC)				1
		Access Controls	(JIC)				1
		Facility Support Staff	(JIC)				(b)
			TOTAL:	**21**	**37**	**3**	**32(b)**

* Response time is based on optimum travel conditions.

(a) May be provided by personnel assigned other functions.

(b) Personnel numbers depend on the type and extent of the emergency.

(c) Fire Brigade per FSAR/Technical Specifications, as applicable.

(d) Function performed by on-shift security personnel.

Section 3: Classification of Emergencies

3.1 General

The Quad Cities Emergency Action Levels and supporting information are located in EP-AA-1006, Addendum 3.

Section 4: Emergency Measures

4.1 Notification of the Emergency Organization

The Emergency Director is responsible for notifying the State of Illinois Emergency Management Agency (IEMA), the State of Iowa Homeland Security and Emergency Management Division (HSEMD), Scott County, and Clinton County via NARS. Rock Island County and Whiteside County will also be notified via NARS; however, the State of Illinois will maintain responsibility of county notification. At the Quad Cities Generating Station, if a General Emergency is the initiating event, the Emergency Director is also responsible for notifying the following local agencies:

- Rock Island County
- Whiteside County

4.2 Assessment Actions

Throughout each emergency situation, continuing assessment will occur. Assessment actions at Quad Cities Station may include an evaluation of plant conditions; in-plant, onsite, and initial offsite radiological measurements; and initial estimates of offsite doses. Core damage information is used to refine dose assessments and confirm or extend initial protective action recommendations. Quad Cities Station utilizes NEDC-33045P-A, Revision 0, (2001) as the basis for the methodology for post-accident core damage assessment. This methodology utilizes real-time plant indications. In addition, Quad Cities Station may use samples of plant fluids and atmospheres as inputs to the CDAM (Core Damage Assessment Methodology) program for core damage estimation.

4.3 Protective Actions for the Offsite Public

To aid the Emergency Response Organization during a developing emergency situation, EP-AA-111, "Emergency Classification and Protective Action Recommendations" has been developed based on Section J.10.m of the Emergency Plan.

4.3.1 <u>Alert and Notification System (ANS) Sirens</u>

This ANS consists of a permanently installed outdoor notification system within a ten-mile radius around the station. The ten-mile radius around the station is primarily an agricultural area with a population density below 2000 persons per square mile. The ANS, as installed, consists of mechanical and electronic sirens that will cover this entire area with a minimum sound level of 60 db. Additionally, the ANS will cover the heavily populated areas within ten-mile radius around the station with a minimum sound level of 70 db to ensure complete coverage.

Backup means of notification is achieved through Route Alerting, which is contained within the State and respective counties' Radiological Emergency Response Plans and procedures. The means consists of utilizing vehicles with public address (PA) systems in the event the primary

method of alerting and notification is unavailable. The backup method has the capability to alert and notify the public within the plume exposure pathway EPZ within a reasonable time, but does not need to meet the 15-minute design objective for the primary prompt public alert and notification system.

4.3.2 Evacuation Time Estimates

The ETE study used population data from the 2010 census which includes parts of two counties in Iowa (Clinton, Scott) and two counties in Illinois (Rock Island and Whiteside). The evacuation times are based on a detailed consideration of the EPZ roadway network and population distribution. The ETE Study, contained in EP-AA-1006 Addendum 2, Evacuation Time Estimates for the Quad Cities Generating Station Plume Exposure Pathway Emergency Planning Zone, presents evacuation times for daytime and nighttime scenarios under various weather conditions for the evacuation of various areas around the Quad Cities Station, once a decision has been made to evacuate.

4.4 Protective Actions for Onsite Personnel

Quad Cities Station has a siren system to warn personnel of emergency conditions. Upon hearing a continuous two (2) minute siren, all personnel not having emergency assignments have been instructed to assemble in predesignated assembly areas. Refer to Figure 4-1.

If a site evacuation of non-essential personnel is required, personnel will be released to their homes or relocated and monitored at one of the following designated relocation centers for Quad Cities:

- Morrison Relocation Center, Morrison, Illinois
- Byron Station, Byron Illinois

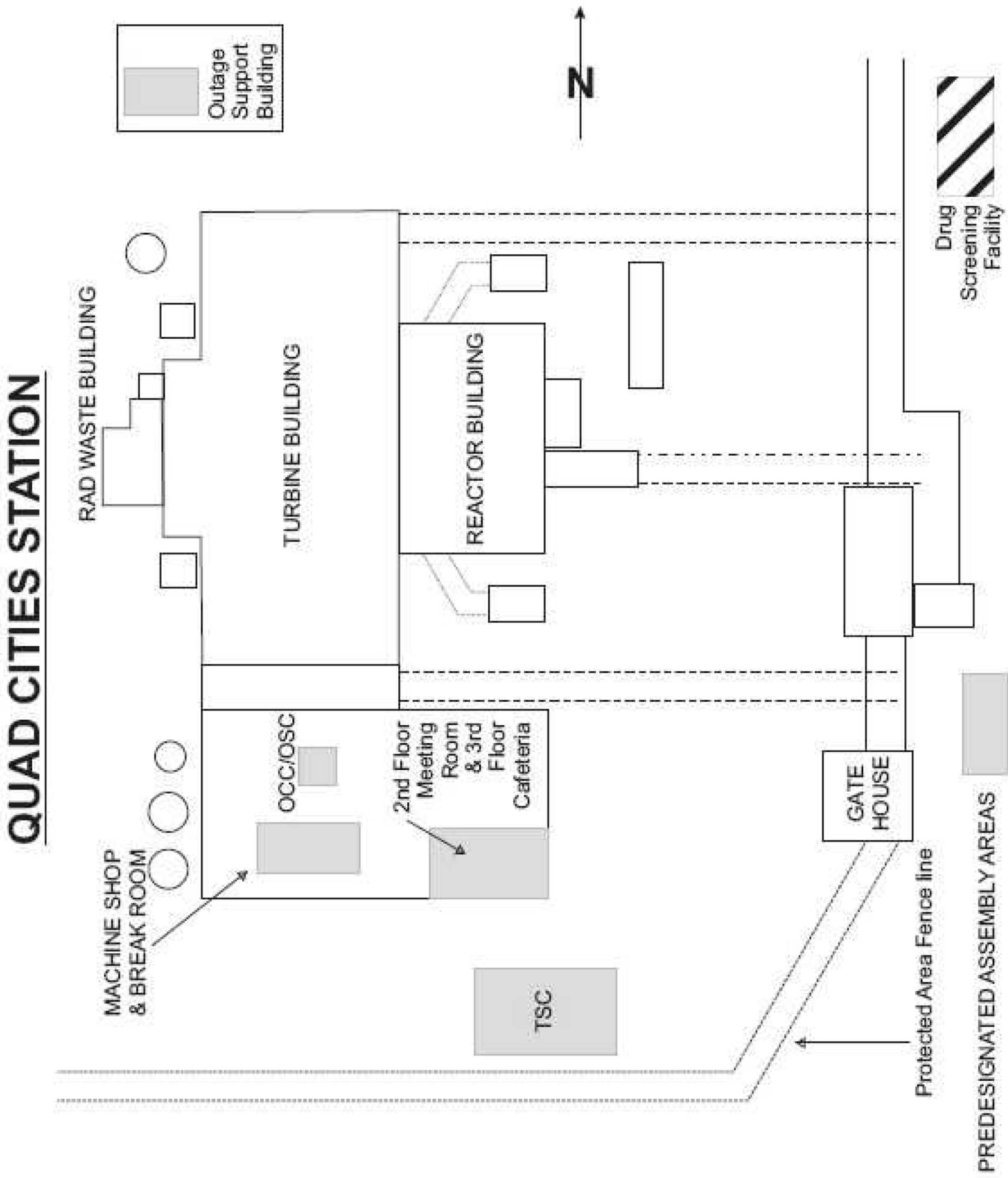
For evacuation routes, refer to EP-AA-113-F-21.

Traffic control for onsite areas will be handled by the Quad Cities Station security force, if necessary.

When a site evacuation is imminent, the TSC Security Coordinator notifies by phone or dispatches a security guard to notify those personnel in buildings outside the protected area (Training Building, Warehouse, Wastewater Treatment Plant, etc.). These personnel are evacuated using the prescribed route to the designated relocation center. Personnel in the warehouses, sewage treatment plant, wastewater treatment plant, and training building will assemble at their present location and await further instructions (e. g. evacuation).

Equipment and personnel would be available at the Morrison Relocation Center and Byron Station for monitoring and decontamination of evacuated personnel. If major decontamination and follow-up or bioassay samples are necessary, those persons would be sent to Byron Station.

Figure 4-1: Predesignated Assembly Areas



Section 5: Emergency Facilities and Equipment

5.1 Emergency Response Facilities

Refer to Figure 5-1 for the location of the Quad Cities Station Control Room, Technical Support Center (TSC), and Operations Support Center (OSC) within the Station's Protected Area boundary.

5.1.1 Station Control Room

The Quad Cities Station Control Room shall be the initial onsite center of emergency control. The Control Room is located on the 620-foot elevation of the Service Building.

5.1.2 Technical Support Center (TSC)

Quad Cities Station has established a Technical Support Center (TSC) in a building located south of the Service Building. The TSC fully meets the requirements of Section H.1.b of the Emergency Plan.

5.1.3 Operational Support Center (OSC)

Quad Cities Station has designated an Operational Support Center. The OSC is located on the ground floor in the Service Building in a space designated as the Outage Control Center. The OSC conforms to the requirements of Section H.1.c of the Emergency Plan, and is the location to which operations support personnel will report during an emergency and from which they will be dispatched for assignments in support of emergency operations.

5.1.4 Alternative Facility

The Alternative Facility maintains the capability for staging the TSC/OSC emergency response organization personnel in the event of a hostile action. This alternative facility has the capability for communications with the emergency operations facility, control room, and plant security and the capability for engineering assessment activities, including damage control team planning and preparation. Consistent with NRC EPFAQ No. 2013-005, the EOF will satisfy the offsite notification responsibilities for the Alternative Facility. The Alternative Facility is located at 14439 Crosby Road, Morrison Illinois. **(CM-1, ref. AR 1362747.44)**

5.2 Assessment Resources

5.2.1 Onsite Meteorological Monitoring Instrumentation

The meteorological tower, located 1623 meters SSE of the plant, is 300 ft. high and is instrumented at three levels. The 33 ft., 196 ft. and 296 ft. levels correspond to the elevations of the possible points of airborne effluent release. Wind speed and wind direction are measured at all three elevations. Ambient temperature is measured at 33 ft. and differential temperatures referenced to 33 ft. are measured at 196 ft. and 296 ft. Precipitation is measured nearby.

The onsite meteorological monitoring program is covered in the contractor specification and vendor procedures of the meteorological monitoring contractor. These data are used to generate wind roses and to provide estimates of airborne concentrations of gaseous effluents.

5.2.1.1 Instrumentation

The meteorological tower is instrumented with equipment that conforms with the recommendations of Regulatory Guide 1.23 and ANSI/ANS 2.5 (1984). The equipment is placed on booms oriented into the general prevailing wind at the site. Equipment signals are brought to the process computers and to an instrument building with controlled environmental conditions. The building at the base of the tower houses the recording equipment, signal conditioners, etc., used to process and re-transmit the data to the end point users.

5.2.1.2 Meteorological Measurement Program During a Disaster

Cooperation between the corporate office and the meteorological contractor assures that a timely restoration of any outage can be made. Emergency field visits to the site are made as quickly as possible after detection of a failure.

Should a disaster of sufficient magnitude occur to destroy the tower structure, a contract is maintained to have a temporary tower erected within 72 hours, weather conditions permitting. Further, the meteorological contractor maintains two levels of sensors (wind speed, wind direction and temperature) in a state of readiness for use on the temporary tower.

Additionally, Exelon Nuclear's existing instrumented towers at other nuclear sites provide a high density measurement network with multiple backup opportunities.

Meteorological data are available to the station Control Room, Technical Support Center, and Emergency Operations Facility for use in the Dose Assessment Computer Model for estimating the environmental impact of unplanned releases of radioactivity from the station.

5.2.2 Onsite Radiation Monitoring Equipment

Sections 2.7, 7.6 and 9.5 of the UFSAR for Quad Cities Station, Unit 1 and 2, describe in detail the radiation monitoring systems and equipment. The modified off-gas treatment system is described in Section 9.2 of the UFSAR. In addition to the dedicated systems described here, chemistry and health physics personnel are trained and equipped to perform radiological monitoring and sampling.

The radiation monitoring systems and equipment can be categorized into four (4) groups:

5.2.2.1 Radiological Noble Gas Effluent Monitoring: A wide-range monitoring system is installed in the effluent stream in the main chimney and in the effluent stream of the reactor building vent stack. Methods for converting instrument readings to release rates have been developed and are incorporated into Station procedures.

5.2.2.2 Radioiodine and Particulate Effluent Monitoring: Effluent sampling media are analyzed in the Station counting room using an HPGe isotopic system.

5.2.2.3 High-Range Containment Radiation Monitors: Two high range containment radiation monitors are installed on each of Quad Cities Station's units. The range of these monitors is from 1 R/hr to 1 E+08 R/hr.

5.2.2.4 In-plant Iodine Instrumentation: Quad Cities Station has the capability to sample and determine iodine concentrations in the plant using Silver Zeolite or charcoal cartridges and gamma ray spectroscopy. Monitors may be used to measure increasing levels of iodine during emergency conditions (e.g. a portable gamma ray spectroscopy system).

5.2.3 Onsite Process Monitors

Adequate monitoring capability exists to properly assess the plant status for all modes of operation. The operability of the post-accident instrumentation ensures information is available on selected plant parameters to monitor and assess important variables following an accident. Instrumentation is available to monitor the parameters and ranges given in Technical Specifications.

Station procedures have been developed which would aid personnel in recognizing inadequate core cooling using applicable instrumentation.

5.2.4 Onsite Fire Detection Instrumentation

Quad Cities Station has a fire protection system that is designed to quickly detect any fires, annunciate locally and in the Control Room, and initiate the appropriate automatic action.

The station fire protection system is described in the Fire Hazards Analysis Report. The detection instrument minimum requirements and further system description are contained in QCAP 1500-1 (Administrative Requirements for Fire Protection). In the event that a portion of the fire detection instrumentation is inoperable, contingency actions are taken as defined in the above.

5.2.5 Facilities and Equipment for Offsite Monitoring

Consult Part II, Section 6 of the station specific Offsite Dose Calculation Manual (ODCM) for the most current location for fixed continuous air samplers and Dosimeter of Legal Record (DLR) locations.

5.2.6 Site Hydrological Characteristics

Assessments covering the hydrological aspects of the site (i.e., effects of the Mississippi River) are made as follows:

a. Onsite: River level gauge located in the intake bay.

b. Offsite: The U.S. Army Corps. of Engineers will provide information regarding river levels and other conditions of importance. (Flood information can be obtained from the U.S. National Weather Service.)

5.3 Protective Facilities and Equipment

The onsite assembly areas for Quad Cities Station are shown in Figure 4-1. These areas are suitable because:

1) They are large open areas suitable for assembling a large number of people in a short time;

2) They are relatively close to the Security Gatehouse; and

3) They have a low probability of being affected by a serious accident involving the Nuclear Steam Supply System (NSSS).

The offsite evacuation assembly areas for Quad Cities Station are discussed in Section 4.4 of this annex. These areas are suitable because they are easily accessible. The relocation routes to these facilities would be determined by the actual wind direction at the time of evacuation.

5.4 First Aid and Medical Facilities

Quad Cities Station has a decontamination/first aid room on the ground floor of the Service Building near the entrance to the plant. This room is provided with a sink, showers, and supply cabinet.

First aid kits, stretchers, sinks, eyewashes, and emergency showers have been placed in strategic locations throughout the station.

Medical treatment given to injured persons at the station is of a "first aid" nature. When more professional care is needed, injured persons are transported to a local hospital or clinic. Genesis Medical Center Illini Campus in Silvis, Illinois, is the Quad Cities Station primary supporting medical facility. Trinity Medical Center West Campus in Rock Island, Illinois is the backup medical facility. Presence St. Joseph Medical Center in Joliet, Illinois, is an additional backup medical facility.

All three hospitals agree in the event of an emergency, including a hostile action based event, to ensure the medical treatment of contaminated injured/ill personnel and to ensure the capability for the evaluation of radiation exposure and uptake, including assurance that persons providing these services are adequately prepared to handle contaminated individuals and capable of providing medical support for any contaminated injured individual.

5.5 Law Enforcement Agencies

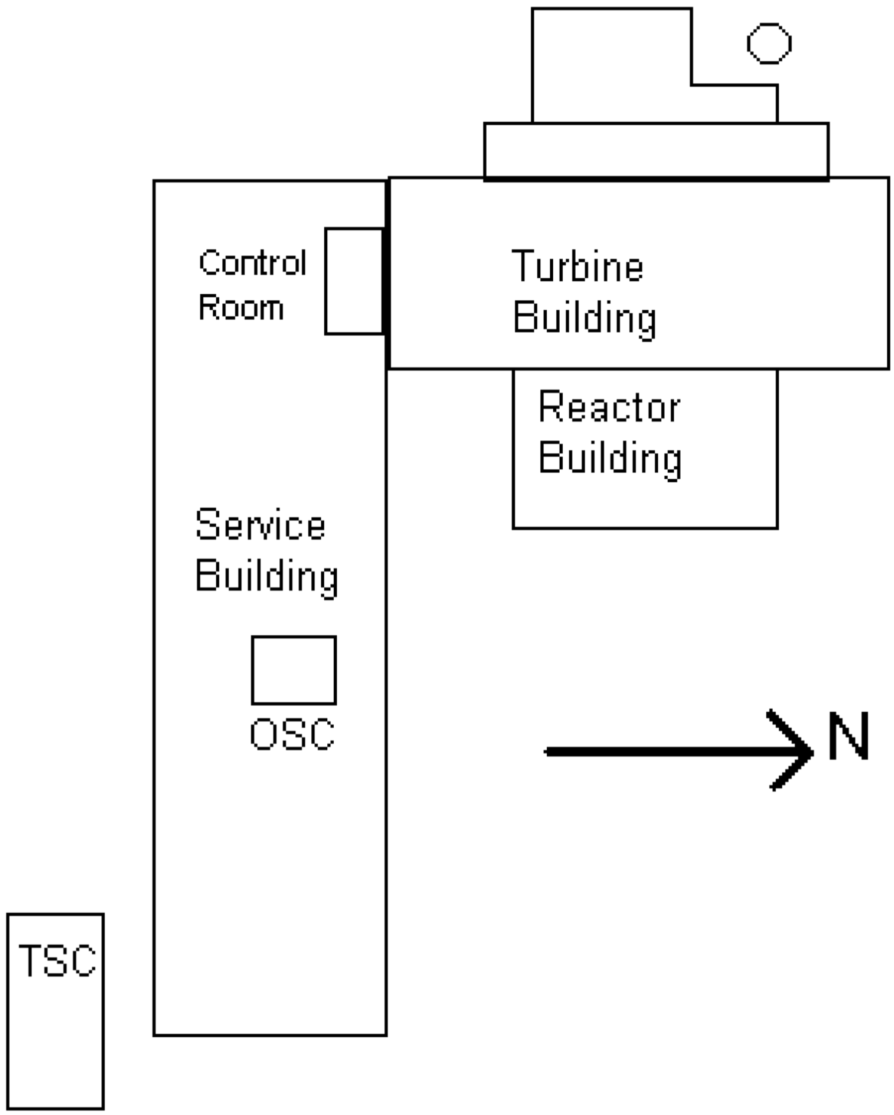
A Letter of Agreement is established for Local Law Enforcement, to support Quad Cities Station to respond to a Radiological Event including a Hostile Action Based Event, in conjunction with the National Incident Management System upon notification by the station in accordance with the established communications protocol.

5.6 Fire Fighting Organizations and EMS Support

A Letter of Agreement is established with the Local Fire Protection District to respond to a Radiological Event, including a hostile action based event, in conjunction with the Mutual Aid Box Alarm System as requested via the established notification protocol.

The Genesis Medical Center, Illini Campus Hospital/Emergency Medical System (EMS) agrees to assist Quad Cities Station as requested by transporting injured/ill personnel, including radiologically contaminated injuries, from the Quad Cities Station in Cordova, Illinois and subsequent medical treatment of injured/ill personnel at Illini Campus hospital via the established notification protocol.

Figure QCA 5-1: Location Of Onsite Area Emergency Response Facilities



Appendix 1: NUREG-0654 Cross-Reference

Annex Section	NUREG-0654
1.0	Part I, Section A
1.1	Part I, Section C
1.2	Part I, Section D
1.3	Part II, Section A.1
Figure 1-1	Part I, Section D
2.0	Part II, Section A.4
2.1	Part II, Section A.3
3.0	Part II, Section D
4.1	Part II, Section E.1 & J.7
4.2	Part II, Section I.2 & 3
4.3	Part II, Section J.10.m
4.3.1	Part II, Section E.6
4.3.2	Part II, Section J.8
4.4	Part II, Section J.1-5
EP-AA-111	Part II, Section J.10.m
Figure 4-1	Part II, Section J.5
4.4	Part II, Section J.2 & 3
EP-AA-1006, Addendum 2	Part II, Section J.8
EP-AA-1006, Addendum 2	Part II, Section J.10.b
5.1	Part II, Section H.1 & G.3
5.2.1	Part II, Section H.5.a & 8
5.2.2	Part II, Section H.5.b & I.2
5.2.3	Part II, Section H.5.c
5.2.4	Part II, Section H.5.d
5.2.5	Part II, Section H.6.b & 7
5.2.6	Part II, Section H.5.a & 6.a
5.3	Part II, Section J.1-5
5.4	Part II, Section L.1 & 2
Figure 5-1	Part II, Section H.1

Appendix 2: Station Letters of Agreement

1. The Illinois State Police - law enforcement
2. The Rock Island County Sheriff's Office - law enforcement
3. Genesis Medical Center Illini Campus in Silvis, Illinois - medical treatment and ambulance services
4. Trinity Medical Center West Campus - medical treatment.
5. Cordova Fire Department - fire protection
6. Presence St. Joseph Medical Center of Joliet, Illinois.