Dominion®

North Anna 3 Combined License Application

Part 5: Emergency Plan

Revision 2

June 2010

Explanatory Notes Regarding the Emergency Plan and Supplemental Information

The North Anna Power Station Unit 3 Combined License Emergency Plan consists of a basic plan and eight appendices. The basic plan follows the format of NUREG-0654 and provides detailed information regarding each of the sixteen Planning Standards and associated Evaluation Criteria. The eight appendices that follow provide additional detailed information on various aspects of the Emergency Plan. Supplemental information includes the detailed evacuation time estimate report and current state and local emergency planning documents. Emergency Planning Inspections, Test, Analyses, and Acceptance Criteria (ITAAC) are included in Part 10 of the COLA.

Emergency Plan	
Basic Plan	North Anna Power Station Unit 3 Combined License Application Emergency Plan
Appendix 1	Emergency Action Levels
Appendix 2	Assessment and Monitoring for Actual or Potential Off-site Consequences of a Radiological Emergency
Appendix 3	Public Alert and Notification System Conceptual Design
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Virginia Emergency Operations Plan, Radiological Emergency Response Basic Plan	
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Orange County Radiological Emergency Response Plan	
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REVISION SUMMARY

Revision 2

Section	Changes
All	Part 5 revised to reflect the change from ESBWR technology to US-APWR technology. Expanatory Notes revised to reflect insertion of EALs based on NEI 99-01. I.B – Revised to reflect insertion of EALs in App. 1. I.C.3 – Revised to reflect technology change. II.A.1.b – Revised to reflect technology change; Revised to reflect consolidation of Certification Letters and title change to National Response Framework. II.A.3 – Revised to reflect consolidation of Certification Letters and title change to National Response Framework. Sec. II.B.8 – Revised to reflect technology change. Sec. II.B.9 – Revised to reflect consolidation of Certification Letters. Sec. II.C.1.a – Revised to reflect NRC's preferred method of requesting Federal assistance. Sec. II.C.4 – Revised to reflect consolidation of Certification Letters. Sec. II.D.2 – Revised to reflect insertion of EALs in App. 1. Sec. II.F.1 – Revised to reflect technology change. Sec. II.H.1 – Revised to reflect technology change and correct reference. Sec. II.H.5.c – Editorial correction. Sec. II.H.6.b – Revised to reflect consolidation of Certification Letters. Sec. II.H.8 – Provided reference for met system description. Sec. II.H.9 – Provided OSC location to reflect technology change. Sec. II.I.2 – Revised to reflect technology change and provide reference for PASS description. Sec. II.I.5 – Updated to reflect complete and correct references. Sec. II.L.1 – Revised to reflect consolidation of Certification Letters. Sec. III.A – Revised to reflect technology change, title change, and editorial corrections. Sec. III.C – Revised to reflect insertion of EALs. App. 1 – Changed title and inserted App. 1 EALs. App. 2, Sec 1.0 & 2.3 – Provided correct reference. App. 4 – Corrected page footer. App. 7 – Revised to reflect consolidation of Certification Letters. App. 8 – Revised to reflect consolidation of Certification Letters.

Revision 2 *(continued)*

Section	Changes
Expanatory Notes, I.B, II.A.1.b, II.D, II.D.1, II.D.2, II.I.1, II.P.7, III.A.13, Appendix 1, Appendix 8	RAI 13.03-3- Revised, Emergency Action Levels
II.H.1, II.H.2	RAI 13.03-4, Clarify Change to HSI Function From SPDS Function
II.H.2	RAI 13.03-5, Clarify New EOF

Revision 1

Section	Changes
I, I.C.2, I.C.3, II.A, II.B, II.C, II.D, II.D.2, II.E, II.E.2, II.E.6, II.E.7, II.F, II.G, II.H, II.H.4, II.I, II.I.7, II.J, II.J.8, II.K, II.L, II.O, II.P, III.A.19, Appendix 1–Executive Summary, Appendix 1–1.0, Appendix 1–3.0	RAI 13.03-2.2, IBR is SSAR in ESPA versus ESP
I.A, I.B, I.C.3, II.A.1.b, II.B.1, II.H.2, II.H.5.a, II.H.5.b, II.H.5.c, II.H.5.d, II.K.2, II.L.1, II.N.2.b, II.P.9, III.A.9, III.A.10, III.A.19, IC HU4, Appendix 2–1.0, Appendix 2–2.1, Appendix 2–2.2, Appendix 8	Made references to Unit 3. Editorial changes. Corrected references. Added reference to MD plan (Appendix 8). Updated Appendix 4 with ETE R1 executive summary.
II.B.8, II.C.3	RAI 13.03-2.3, Vendor Support During Emergency Events
II.E.1, II.F.1.d	Added locations of ENS access and description of communication capabilities between the Control Room/TSC and radiological field personnel.
II.G.4.a, II.G.4.c	RAI 13.03-2-8, Classification of Titles in Public Information Structure
II.H.1, II.H.2	Corrected description of technical data display in TSC.
Table II-2	RAI 13.03-2.9, Required Minimum Staffing Times
II.J.10.a, Figure II-5	RAI ETE-4, Evacuation Routes, Monitoring Points, and Shelter Locations
II.P.4	Changed FSRC to proper noun.
Appendix 1–Executive Summary	Deleted incorrect reference.
Appendix 8	Editorial corrections.

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Acronyms and Abbreviations

AED	Automatic External Defibrillator
ALARA	As Low As Reasonably Achievable
CDE	Committed Dose Equivalent
CFR	Code of Federal Regulations
COL	Combined License
COVRERP	Commonwealth of Virginia Radiological Emergency Response Plan
CPR	Cardio-Pulmonary Resuscitation
CR	Control Room
DCD	Design Control Document
DEQ	Department of Environmental Quality
DHS	(U.S.) Department of Homeland Security
DOE	(U.S.) Department of Energy
EAL	Emergency Action Level
EAS	Emergency Alert System
EDE	Effective Dose Equivalent
ENS	Emergency Notification System
EOC	Emergency Operations Center
EOF	Emergency Operations Facility
EPA	(U.S.) Environmental Protection Agency
EPIP	Emergency Plan Implementing Procedure
EPZ	Emergency Planning Zone
ERDS	Emergency Response Data System
ERF	Emergency Response Facility
ERO	Emergency Response Organization
ESP	Early Site Permit
ETE	Evacuation Time Estimate
FEMA	Federal Emergency Management Agency
FRMAC	Federal Radiological Monitoring and Assessment Center
FRMAP	Federal Radiological Monitoring Assessment Plan
FSAR	Final Safety Analysis Report
GUI	Graphic User Interface
HEAR	Hospital Emergency Alerting Radio
HPN	Health Physics Network
INPO	Institute of Nuclear Power Operations
ITAAC	Inspections, Tests, Analyses and Acceptance Criteria
JIC	Joint Information Center
LAN	Local Area Network
LCO	Limiting Condition of Operation

MIDAS	Meteorological Information and Dose Assessment System
MIDAS-NU	MIDAS-Nuclear
NAEP	North Anna Emergency Plan
NAPS	North Anna Power Station
NEI	Nuclear Energy Institute
NOAA	(U.S.) National Oceanographic and Atmospheric Administration
NOUE	Notification of Unusual Event
NRC	(U.S.) Nuclear Regulatory Commission
NWS	(U.S.) National Weather Service
ODCM	Offsite Dose Calculation Manual
ORO	Offsite Response Organization
OSC	Operational Support Center
PAG	Protective Action Guide
PAR	Protective Action Recommendation
PMCL	Protective Measures Counterpart Link
POI	Point of Interest
QA	Quality Assurance
REAC/TS	Radiation Emergency Assistance Center/Training Site
RERP	Radiological Emergency Response Plan
RM/F	Radiation Monitors and Flow
RPP	Radiation Protection Program
RSCL	Reactor Safety Counterpart Link
SOSC	State On Scene Coordinator
SPDS	Safety Parameter Display System
Sv	Sievert
TEDE	Total Effective Dose Equivalent
TSC	Technical Support Center
UHF	Ultra High Frequency
US-APWR	US-Advanced Pressurized Water Reactor
VCUMC	Virginia Commonwealth University Medical Center
VDEM	Virginia Department of Emergency Management
VDH	Virginia Department of Health
WAN	Wide Area Network

I. Introduction

This emergency plan describes the plans established by Dominion for responding to a radiological emergency at North Anna Power Station (NAPS) Unit 3. Portions of this plan incorporate content by reference from Part 2, Site Safety Analysis Report, of the North Anna ESPA (Reference 19). This plan uses the format "SSAR Section x.y.z" to identify content incorporated from Part 2 of the ESPA.

A. Purpose

This Emergency Plan describes the pre-planned facilities, equipment, response organizations, assessment and protective actions, and cooperative agreements established by Dominion to provide for adequate protection of life and property in the event of a radiological emergency at Unit 3. In this context, protection of life and property includes:

- Notifying and mobilizing affected members of the licensee staff, Federal, Commonwealth of Virginia, risk jurisdiction, and commercial response organizations, and the public;
- Limiting the radiological impact of the emergency on plant employees and affected members of the public; and
- Limiting the potential adverse impact of protective actions, such as evacuations or sheltering.

The impact of plant emergencies is limited through the implementation of pre-planned and controlled preparatory, assessment, and protective actions consistent with this plan.

B. Scope

This emergency plan applies to planning for and response to any radiological emergency condition at Unit 3. Section II.D describes the emergency classification system. Appendix 1 identifies radiological emergency conditions, their initiating conditions, and Emergency Action Levels (EALs).

This emergency plan has been coordinated with the plans of affected government agencies and private sector support organizations listed in Section II.A. Ongoing coordination with affected risk jurisdiction, Commonwealth of Virginia, and Federal agencies and private sector support organizations is imperative to provide for an effective emergency response capability.

C. Planning Basis and Emergency Planning Zones

1. Planning Basis

This plan has been developed to meet the requirements of 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses For Nuclear Power Plants," (Reference 1). Consistent with those requirements, this plan is based on the requirements of 10 CFR Part 50, "Domestic Licensing Of Production And Utilization

Facilities," (Reference 2) primarily Section 50.47, "Emergency Plans," (Reference 3) and Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities" (Reference 4). This plan is also based on the guidance provided in NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" (Reference 5).

2. **Emergency Planning Zones**

NUREG-0654 establishes two Emergency Planning Zones (EPZs) for which planning for predetermined actions should be implemented – the plume exposure pathway EPZ, which has a radius of approximately ten miles, and the ingestion exposure pathway EPZ, which has a radius of approximately fifty miles. When recommending the size of these EPZs in 1978, the NRC/EPA Task Force on Emergency Planning considered the 1975 Reactor Safety Study (WASH-1400) (Reference 6). The NRC/EPA Task Force on Emergency Planning determined that this study was the best available source of information on the relative likelihood of large accidental releases of radioactivity, given a core melt event (Reference 7). Since that time, significant advances have been made in understanding the timing, magnitude, and chemical form of fission product releases from severe nuclear power plant accidents (Reference 8). The plan recognizes that the size of these areas is subject to change if later analyses, design-specific factors, and legislative or regulatory initiatives warrant.

Plume Exposure Pathway EPZ

The plume exposure pathway EPZ is that area where the principal sources of incident-related radiation exposures are likely to be whole body gamma radiation exposures and inhalation exposures from the passing radioactive plume. As a result of this exposure scenario, any exposures resulting from a radiological incident at the facility are likely to have a duration from less than one hour to a few days.

The plume exposure pathway EPZ consists of an area about 10 miles in radius around the site. Figure I-1 provides an illustration of the plume exposure pathway EPZ. The description of the plume exposure pathway EPZ in SSAR Section 13.3.2.2.1 is incorporated by reference. Collectively, the affected counties are referred to as the risk jurisdictions.

Ingestion Exposure Pathway EPZ

The ingestion exposure pathway EPZ is that area where the principal sources of incident-related radiation exposures are likely to result from ingestion of contaminated water and food, including milk, fresh vegetables, and aquatic foodstuffs. As a result of

this exposure scenario, any exposures resulting from a radiological incident at the facility are likely to have a duration from a few hours to months.

The ingestion exposure pathway EPZ consists of an area about 50 miles in radius around the site. Figure I-2 provides an illustration of the ingestion exposure pathway EPZ. The description of the Ingestion Exposure Pathway EPZ in SSAR Section 13.3.2.2.1 is incorporated by reference.

3. Site and Area Description

Unit 3 consists of a Mitsubishi US-Advanced Pressurized Water Reactor (US-APWR) as described in the US-APWR Design Control Document (DCD) (Reference 9) and the associated Final Safety Analysis Report (FSAR) (Reference 10).

The site and area descriptions in SSAR Section 13.3.2.1.1 are incorporated by reference.

Figure I-1 North Anna Site Plume Exposure Pathway EPZ

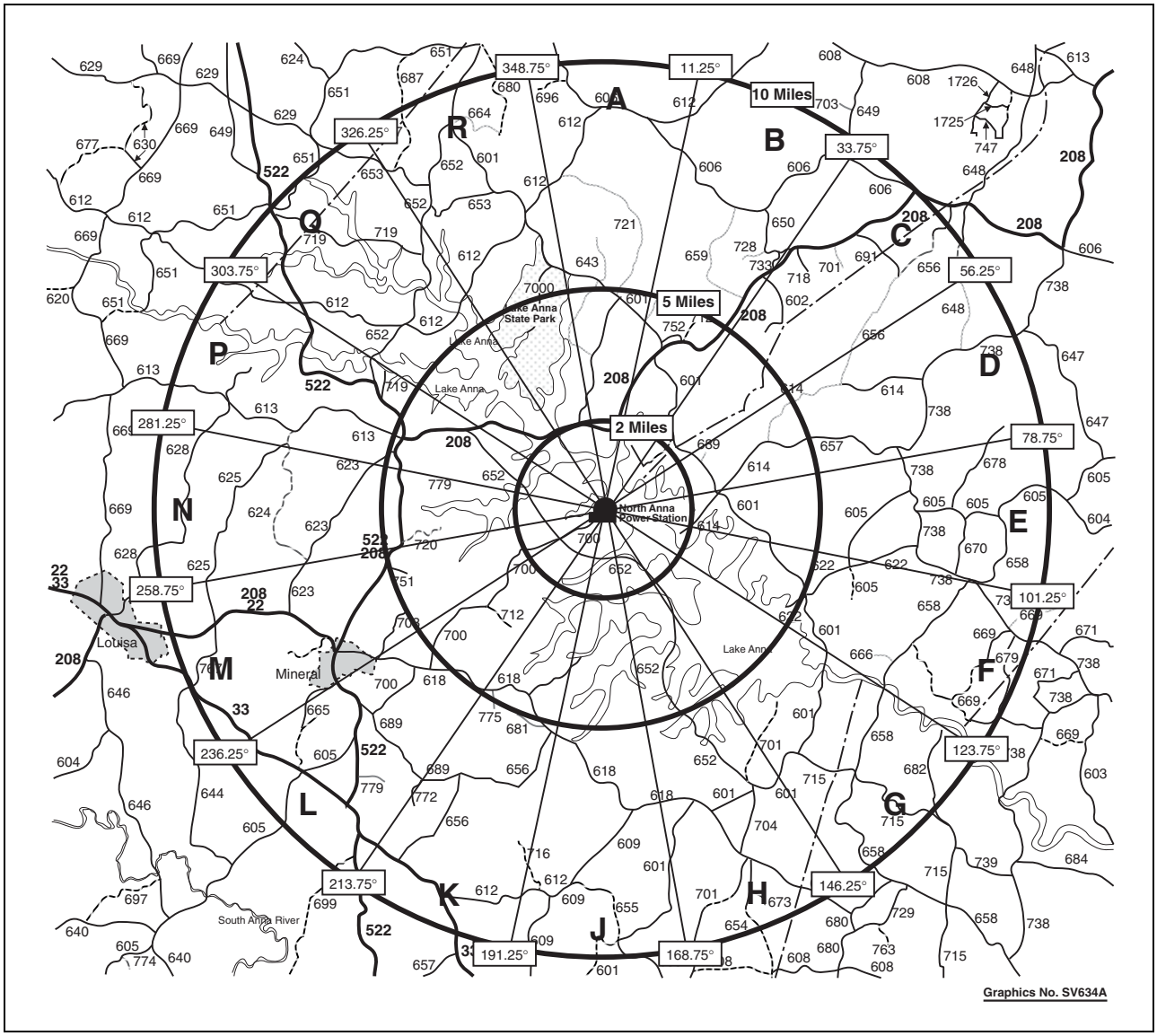
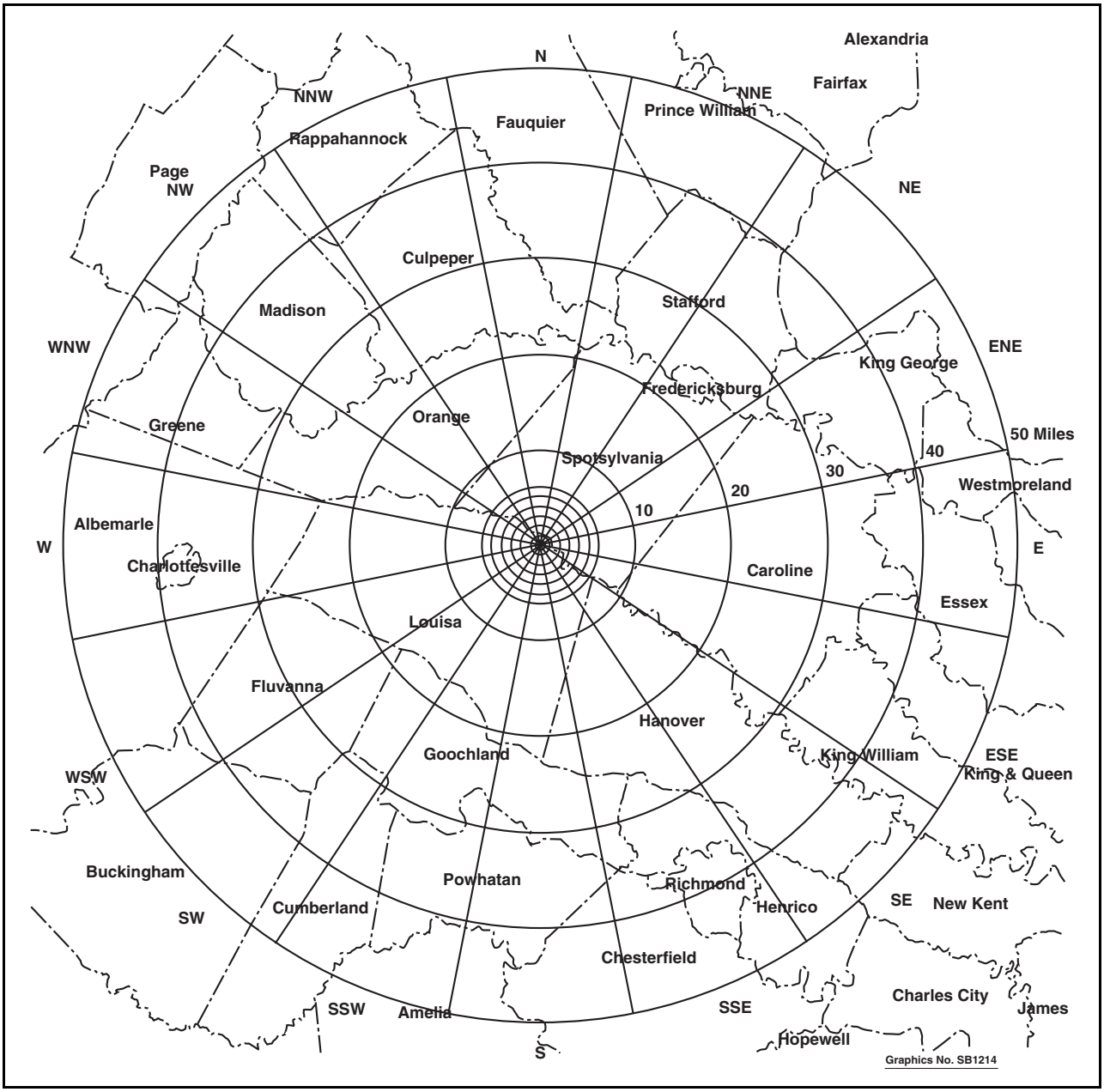


Figure I-2 North Anna Site Ingestion Exposure Pathway EPZ



II. Emergency Plan

A. Assignment of Responsibility (Organization Control)

The description of participating organizations in SSAR Section 13.3.2.2.2.a is incorporated by reference.

1. Emergency Organization

a. Participating Organizations

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Concept of Operations

Dominion's responsibilities during an emergency condition focus on taking actions to:

- Assess plant conditions
- Classify emergency conditions
- Notify affected agencies of emergency conditions
- Provide technical expertise to affected agencies
- Provide support for offsite assessment and protective activities
- Make protective action recommendations
- Mitigate the consequences of adverse plant conditions by monitoring and controlling plant parameters
- Request assistance form off-site agencies, as needed
- Provide support to affected agencies for communications with the affected public
- Terminate emergency conditions

Normal operations at Unit 3 are conducted under the authority of the Shift Manager and directed from the Unit 3 Control Room. In the event of an abnormal condition, the Shift Manager directs the activities of the plant staff in performing initial assessment, corrective, and protective functions. Using approved operating procedures, including the EALs provided in Appendix 1, the Shift Manager determines if an emergency condition exists and, if so, the proper emergency classification. Based on this classification and plant conditions, the Shift Manager assumes the role of the *Emergency Coordinator*[1], makes or directs initial notifications to affected plant staff

1. Throughout this plan, certain position titles, such as *Emergency Coordinator* and *EOF Director*, are used consistent with the provisions of existing regulations, guidance, and Dominion documents. The position titles are provided in italics to denote their generic application. The actual position titles to be used in the execution of this plan will be established in emergency plan implementing procedures or other facility documentation.

and Commonwealth of Virginia, risk jurisdiction, and Federal authorities, and determines if activation of the Dominion emergency response facilities (ERFs) is desirable or required.

The Unit 3 Control Room is the initial center for coordination of emergency response affecting the unit. For emergencies classified as Alert, Site Area Emergency and General Emergency, the *Emergency Coordinator* directs the activation of the emergency response organization (ERO)[2,3,4]. The *Emergency Coordinator* may direct the activation of all or part of the ERO for a Notification of Unusual Event, based on an assessment of plant conditions and support needs.

The Unit 3 Technical Support Center (TSC) acts in support of the command and control function of the Unit 3 Control Room. The TSC provides an area for station personnel who have expertise in diverse areas of plant operation to support the emergency response. This facility is equipped with communication equipment, computer terminals, printers, off-site and on-site computer access, plant drawings, procedures and other materials and equipment to support its function. Personnel in the TSC assess the accident condition and make recommendations to the Control Room, the Emergency Operations Facility (EOF) and off-site agencies as necessary to provide for the safety of plant personnel and members of the general public. After the EOF is operational and activated, the EOF assumes many of the functions of the TSC and relies on the TSC as a vital link to the station. The TSC provides the EOF with up-to-date plant parameters, which allows the EOF staff to perform its assigned tasks.

Following activation of the ERFs and receipt of an adequate turnover, the *Site Vice President* or other designated member of the station management staff relieves the Shift Manager of *Emergency Coordinator* responsibilities and directs the activities of the on-site emergency response organization from the TSC. If the EOF is activated, the *EOF Director* assumes responsibility for the licensee's offsite emergency response efforts, coordinates the availability and utilization of corporate and external resources, and manages recovery efforts.

2. If an event is transient in nature such that staffing of the ERO is not practical prior to termination of the event, then the ERO may not be staffed; however, notifications to affected authorities will be completed consistent with the requirements of this plan.
3. The ERO may be staffed prior to the declaration of an emergency situation, such as in anticipation of severe weather that is likely to result in the declaration of an emergency condition.
4. Under some circumstances, such as unanticipated natural events or hostile action against the facility, the *Emergency Coordinator* may judge that movement of personnel as needed to staff the emergency response facilities may create undue personnel hazards. Under such circumstances, the Emergency Coordinator may elect to postpone staffing of the emergency response facilities and implement compensatory measures as needed to provide for ongoing personnel and facility safety.

The Operational Support Center (OSC) provides an operational center to provide support to the TSC and Control Room. The OSC dispatches assessment and repair teams as directed by the *Emergency Coordinator*, providing operational information, radiological assessment, and manpower for in-plant functions.

Table II-1, Responsibility for Emergency Response Functions, summarizes the responsibilities and activities of the ERFs under the various emergency classifications.

Coordination with NAPS Units 1&2

Dominion has identified the need to coordinate emergency response actions taken at Unit 3 with Units 1&2. As noted previously in this section the *Emergency Coordinator* is responsible for making notifications to affected plant staff, which may include the Unit 1&2 Control Room. This notification and subsequent communications are important to apprise the Unit 1&2 staffs of any actions they may be required to take.

Additionally, in the unlikely event that emergencies are declared at Unit 3 simultaneously with Unit 1 or 2, the *Emergency Coordinator* function is designated from onsite shift management in accordance with emergency plan implementing procedures (EPIPs). The *Emergency Coordinator* discharges those duties described in this Emergency Plan, as well as those described in the Unit 1&2 Emergency Plan and provides for coordination of activities between the on-site ERFs.

Commonwealth of Virginia Government Response

The Commonwealth of Virginia organization for response to radiological emergencies is based on normal governmental structures and channels of communication. The Governor directs the emergency response through the State Coordinator of the Virginia Department of Emergency Management (VDEM). The State Coordinator of the VDEM coordinates the overall response, and the Virginia Department of Health (VDH) provides technical advice and assistance on radiological accident assessment, protective action, radiological control, and radiological monitoring.

When notification is received, the COVRERP is implemented and the VDH initiates action to assess and evaluate the radiological situation in order to provide guidance and assistance to risk jurisdiction governments. After the initial immediate actions, subsequent protective actions are implemented based on the results of the Commonwealth of Virginia evaluation of the radiological situation and the company's recommendations. Commonwealth of Virginia and Federal agencies provide assistance as required. Response operations at the state level are coordinated by the VDEM.

The Commonwealth of Virginia also provides police support during activation of this plan. The first response is likely to be from police units normally based in the local area. These resources can be supplemented as needed by additional units dispatched from other parts of the state. The Virginia State Police also provides traffic control and additional security.

The State Coordinator of the VDEM coordinates the overall response operations at the state level and performs specific duties as defined in the Virginia Emergency Operations Plan, Radiological Emergency Response Basic Plan. The Virginia Emergency Operations Center (EOC) is located at 7700 Midlothian Turnpike, Richmond, Virginia. There are local EOCs in the risk jurisdictions. The VDH sends appropriate liaison personnel to the EOF upon activation.

VDH personnel provide technical advice and assistance on radiological accident assessment, protective actions, radiological exposure control, and radiological monitoring. Virginia EOC staffing is augmented when notification is received of a radiological emergency classified as an Alert or above. Included in the planned response is a team sent to the EOF, which provides direct interface between the VDH and the company's radiological assessment personnel.

Additional Commonwealth of Virginia organizations having possible responsibilities in a radiological emergency are listed in the COVRERP. Requests for support services from these organizations are coordinated through the VDEM.

Figure II-1, Emergency Response Organization Interrelationships, depicts the interrelationships among the various Commonwealth of Virginia and Federal organizations that may respond to an emergency at the facility.

Risk Jurisdiction Government Emergency Response

Responsibility for radiological emergency response rests primarily with the elected officials of local governments. As time is a major factor in realizing the benefits of protective action in the event of a radiological emergency, certain of these actions are predetermined and agreed upon by the local governing body and are implemented without delay upon notification of a radiological emergency. An Insta-phone with backup by commercial telephone, having extensions available in the Control Room, TSC and EOF, is used for normal transmission of emergency notifications to these authorities. Receipt of message by Insta-phone constitutes verification. If the message was received by means other than by Insta-phone, procedures for authentication of an emergency, via the use of call-back numbers, are maintained in the COVRERP and risk jurisdiction RERPs. Risk jurisdiction law enforcement personnel also respond to these Plans. They can perform essentially the same

functions as the Virginia State Police and coordinate their efforts with that organization.

In the event of an emergency, the Station is in communication with the risk jurisdiction Emergency Services Directors, who have the capability of activating their EOCs. The Station relies upon the risk jurisdictions to provide assistance in the event an evacuation from the site requires a remote assembly point or for any services the risk jurisdictions are capable of providing to mitigate the results of the emergency.

The risk jurisdiction health department is the primary health response agency, with the Virginia Health Department providing assistance to them as required, with emphasis on the special requirements for those individuals who are contaminated with radioactivity. Accident assessment personnel operate from the Virginia EOC.

In the event of an emergency, notification and coordination with the risk jurisdictions within the ingestion exposure pathway EPZ are the responsibility of the VDEM and VDH in cooperation with the Virginia Department of Agriculture and Consumer Services and the Virginia Department of Environmental Quality (DEQ), Water Division.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

Federal Government Emergency Response

The Station also maintains close contact with the NRC Operations Center and/or the NRC Region II offices in Atlanta, Georgia. This is an important function to provide accurate information and assessment of the emergency to the Federal Government. As a result of these communications, the NRC can best appraise their response to the emergency. In a like manner, the U.S. Department of Energy, Oak Ridge Operations, is available to provide radiological assistance to the Station.

The Federal Radiological Monitoring and Assessment Center (FRMAC) Operations Plan (Reference 11) provides for the coordinated management of Federal technical response activities related to a radiological emergency. Its primary goals include:

- Assisting the Commonwealth of Virginia and Federal Coordinating Agency with personnel, equipment, and technical resources, as needed;
- Collecting offsite environmental radiological data; and,
- Providing the data and related assessments to involved State agencies and to the Federal Coordinating Agency.

The Department of Energy (DOE), because of its history and capabilities in radiological monitoring and assessment, was assigned the responsibility to prepare for, establish, and manage the FRMAC. The FRMAC may be activated when a major

radiological emergency exists, and the Federal government responds when a State, other governmental entity with jurisdiction, or a regulated entity requests federal support.

Further information concerning objectives and organization is provided in the FRMAC Operations Plan.

Appendix 7 provides a copy of the certification letter established between Dominion and the supporting Commonwealth of Virginia and risk jurisdiction agencies and private sector organizations supporting this plan. The responsibilities of many Federal agencies are established in the National Response Framework (Reference 12) and therefore no agreement letters are required for these agencies.

c. Organizational Interrelationships

The interfaces between and among the onsite and offsite functional areas of emergency response described in SSAR Section 13.3.2.2.2.b.1 are incorporated by reference. Figure II-1 illustrates these interrelationships.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

d. Individual in Charge of Emergency Response

In the event of an abnormal condition, the Shift Manager determines if an emergency condition exists and, if so, classifies the emergency. Upon declaration of an emergency, the Shift Manager or Unit Supervisor assumes the role of the *Emergency Coordinator* and is in charge of the emergency response for the facility.

If required by the emergency classification, or if deemed appropriate by the *Emergency Coordinator*, emergency response personnel are notified and instructed to report to their emergency response locations[5]. The Shift Manager is relieved as *Emergency Coordinator* when the designated management representative reports to the station and is updated as to the status of the unit, the emergency actions taken, and the current status of the emergency. Following this relief, the *Emergency Coordinator* may relocate to the TSC.

The EOF may be activated concurrent with the TSC and always is activated upon declaration of a Site Area Emergency or General Emergency. The EOF is staffed by Dominion personnel, including the *EOF Director*, who directs the activities of this facility. The senior Dominion representative is responsible for ensuring the EOF communicates emergency status to the Commonwealth of Virginia and risk

5. See Section II.A.1.a of this plan regarding situations under which staffing of the emergency response facilities may be deferred.

jurisdiction governments, directs the efforts of the offsite monitoring teams, makes radiological assessments, recommends offsite protective measures to the Commonwealth of Virginia, and arranges through the company for dispatch of any special assistance or services requested by the station.

The Director Nuclear Protection Services and Emergency Preparedness reports to Dominion's senior nuclear executive who is responsible for the total execution of the radiological emergency response effort at Dominion's fleet of nuclear power plants.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

e. 24 Hour Emergency Response Capability

Dominion maintains capability for 24 hour response, including staffing of communications links, through training of multiple responders for key emergency response positions, consistent with the staffing requirements of Section II.B.5 and the training requirements of Section II.O.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Functions, Responsibilities, and Legal Basis

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

3. Written Agreements

Appendix 7 provides a copy of the certification letter established between Dominion and the Commonwealth of Virginia and risk jurisdiction government agencies and private sector organizations committed to supporting further development and implementation of this plan.

The responsibilities of many Federal agencies are established in the National Response Framework; therefore, no certification letters are required for these agencies.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

4. Continuous Operations

Dominion maintains capability for continuous operations through training of multiple responders for key emergency response positions, consistent with the training requirements established in Section II.O. The *Emergency Coordinator* bears responsibility for ensuring continuity of technical, administrative, and material resources during emergency operations.

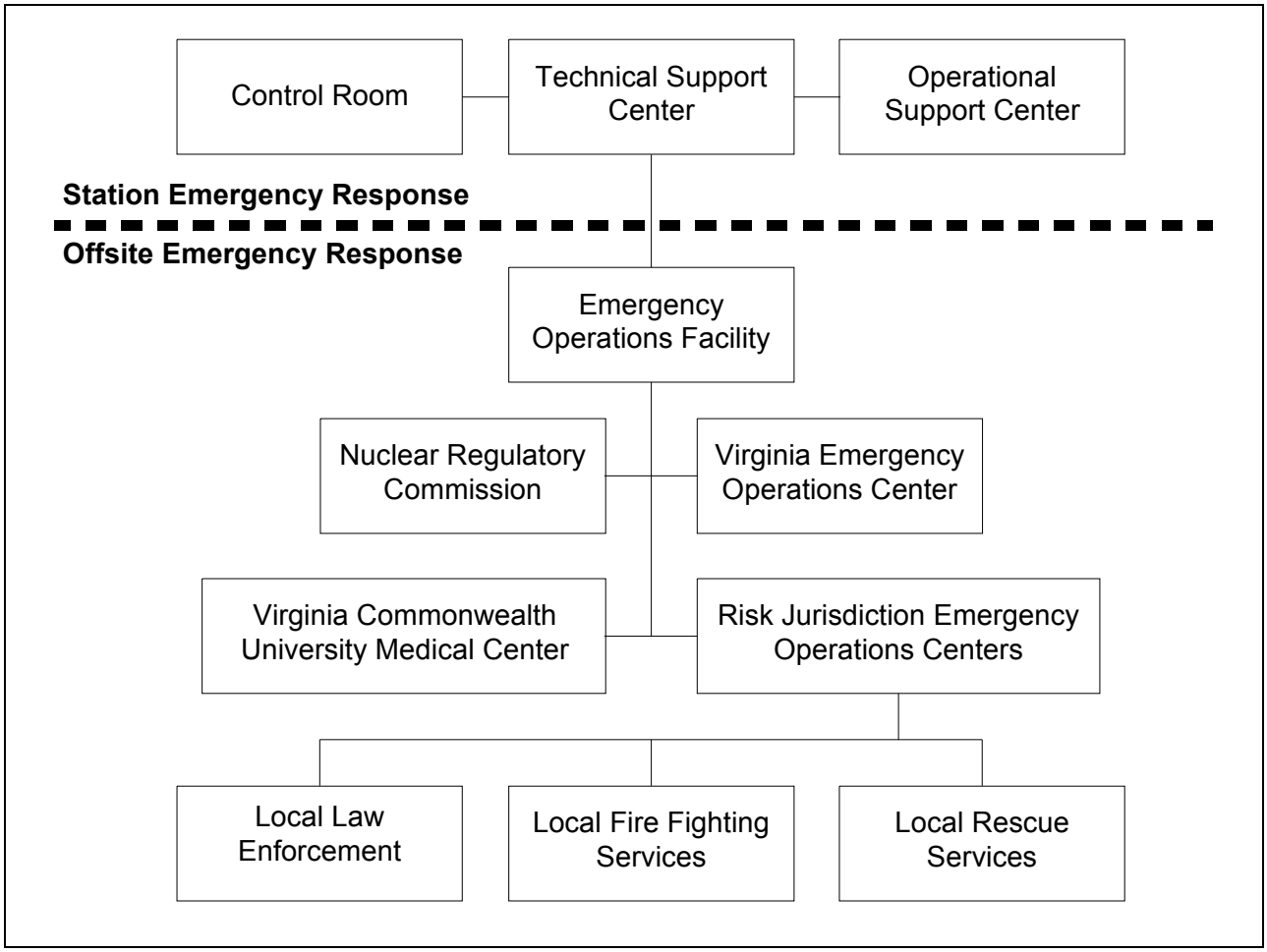
Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

Table II-1 Responsibility for Emergency Response Functions

Function	Emergency Classification			
	NOUE	Alert	Site Area Emergency	General Emergency
Supervision of reactor operations and manipulation of controls	CR	CR	CR	CR
Management of plant operations	CR (TSC)	TSC	TSC	TSC
Technical support for reactor operations	CR (TSC)	TSC	TSC	TSC
Management of corporate emergency response resources	CR (TSC) (EOF)	TSC (EOF)	EOF	EOF
Monitoring of radioactive effluents and the environs; dose assessment and projection	CR (TSC) (EOF)	TSC (EOF)	EOF	EOF
Provision of information to Commonwealth of Virginia and risk jurisdiction emergency response organizations, including Protective Action Recommendations	CR (TSC) (EOF)	TSC (EOF)	EOF	EOF
Management of recovery operations	CR (TSC) (EOF)	TSC (EOF)	TSC/EOF	TSC/EOF
Technical support for recovery operations	CR (TSC) (EOF)	TSC (EOF)	TSC/EOF	TSC/EOF

Note: Listing of facilities in parentheses indicates that activation of these facilities or performance of these functions is optional, based on management assessment of plant conditions and emergency response needs.

Figure II-1 Emergency Response Organization Interrelationships



B. Onsite Emergency Organization

1. Onsite Emergency Organization

The description of the Onsite Emergency Organization in SSAR Section 13.3.2.2.2.b is incorporated by reference.

Figure II-2 illustrates the onsite emergency response organization (ERO). EPIPs provide details regarding ERO position functions.

The minimum staff required to conduct routine and immediate emergency operations is maintained at the station consistent with 10 CFR 50.54(m) and this plan. Staffing is described in FSAR Section 13.1. Station administrative procedures provide the details of the normal station organization, including reporting relationships.

Upon declaration of an emergency, designated members of the normal staff complement fulfill corresponding roles within the emergency response organization. For example, Health Physics personnel undertake radiation protection activities, Security personnel

undertake Security activities, Engineering personnel focus on plant assessment and technical support for operations, and Operations personnel focus on plant operations.

2. Emergency Coordinator

The Shift Manager/Unit Supervisor position is continuously staffed consistent with 10 CFR 50.54(m). Upon recognition of an emergency condition, the individual filling this position assumes the duties of the *Emergency Coordinator* until relieved by a qualified member of the management staff consistent with Section II.B.3 or until termination of the emergency condition, whichever comes first.

The individual filling the *Emergency Coordinator* role has the responsibility and authority to initiate any required emergency response actions, including notification of affected Federal, Commonwealth of Virginia, and risk jurisdiction authorities and provision of Protective Action Recommendations to offsite authorities. Upon staffing of the ERO, the *EOF Director* relieves the *Emergency Coordinator* of responsibility for notification of and coordination with offsite authorities.

3. Emergency Coordinator Line of Succession

If the Shift Manager is rendered unable to fulfill the duties and responsibilities of the *Emergency Coordinator* position (such as due to personal illness or injury) the Unit Supervisor or, in the absence of a Unit Supervisor (i.e., as may be permitted in cold shutdown or refueling modes), a Reactor Operator present on shift (a position that also will be continuously staffed) assumes the *Emergency Coordinator* position until relieved by a qualified member of the management staff as outlined below.

A trained, higher level member of the licensee's management staff may assume *Emergency Coordinator* responsibilities from the Shift Manager after becoming fully familiar with the pertinent plant and radiological conditions and status of emergency response/accident mitigation efforts.

4. Emergency Coordinator Responsibilities

The *Emergency Coordinator* has the responsibility and authority to initiate emergency actions necessary to protect the life, health, and safety of the plant staff. Any required evacuations of individuals (including members of the public) from the plant's Exclusion Area are conducted cooperatively with Commonwealth of Virginia and risk jurisdiction agencies. The non-delegable responsibilities of the *Emergency Coordinator* include:

- Classifying the emergency
- Authorizing notification to the NRC, Commonwealth of Virginia and risk jurisdiction agencies of the emergency status
- Recommending protective measures

- Authorizing emergency exposure limits

Other responsibilities of the *Emergency Coordinator* include:

- Activating emergency personnel and facilities
- Reducing power or shutting down the reactor
- Committing company funds as necessary
- Acquiring emergency equipment or supplies
- Ordering site evacuation
- Restricting access to the site
- Notifying company management
- Implementing work schedules
- Directing onsite emergency activities

As indicated in Table II-1, the EOF may assume responsibility for:

- Management of corporate emergency response resources
- Monitoring of radioactive effluents and the environs
- Dose assessment and dose projections, including recommending protective measures
- Provision of information regarding emergency status to offsite emergency response support organizations, including notification to the NRC, the Commonwealth of Virginia, and the risk jurisdiction agencies

5. Plant Emergency Response Staff

Dominion will establish minimum emergency response staffing consistent with Table II-2, which has been based on the guidance provided in Table B-1 of NUREG-0654. Figure II-2 illustrates the plant staff emergency organization.

Upon declaration of an emergency, members of the plant staff assume positions in the emergency response organization consistent with their training and management assignments. Figure II-3 provides an illustration of the augmented plant staff emergency response organization.

The ERO, when fully activated, includes the positions described in Table II-2. Additional personnel may be designated as emergency responders providing special expertise deemed beneficial, but not mandatory, to the planned response. The individuals assigned as responders for the emergency positions are designated based on the technical requirements of the position.

The onsite emergency organization provides for the key functions of accident assessment, radiological monitoring and analysis, security, fire-fighting, first aid and rescue, and communications.

6. Interfaces Between Functional Areas

Figure II-1 illustrates the interfaces between and among the site functional areas of emergency response activity, Dominion EOF support, the affected Commonwealth of Virginia and risk jurisdiction government response organizations, the NRC, and other offsite organizations.

7. Corporate Support for the Plant Staff

Upon declaration of an Alert, Site Area Emergency, or General Emergency, the *Emergency Coordinator* directs the activation and notification of the onsite and offsite ERFs. Dominion management, technical, and administrative personnel staff the EOF and provide (or coordinate) augmented support for the plant staff.

The Dominion corporate staff focuses on discharging management, technical and administrative activities as needed to support the plant staff and to relieve the plant staff of external coordination responsibilities, including notification of and coordination with offsite authorities and release of information to the media. In addition to the activities discussed in Table II-2, activities of the Dominion corporate staff include:

- Logistical support for plant personnel
- Technical support for planning and recovery/re-entry operations
- Management-level interface with governmental authorities
- Coordination with, and release of information to, the news media

8. Support from Contractor and Private Organizations

The Institute of Nuclear Power Operations (INPO) serves as a clearinghouse for industry wide support during an emergency. When notified of an emergency situation, INPO provides emergency response as requested. INPO provides the following emergency support functions:

- Assistance to the affected utility in locating sources of emergency manpower and equipment
- Analysis of the operational aspects of the incident
- Dissemination to member utilities of information concerning the incident
- Organization of industry experts who could advise on technical matters

If requested, one or more suitably qualified members of the INPO staff will report to the *EOF Director* and assist in coordinating INPO's response to the emergency.

Dominion may request that the reactor vendor, Mitsubishi, provide technical support for emergency response activities. Mitsubishi will operate primarily from its corporate offices, with a small contingent at the plant if requested.

If required at the time of the event, additional resources can be obtained through purchase agreements with the supporting institutions. These agreements would be negotiated on an as-needed basis.

9. Risk Jurisdiction Emergency Response Support

Dominion has established and will maintain agreements for risk jurisdiction emergency response support services, including fire fighting, rescue squad, medical and hospital services. Appendix 7 provides the certification letter for organizations providing these services.

Figure II-2 North Anna Unit 3 Emergency Response Organization – On-Site

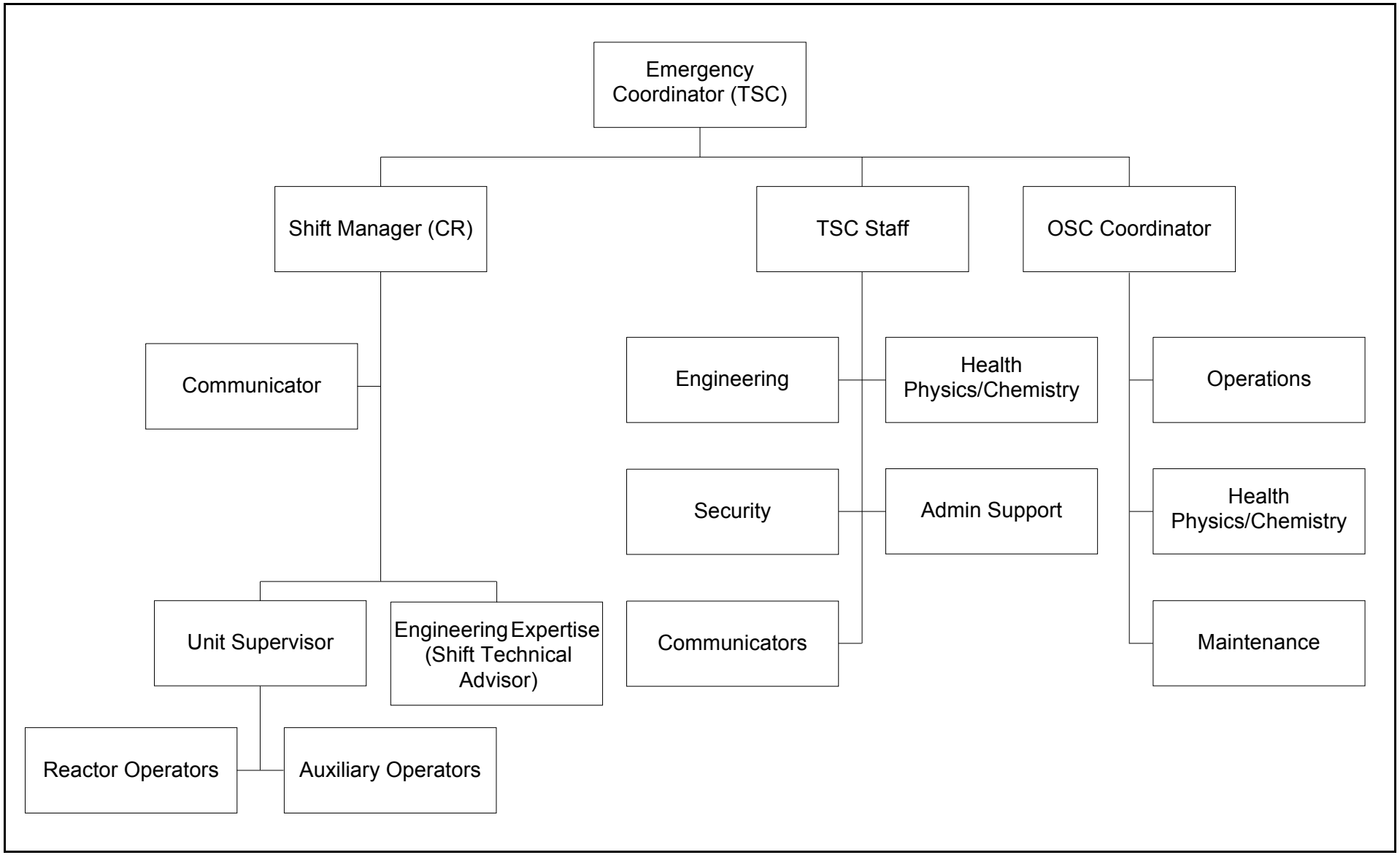


Figure II-3 North Anna Unit 3 Augmented Emergency Response Organization

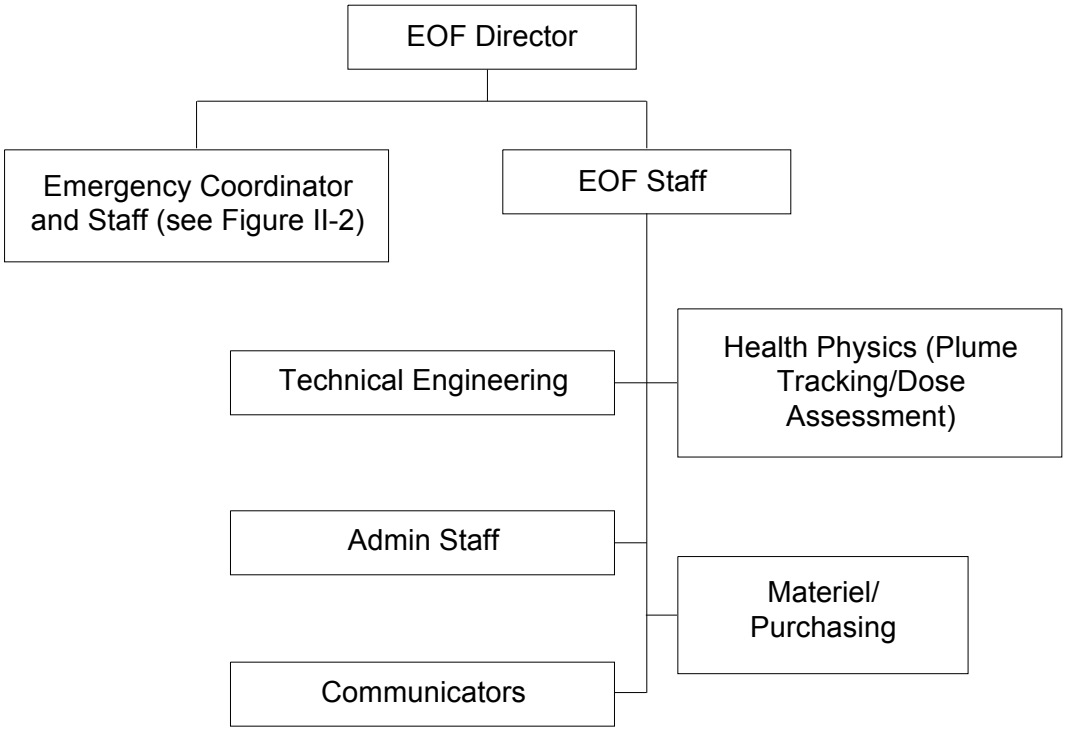


Table II-2 Plant Staff Emergency Functions

Major Functional Area	Major Tasks	Position, Title, or Expertise	On Shift[2,3]	Capability for Additions	
				Approx 45 min	Approx 60 min
Plant Operations and Assessment of Operational Aspects	Supervision of Station Operations and Assessment of Operational Aspects of Plant Operations	Shift Manager-(SRO)	1		
		Unit Supervisor (SRO)	1		
		Control Room Operator (RO)	2		
		Non-Licensed Operator	2		
Emergency Direction and Control (*Emergency Coordinator*)	Direction and Control of On-Site Emergency Activities	Shift Manager	1[1]		
Notification and Communication	Notify licensee, Commonwealth of Virginia, risk jurisdiction, and Federal personnel and maintain communication	Emergency Communicator	1[4]	1[4]	2[4]
Radiological Accident Assessment and Support of Operational Accident Assessment	EOF Director	Senior Manager			1
	Dose Assessment	Radiological Assessment Coordinator		1	
	Off-site surveys	HP Technicians		2[4]	2[4]
	On-site (out of plant)			1[4]	1[4]
	In-plant surveys		1	1	1
	Chemistry/Radiochemistry	Chemistry	1		1

Table II-2 Plant Staff Emergency Functions

Major Functional Area	Major Tasks	Position, Title, or Expertise	On Shift[2,3]	Capability for Additions	
				Approx 45 min	Approx 60 min
Plant System Engineering, Repair and Corrective Actions	Technical Support	Shift Technical Advisor function[5]	1		
		Technical Support Team Member (Core and Thermal Hydraulics)			1[6]
		Technical Support Team Member (Electrical)			1
		Technical Support Team Member (Mechanical)			1
	Repair and Corrective Actions	Damage Control Team Member (Mechanical Maintenance)	1[1]		2
		Damage Control Team Member (Electrical Maintenance)	1[1]	1	1
		Damage Control Team Member (Instrumentation and Control)		1	
Protective Actions (In-Plant)	Radiation Protection a. Access Control b. HP Coverage for repair, corrective actions, search and rescue, first aid, and firefighting c. Personnel monitoring d. Dosimetry	HP Technicians	2[1]	2[4]	2[4]
Firefighting	Firefighting	Fire Team Members	Per FSAR	Local Support	
Rescue Operations and First Aid	First Aid	First Aid Team Member	2[1, 4]	Local Support	

Table II-2 Plant Staff Emergency Functions

Major Functional Area	Major Tasks	Position, Title, or Expertise	On Shift[2,3]	Capability for Additions	
				Approx 45 min	Approx 60 min
Site Access Control and Personnel Accountability	Security, firefighting, communications, personnel accountability	Security Team Members	Staffing levels for the on-shift, initial additions and supplemental additions are provided in the Security Plan.		
		Security Team Leader			
Totals			**16**	**10**	**16**

1. This coverage is initially provided by personnel assigned other functions.
2. The minimum shift crew will be as defined in 10 CFR 50.54(m)(2)(i) and the Technical Specifications.
3. On-shift positions may be vacant for up to two hours due to unforeseen circumstances, such as sudden illness.
4. These resources are common between North Anna Units 1&2 and Unit 3 and may be shared.
5. These duties may be performed by an appropriately qualified SRO.
6. The Shift Technical Advisor function provides core thermal/hydraulics expertise prior to supplemental staff addition.

C. Emergency Response Support and Resources

The arrangements for emergency response support and resources described in SSAR Section 13.3.2.2.2.c are incorporated by reference.

1. Federal Response Capability

a. Under some complex circumstances it may be necessary to obtain offsite radiological monitoring support from Federal government agencies. The *Emergency Coordinator/EOF Director* may request FRMAC assistance through the NRC.

b. Federal radiological monitoring assistance may be provided by DOE-Oak Ridge under the DOE Radiological Assistance Program. Support available from DOE-Oak Ridge includes medical support from the Radiation Emergency Assistance Center/Training Site (REAC/TS). Dominion estimates that a FRMAC Advance Party could be expected at the site within 6 to 14 hours following the order to deploy, based on the availability of airports near the site.

   Dominion expects that NRC assistance from NRC's offices in Atlanta, GA, will arrive in the site vicinity within 7-8 hours following notification.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

c. Dominion provides facilities and resources needed to support the Federal response through the EOF. Available resources include office space and telephone and radio communications circuits. Dominion also provides limited office space and telephone communications facilities for NRC personnel in the TSC.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Offsite Organization Representation in the EOF

a. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Dominion does not expect risk jurisdiction representatives to be present at the EOF. A VDEM State On-Scene Coordinator (SOSC) serves as the Commonwealth's representative to provide interface between the utility and Commonwealth of Virginia and risk jurisdiction governments.

3. Radiological Laboratories

Radiological laboratories available to support emergency response efforts are available through the Commonwealth of Virginia to respond to an emergency at the NAPS site. These resources include those facilities listed below. Estimated travel times to the NAPS site are provided parenthetically.

- University of Virginia, Charlottesville, Virginia (45 minutes)
- Virginia Commonwealth Laboratories, Richmond, Virginia (75 minutes)
- Virginia Commonwealth University Medical Center, Richmond, Virginia (75 minutes)
- Newport News Shipbuilding & Drydock, Newport News, Virginia (3 1/2 hours)
- VDH Radiological Health Program Mobile Laboratory (1 hour)

North Anna maintains fixed laboratory equipment to support sampling analysis and monitoring. The equipment includes multichannel analyzers, proportional counters, a tritium analyzer, and whole body counters; arrangements are maintained for reading thermoluminescent dosimeters (TLDs).

The listed laboratory facilities are available to support emergency response activities on a 24-hour per day basis.

4. Other Supporting Organizations

Dominion has made arrangements to obtain additional emergency response support from the INPO Fixed Nuclear Facility Voluntary Assistance Agreement signatories and the Radiation Emergency Assistance Center/Training Site (REAC/TS). A certification letter in Appendix 7, outlines the scope of the expected support.

D. Emergency Classification System

Dominion uses a standard emergency classification scheme, based on system and effluent parameters, which allows affected Commonwealth of Virginia and risk jurisdiction response organizations to determine initial offsite response measures.

The description of the emergency classification system in SSAR Section 13.3.2.2.2.d is incorporated by reference.

1. Classification System

10 CFR 50, Appendix E identifies four distinct classes of emergencies:

- Notification of Unusual Event (NOUE) - Events are in process 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 off-site response or monitoring are expected unless further degradation of safety systems occurs.

Potential degradation of the level of safety of the plant is indicated primarily by exceeding plant technical specification Limiting Condition of Operation (LCO) allowable action statement time for achieving required mode change. Precursors of more serious events should also be included because precursors do represent a potential degradation in the level of safety of the plant. Minor releases of radioactive materials are included. In this emergency class, however, releases do not require monitoring or offsite response.

Actions undertaken at the NOUE emergency class include promptly informing State and local offsite authorities of the event, augmenting on-shift resources as needed, assessment and response, and escalation to a more severe class, if appropriate. If the emergency class is not escalated to a more severe class, then State and local offsite authorities will be notified of event termination in accordance with implementing procedures.

- Alert – Events are in process 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 (PAG) exposure levels.

  Rather than discussing the distinguishing features of “potential degradation” and “potential substantial degradation,” a comparative approach would be to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency class is warranted, or whether de-escalation or termination of the emergency class declaration is warranted. Dose consequences from these events are small fractions of the EPA PAG plume exposure levels.

  Actions undertaken at the Alert emergency class include those described for the NOUE emergency class and activation of the Technical Support Center and Operational Support Center. In addition, Emergency Operations Facility and other key emergency personnel are alerted, on-site monitoring teams are dispatched, periodic plant status updates and meteorological assessments are provided to offsite authorities, as are dose estimates, if any event related releases are occurring.

- Site Area Emergency - Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or hostile actions that result in intentional damage or malicious act: 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.

The discriminator (threshold) between Site Area Emergency and General Emergency is whether or not the EPA PAG plume exposure levels are expected to be exceeded outside the site boundary. This threshold, in addition to dynamic dose assessment considerations discussed in the EAL guidelines, clearly addresses NRC and offsite emergency response agency concerns as to timely declaration of a General Emergency.

Actions undertaken at the Site Area Emergency emergency class include those described for the Alert emergency class and activation of the Emergency Operations Facility. In addition, an individual is dedicated to provide plant status updates to offsite authorities and periodic media briefings (jointly with offsite authorities when practicable), senior technical and management staff are made available for consultation with NRC and the Commonwealth of Virginia on a periodic basis, and release and dose projections based on available plant condition information and foreseeable contingencies are provided.

- General Emergency – Events are in process 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 los 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.

  The bottom line for the General Emergency is whether evacuation or sheltering of the general public is indicated based on EPA PAGs, and therefore should be interpreted to include radionuclide release regardless of cause. In addition, it should address concerns as to uncertainties in systems or structures (e.g., containment) response, and also events such as waste gas tank releases and severe spent fuel pool events that may affect the public. To better assure timely notification, EALs in this category must primarily be expressed in terms of plant function status, with secondary reliance on dose projection. In terms of fission product barriers, loss of two barriers with loss or potential loss of the third barrier constitutes a General Emergency.

  Actions undertaken at the General Emergency emergency class are identical to those described for the Site Area Emergency emergency class except there is no more severe emergency class.

Appendix 1 provides recognition categories, the associated initiating condition matrices, and the EALs.

2. Emergency Action Levels

The description of emergency action levels provided in SSAR Section 13.3.2.2.2.c is incorporated by reference. The following information supplements that description.

Appendix 1 provides the parameter values and equipment status that are indicative of each emergency class.

3. Commonwealth/Risk Jurisdiction EAL Scheme

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

4. Commonwealth/Risk Jurisdiction Emergency Action Procedures

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

E. Notification Methods and Procedures

Dominion maintains procedures for notification of Commonwealth of Virginia and risk jurisdiction response organizations and licensee emergency responders. These procedures include, or make reference to, the pre-planned content of messages to Commonwealth of Virginia and risk jurisdiction organizations. Dominion also makes arrangements to provide prompt notification to members of the public within the plume exposure pathway EPZ.

The descriptions of notification methods and procedures provided in SSAR Section 13.3.2.2.2.e are incorporated by reference.

1. Notification of Commonwealth and Risk Jurisdiction Authorities

Dominion maintains systems and procedures needed to provide prompt notification of affected Commonwealth of Virginia, risk jurisdiction, and Federal authorities following the declaration of any emergency condition, consistent with the emergency classification and action level scheme described in Appendix 1. The *Emergency Coordinator* initiates notification of affected Commonwealth of Virginia and risk jurisdiction authorities, including escalation or de-escalation of any emergency condition. The affected authorities include the Commonwealth of Virginia and the following risk jurisdictions:

- Caroline County
- Hanover County
- Louisa County
- Orange County
- Spotsylvania County

The primary notification method to be used is the Insta-phone system, which is accessible from the Control Room, TSC, and EOF. Back-up notification capability is maintained through the use of commercial telephone systems. Message content and verification methods are established in implementing procedures.

Dominion maintains systems and procedures needed to provide prompt notification of the USNRC Operations Center following the declaration of any emergency condition. The USNRC will be notified as soon as is practical following the notification of the Commonwealth of Virginia and risk jurisdiction authorities and within one (1) hour of the emergency declaration, including escalation or de-escalation of any emergency declaration. The primary notification method to be used is the Emergency Notification System, which is accessible from the Control Room, TSC, and EOF. Back-up notification capability is maintained through the use of commercial telephone systems.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Notification and Mobilization of Licensee Response Organizations

The description of the methods and procedures used for notifying and mobilizing the Dominion ERO provided in SSAR Section 13.3.2.2.2.e is incorporated by reference. The following information supplements that description.

The *Emergency Coordinator* directs the notification and mobilization of the licensee emergency response organization following the declaration of an Alert or higher level emergency. Although Dominion does not expect that the augmented resources of the emergency response organization would be required for a Notification of Unusual Event, all or part of the emergency response organization may be mobilized at the Notification of Unusual Event level at the discretion of the *Emergency Coordinator*.

When staffing of the ERO is required, or desired by the *Emergency Coordinator*, affected personnel may be notified by a multifaceted process, including alarms, announcements, pagers, telephones, on-line messages, etc. Notification and mobilization of the emergency response organization is initiated in accordance with implementing procedures.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

3. Message Content

The content of initial emergency notification messages from the plant to affected Commonwealth of Virginia and risk jurisdiction authorities includes information addressing the class of emergency, status of any radioactive releases, the locations of

any potentially-affected populations, and recommendations regarding public protective actions.

The COVRERP provides the notification form used for notification of Commonwealth and risk jurisdiction authorities. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

4. Follow-up Messages to Offsite Authorities

Follow-up messages from the plant to affected Commonwealth of Virginia and risk jurisdiction authorities include the following information, to the extent the information is available and appropriate, as mutually agreed upon between Dominion and VDEM:

- Incident date, time, and location;
- Name of and contact information for caller;
- Emergency classification;
- Information regarding any actual or potential radioactive releases, including medium, i.e., airborne, waterborne, surface spill, estimated duration/impact time, release point and elevation, chemical and physical form, and estimates of total and relative quantities and concentrations of noble gases, iodines, and particulates;
- Meteorological conditions, including wind speed and direction, stability class, and precipitation;
- Actual or projected exposure rates and projected integrated dose at the site boundary;
- Projected exposure rates and integrated doses at the projected peak location and at 2, 5, and 10 miles, including affected sectors;
- Estimates of surface contamination levels in the plant, onsite, and offsite;
- Emergency response actions underway;
- Recommended emergency actions, including protective action recommendations;
- Requests for any onsite support by offsite organizations (e.g., firefighting or medical transportation support); and
- Prognosis for changes in event classification or other conditions based on current assessments of plant conditions.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

5. Disseminating Information to the Affected Public

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

6. Instructions to the Public in the Plume Exposure EPZ

The description of the methods and procedures used for providing instructions to members of the public provided in SSAR Section 13.3.2.2.2.e is incorporated by reference. The following information supplements that description.

The primary method of alerting the public is by sounding the Alert and Notification System sirens. Other alerting methods may include telephone communications, television and radio communications via the Emergency Alert System (EAS) stations, public address systems, bull horns from patrol cars, and personal contact.

The Commonwealth of Virginia and risk jurisdiction governments have ultimate responsibility for warning the public. Should it be necessary, Commonwealth of Virginia and risk jurisdiction authorities will alert the public within the plume exposure pathway EPZ using alternative methods described in the Virginia Emergency Operations Plan, Radiological Emergency Response Basic Plan and the risk jurisdiction Radiological Emergency Response Plans. Details of alternate methods are located in the same section of the respective plans as the primary methods. Members of the public within the plume exposure pathway EPZ shall be informed of what actions to take following activation of the Alert and Notification System. Upon hearing the alert, they are instructed to turn on their radios or television sets to the EAS to receive further instructions. The affected risk jurisdictions and the Commonwealth of Virginia have a 24 hour per day capability to activate the system. If the Commonwealth of Virginia cannot be contacted, the risk jurisdictions can contact the EAS control station directly in accordance with their respective plans.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

7. Written Messages to the Public

The description of the processes used for providing written messages to the public provided in SSAR Section 13.3.2.2.2.g is incorporated by reference. The following information supplements that description.

Affected Commonwealth of Virginia and risk jurisdiction officials bear responsibility for providing written emergency messages intended for the public, in particular providing instructions regarding specific protective actions. Dominion supports development of these messages by providing supporting information.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

F. Emergency Communications

Dominion maintains systems and procedures that provide for prompt communications between its ERFs and between the site and offsite ERFs. The descriptions of plans for implementing emergency communications provided in SSAR Section 13.3.2.2.2.f are incorporated by reference.

1. Description of Communication Links

Dominion maintains reliable communications links both within the plant and between the plant and external emergency response organizations. Section 9.5.2 of the US-APWR DCD provides a description of communications systems that are within the scope of the certified design.

a. Dominion maintains capabilities for 24 hour per day emergency notification to the Commonwealth of Virginia and risk jurisdiction emergency response network. Commonwealth of Virginia/risk jurisdiction warning points are manned 24 hours per day. This communications link consists of an Insta-phone loop with links to risk jurisdictions and the Commonwealth of Virginia. If the Insta-phone is out of service, regular commercial telephone will be used to make the notifications and the above localities have a system to call back to the power station and verify the message.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Provisions for communicating with Commonwealth of Virginia and risk jurisdiction governments include an Insta-Phone loop that has been installed to permit simultaneous telephone-speaker communications from the Station to the risk jurisdictions and the Virginia EOC on a 24-hour per day basis. This loop can be activated from the Control Room, TSC, or EOF.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

c. Separate telephone lines are dedicated for communications with the NRC and include the following:

   - Emergency Notification System (ENS): Provide for initial notifications, as well as ongoing information about plant systems, status and parameters, will be provided to the NRC. ENS lines are located in the Control Room, TSC and EOF.
   - Management Counterpart Link (MCL): Provides for internal discussions between the NRC Executive Team Director/members and the NRC Director of Site Operations or licensee management. MCL lines are located in the TSC and EOF.

- Health Physics Network (HPN): Provide for communications regarding radiological and meteorological conditions, assessments, trends, and protective measures. HPN lines are located in the TSC and EOF.
- Reactor Safety Counterpart Link (RSCL): Allows for internal NRC discussions regarding plant and equipment conditions. RSCL lines are located in the TSC and EOF.
- Protective Measures Counterpart Link (PMCL): Allows for conduct of internal NRC discussions on radiological releases, meteorological conditions, and protective measures. PMCL lines are located in the TSC and EOF.
- Local Area Network (LAN) Access: Provides access to the NRC local area network. Jacks are provided in the TSC and EOF.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

d. Dominion provides capability for communications between the Control Room or TSC and the EOF, risk jurisdiction and Virginia EOCs via the Insta-Phone loop as described in Section II.F.1.b. Communications capabilities between the Control Room or TSC and radiological field personnel are also provided.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

e. Notification, alerting and activation of emergency response personnel in the TSC, OSC, and EOF are described in Section II.E.2.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

f. Dominion provides for communications between Control Room/TSC/EOF and the NRC Operations Center via dedicated telephone lines.

g. Dominion will activate the Emergency Response Data System (ERDS) within one hour of the declaration of an Alert or higher emergency classification in accordance with the applicable facility procedure(s).

2. Communication with Fixed and Mobile Medical Support Facilities

Dominion maintains communications systems that allow for communications between the site and fixed and mobile medical support facilities. The communications systems include both commercial telephone communications with fixed facilities and radio communications to the ambulance.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

3. Communication System Tests

Dominion conducts tests of its emergency communications system as follows:

- Communications with the facility and EOF and the Commonwealth of Virginia/risk jurisdiction warning points are tested monthly.
- Communications between the Virginia/risk jurisdiction EOCs and field assessment teams are tested annually.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

G. Public Education and Information

Dominion maintains a coordinated program to educate affected members of the public regarding emergency notification methods and actions. The descriptions of plans for implementing a public information program provided in SSAR Section 13.3.2.2.2.g are incorporated by reference.

1. Public Information Program

Dominion coordinates with affected Commonwealth of Virginia and risk jurisdiction authorities to disseminate pertinent emergency response information to members of the public in the plume exposure pathway EPZ on a yearly basis. Information may be provided via a number of methods. Distribution methods may include providing informational publications such as brochures or calendars through mailings to individual households in the plume exposure pathway EPZ. Emergency public information may also be distributed in telephone directories and utility bills, through public information postings, and information distributed via local media outlets. The distributed information includes:

- Educational information on radiation;
- Information regarding notification methods and immediate actions;
- Protective measures, such as information addressing evacuation routes, relocation centers, sheltering, respiratory protection, and radioprotective drugs;
- Information addressing special needs of the handicapped; and
- Point of contact for additional information.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Distribution and Maintenance of Public Information

Dominion coordinates with affected Commonwealth of Virginia and risk jurisdiction authorities to disseminate pertinent emergency response information to members of the public in the plume exposure pathway EPZ on a yearly basis. Written information applicable to permanent residences is provided in a form that is likely to be maintained in the residence (e.g., calendars, brochures) so it will be available during an emergency.

Information intended for transients (individuals on vacation in, camping in, or traveling through the plume exposure pathway EPZ) may include public postings, publications provided to hotels, motels, and campgrounds, and information published in telephone directories. These sources of information provide transients sources for local emergency information, such as local radio and television stations.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

3. News Media Coordination

a. The outlet for emergency information is the Joint Information Center. Dominion's *Chief Technical Spokesperson* will serve as the primary licensee spokesperson and media contact in the Joint Information Center. The *Chief Technical Spokesperson* gathers information from the ERO for dissemination to the news media and updates the news media on a periodic basis throughout any emergency situation during which the members of the media respond to the JIC.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Dominion provides a designated space for limited numbers of news media personnel within the EOF.

4. Information Exchange

a. The Dominion public affairs liaison has access to required public information, primarily through communications with the *Chief Technical Spokesperson* and designated members of the EOF staff.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. The Dominion public affairs liaison coordinates continuity and consistency of information with designated members of the Commonwealth of Virginia and risk jurisdiction emergency response organizations on a periodic basis.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

c. Rumor control is accomplished through ongoing contact with the *Chief Technical Spokesperson* and by the activities of a Dominion public affairs liaison in the JIC, who monitors communications, identifies rumors, and makes appropriate contacts to obtain and disseminate accurate information through the representatives in the JIC. The rumor control number is announced by the VDEM Public Affairs Office at media briefings and in press releases.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

5. News Media Training

News media training is accomplished through briefings for the news media offered on a yearly basis. These annual briefings acquaint members of the media organizations with the emergency plans, information regarding radiation hazards, and points of contact for release of public information during an emergency.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

H. Emergency Facilities and Equipment

The descriptions of ERFs in SSAR Section 13.3.2.2.2.h are incorporated by reference.

1. On-Site Emergency Response Facilities

The TSC and OSC are provided to support emergency operations consistent with the guidance provided in NUREG-0737, Supplement 1.

The function of the TSC is to provide an area and resources for use by personnel providing plant management and technical support to the plant operating staff during emergency evolutions. The TSC relieves the reactor operators of peripheral duties and communications not directly related to reactor system manipulations and prevents congestion in the Control Room.

The TSC is located in the Access Building. The US-APWR Design Certification Document provides pertinent design information (instrumentation, data system equipment, and power supplies) for the TSC in Tier 2.

Section II.B.5 provides a description of the TSC staff. Section II.O.4 provides a description of emergency response organization training and qualification.

The size of the TSC is sufficient to support a staff of 25 people.

The TSC is environmentally controlled to provide room air temperature, humidity and cleanliness appropriate for personnel and equipment. The room is provided with radiological protection and monitoring equipment necessary to monitor personnel radiation exposure and to maintain personnel doses less than 0.05 Sv (5 rem) total effective dose equivalent (TEDE), as defined in 10 CFR 50.2, for the duration of the accident. The level of protection is similar to the main control room. However, in the event that off-site and on-site AC power were unavailable, the TSC could be evacuated and the TSC management function transferred to a location unaffected by the radiation release.

The TSC is provided with reliable voice and data communication with the main control room and EOF and reliable voice communications with the OSC, NRC Operations Center and Virginia and risk jurisdiction EOCs. Control room data communication of emergency response data system (ERDS) data with the NRC Operations Center is also provided as appropriate. Section II.F provides a description of the communications capabilities provided in the TSC.

Display capability of the technical data system in the TSC includes a workstation that, at minimum, is capable of displaying the parameters that are required of a Safety Parameter Display System (SPDS). The SPDS function is described in DCD Section 18.7 through its incorporated references.

Key reference materials are available to the TSC staff via Local Area Network connection from the Nuclear Electronic Document Library, including:

- Up-to-date, as-built drawings, schematics, and diagrams showing conditions and locations of plant structures and systems down to component level
- Plant technical specifications
- Plant operating procedures
- Emergency operating procedures
- Final Safety Analysis Report
- Up-to-date records related to licensee, State, and local emergency response plans
- Offsite population distribution data
- Evacuation plans

Section II.H.9 provides a description of the OSC.

2. Emergency Operations Facility

The function of the EOF is to provide a location for Dominion management to direct and coordinate emergency response activities, with emphases on providing support to the

plant staff and coordinating emergency response activities with offsite response agencies.

[Dominion provides both a Local EOF and Central EOF to support the North Anna site. The Local EOF is the primary EOF used to support emergency response activities at the North Anna site. The Central EOF may be activated in lieu of the Local EOF to support emergency response activities for emergencies, such as severe storms, that affect both the North Anna and Surry sites. The Central EOF also may be activated if the Local EOF is unavailable. SOF 142

Except for the radiation protection functions of the Local EOF discussed below, the minimum capacities, capabilities, and plant parameter displays of the Local EOF and Central EOF are similar. Therefore, the remainder of this plan refers simply to "the EOF" when describing the features, activation, and operation of the EOF.]

The Local EOF and Central EOF are the same as those used for NAPS Units 1 and 2. The Local EOF is located within the owner-controlled area and the Central EOF at Dominion's Innsbrook Technical Center in Glen Allen, Virginia, approximately 30 miles from Unit 3. This configuration does not alter the functions of the EOF as described in NUREG-0696.

Provisions are made for staffing of the EOF by Dominion, Commonwealth of Virginia, and NRC personnel. Dominion also makes provisions for accommodating a limited number of media personnel in the EOF. Section II.B.5 provides a description of the Dominion EOF staff. Section II.O.4 provides a description of emergency response organization training and qualification.

The size of the EOF is sufficient to support 35 people. The Local EOF was designed to provide a specified protection factor from gamma radiation. The Local EOF also has a specially designed ventilation system to limit the exposure of its occupants and further assure its availability during an emergency. Provisions exist for dedicated radiation monitoring equipment to measure airborne particulate and direct radiation. The location of the Central EOF precludes the necessity of providing radiation monitoring systems.

Section II.F provides a description of the communications capabilities provided in the EOF.

The Local EOF and Central EOF draw power from commercial power sources. There is electrical generator backup power to the Central EOF. A loss of commercial power should not impact any of the voice or data communications equipment located in the Central EOF. Common Dominion telecommunications infrastructure that supports EOF functions, including, but not limited to, fiber optic transmission equipment, telephone switching equipment and data network routers, is configured to operate from at least one

and usually multiple backup power sources in the event of a loss of commercial power. These backup sources include generator, DC battery and UPS systems.

Display capability of the technical data system in the EOF includes a workstation that, at minimum, is capable of displaying the parameters that are required of an SPDS. The SPDS function is described in DCD Section 18.7 through its incorporated references.

Key reference materials will be available to the EOF staff via Local Area Network connection from the Nuclear Electronic Document Library, including:

- Plant technical specifications
- Plant operating procedures
- Emergency operating procedures
- Final Safety Analysis Report
- Up-to-date records related to licensee, State, and local emergency response plans
- Offset population distribution data
- Evacuation plans
- Up-to-date, as-built drawings, schematics, and diagrams showing conditions and locations of plant structures and systems down to component level

3. Commonwealth/Risk Jurisdiction Emergency Operations Centers

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

4. Activation and Staffing of Emergency Response Facilities

Dominion staffs and activates the designated ERFs as follows[6]:

- Notification of Unusual Event – ERF staffing not normally needed, but may be undertaken at the discretion of the *Emergency Coordinator*.
- Alert, Site Area Emergency and General Emergency – Staffing of the TSC and OSC required.
- Site Area Emergency and General Emergency – Staffing of the EOF required.

Following declaration of an emergency condition, the ERFs are staffed and activated in accordance with EPIPs. The descriptions of ERF notification and staffing provided in SSAR Sections 13.3.2.2.2.e.2 and 13.3.2.2.2.f.4 are incorporated by reference.

Commonwealth of Virginia and risk jurisdiction emergency response personnel also staff their ERFs consistent with the provisions of their respective plans.

6. See Section II.A.1.a of this plan regarding situations under which staffing of the emergency response facilities may be deferred.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

5. Onsite Monitoring Systems

Dominion maintains and operates onsite monitoring systems needed to provide data that is essential for initiating emergency measures and performing accident assessment. This includes monitoring systems for geophysical phenomena, radiological conditions, plant processes, and fire hazards.

a. Section 3.7.4 of the FSAR and the DCD provide a description of the seismic monitoring system.

b. Sections 12.3 of the FSAR and the DCD provide a description of the installed radiological monitoring systems. In addition to the installed systems, Dominion maintains an adequate supply of portable radiation monitoring and sampling equipment, including dedicated emergency response equipment, consistent with Sections II.H.7, II.H.10, and II.H.11 and Appendix 6.

c. Section 11.5 of the FSAR and the DCD provide a description of the plant process monitoring systems.

d. Sections 9.5.1 of the FSAR and the DCD provide a description of the plant fire monitoring system.

6. Access to Data from Monitoring Systems

a. Dominion acquires meteorological data from the National Weather Service (NWS) during periods when the primary system is unavailable. Back-up seismic data is available from the U.S. Geological Survey (National Earthquake Information Center) and the Virginia Polytechnic Institute and State University (Virginia Tech) Seismological Observatory. Streamflow data is available from the U.S. Geological Survey. Flooding data is available from NOAA's Hydro-Meteorological Reports. Other data sources, such as commercial media outlets, may also be used.

b. Offsite environmental radiological monitoring equipment includes a series of continuous air samplers and environmental monitoring dosimeters surrounding the facility. The facility's Offsite Dose Calculation Manual (ODCM) describes the monitoring systems. In addition to the monitoring systems, equipment, and radiological laboratory facilities provided at the plant, Dominion maintains arrangements to obtain back-up radiological monitoring and analysis support from

offsite organizations. Section II.A provides a description of these arrangements and the capabilities of the affected organizations and facilities. Appendix 7 provides pertinent certifications from these support organizations.

c. Section II.C.3 provides a description of the available laboratory facilities.

7. Offsite Radiological Monitoring Equipment

Dominion provides offsite radiological monitoring equipment suitable for assessment of the offsite radiological consequences of facility incidents, for use by its offsite monitoring field teams. Appendix 6 provides a description of the types of radiological monitoring equipment provided for field team use.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

8. Meteorological Instrumentation and Procedures

The station's Meteorological Monitoring System provides the capability for providing data that are used for predicting atmospheric effluent transport and diffusion. The system consists of a primary and a backup tower, the locations of which were chosen so as to be representative of regional conditions.

The parameters monitored by the site's primary meteorological tower are listed below.

10 Meter Elevation:

- Wind speed
- wind direction
- horizontal wind direction fluctuation
- temperature (used with 48.4 meter data for differential temperature)
- dew point temperature

48.4 Meter Elevation:

- Wind speed
- wind direction
- horizontal wind direction fluctuation
- temperature (used with 10 meter data for differential temperature)

Precipitation is monitored at the ground level.

The NAPS backup meteorological monitoring site consists of instrumentation on a freestanding 10 meter tower. This tower is located approximately 1300 feet northeast of the Unit 1 containment building and serves as the backup meteorological monitoring site.

A sensor at the top of the mast monitors wind speed, wind direction, and horizontal wind direction fluctuation. SSAR Section 2.3 provides a detailed description of the Meteorological Monitoring System.

9. Operational Support Center

The function of the OSC is to provide a common area and the necessary supporting resources for the assembly of designated operations support personnel during emergency conditions. Designated plant support personnel, as indicated in Section II.B, assemble in the OSC to provide support to both the Control Room and TSC. Personnel reporting to the OSC can be assigned duties in support of emergency operations. Assessment, corrective action, and rescue personnel are dispatched by the OSC to locations in the plant, as directed by the TSC and Control Room.

The OSC is located in the Health Physics Room in the Access Building. The OSC is not designed to remain habitable under all projected emergency conditions; however, implementing procedures make provisions for relocating the OSC as needed, based on ongoing assessments of plant conditions and facility habitability.

The OSC provides dedicated telephone extensions for communicating with the Control Room and the TSC. This permits personnel reporting to the OSC to be assigned to duties in support of emergency operations. The OSC is also equipped with a separate telephone line to provide for communications with on-site and off-site locations, as needed. Section II.F provides a description of the communications capabilities provided in the OSC.

10. Emergency Equipment and Supplies

Dominion performs inspection, inventory, and appropriate operational tests of dedicated emergency equipment and instruments on a quarterly basis consistent with Section II.P. Plant procedures establish requirements for performing inventories and operational tests. Dominion maintains sufficient reserves of equipment and instruments to replace any items that are removed from the emergency kits for calibration or repair.

Appendix 6 provides a description of the emergency equipment and supplies to be provided.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

11. Emergency Kits

Appendix 6 provides a description of the emergency equipment and supplies typically provided for use by emergency response personnel.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

12. Receipt of Field Monitoring Data

Health Physics personnel located in the EOF are designated as the point of contact for the receipt of off-site monitoring data results and sample media analysis results collected by Dominion personnel.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

I. Accident Assessment

The descriptions of provisions for accident assessment provided in SSAR Section 13.3.2.2.2.i are incorporated by reference.

1. Parameters Indicative of Emergency Conditions

Appendix 1 describes plant system and effluent parameter values that are indicative of off-normal conditions and the various indications that correspond to the emergency initiating conditions. Plant procedures specify the types and capabilities of the instruments used to indicate emergency conditions.

2. Plant Monitoring Systems

Section 7.5.1.1 of the US-APWR DCD describes the Post-Accident Monitoring Systems and is incorporated into this plan by reference. Section 9.3.2 of the US-APWR DCD discusses post-accident sampling capabilities.

3. Determination of Source Term and Radiological Conditions

a. Appendix 2 and plant procedures provide means for relating various measured parameters, including containment radiation monitor reading, to the source term available for release within plant systems.

b. Appendix 2 and plant procedures provide means for relating various measured parameters, including effluent monitor readings, to the magnitude of the release of radioactive materials.

4. Relationship Between Effluent Monitor Reading and Exposure and Contamination Levels

Dose assessment procedures include the relationship between effluent monitor readings and onsite and offsite exposures and contamination for various meteorological conditions. Appendix 2 provides a description of the emergency dose assessment program used at NAPS. Information includes dose and dose rate determinations based

on plant effluent monitors, and contamination estimates based on deposition assumptions and meteorological conditions.

5. Meteorological Information

Section II.H.8, Appendix 2, and SSAR Section 2.3 provide a description of the meteorological monitoring systems that are used to provide initial values and continuing assessment of meteorological conditions under emergency conditions.

6. Determination of Release Rates and Projected Doses When Installed Instruments Are Inoperable or Off-Scale

Plant procedures establish processes for estimating release rates and projected doses if the associated instrumentation is inoperable or off-scale. These procedures include the following considerations:

- Estimated releases based on field monitoring data
- Surrogate instrumentation and methods to estimate extent of fuel damage.

Appendix 2 provides a description of the emergency dose assessment program used at NAPS. Information includes dose and dose rate determinations based on plant effluent monitors, and contamination estimates based on deposition assumptions and meteorological conditions.

7. Field Monitoring Capability

Dominion provides emergency response field teams composed of one or more radiation protection technicians trained in accordance with the emergency preparedness training requirements established in Section II.O of this plan. SSAR Section 13.3.2.2.2.i discusses field team activities and is incorporated by reference.

Appendix 6 provides a description of the instrumentation that is available for performance of field monitoring in the plume exposure pathway EPZ. In addition to the required instrumentation, Dominion provides protective equipment (including respiratory protection and radioprotective drugs), communications equipment, and supplies to facilitate performance of radiation, surface contamination, and airborne radioactivity monitoring. Implementing procedures provide guidance for field monitoring teams' performance of monitoring activities. Field monitoring teams act under the direction of Health Physics personnel in the TSC prior to activation of the EOF and, following activation of the EOF, under the direction of Health Physics personnel in that facility.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

8. Assessing Hazards Through Liquid or Gaseous Release Pathways

Dominion trains, designates, equips, dispatches, and coordinates field teams consistent with Section II.I.7. The field teams perform sampling of offsite media as needed to assess the actual or potential magnitude and locations of radiological hazards. Dominion notifies and activates field team personnel consistent with Section II.E. Mobilization times are consistent with Section II.B.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

9. Measuring Radioiodine Concentrations

Dominion equips field teams with portable air samplers, appropriate filters or other sampling media (e.g., silver zeolite or other media capable of collecting airborne radioiodine samples), and analysis equipment capable of detecting radioiodine concentrations at or below 10^{-7} microcuries per milliliter under field conditions, taking into consideration potential interference from noble gas activity and background radiation. Appendix 6 provides information regarding emergency supplies, equipment, and instruments.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

10. Relating Measured Parameters to Dose Rates

Plant implementing procedures establish the means for relating measured parameters, such as surface, airborne, or waterborne activity levels, to dose rates for those key isotopes listed in Table 3 of NUREG-0654. Implementing procedures also establish provisions for estimating the projected dose based on projected and actual dose rates. Health Physics personnel are responsible for directing implementation of these procedures under emergency conditions.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

11. Tracking of Plume Using Federal and Commonwealth Resources

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

J. Protective Response

The descriptions of protective response measures provided in SSAR Section 13.3.2.2.2.j are incorporated by reference.

1. **On-Site Notification**

   Dominion establishes and implements methods to inform personnel within the protected area (within the Security fence) and exclusion area (within 5000 feet of the Unit 3 containment) of an emergency condition requiring individual action.

   Dominion informs individuals located within the protected area primarily via use of the plant public announcement system and audible warning systems. In high noise areas or other areas where these systems may not be audible, other measures, such as visible warning signals or personal notifications, may be used.

   Dominion informs individuals located within the exclusion area, but outside of the protected area, via audible warnings provided by warning systems and the activities of the Security Force (e.g., vehicle-mounted public address systems) and activities of the Virginia Department of Game and Inland Fisheries. Dominion provides information regarding the meaning of the various warning systems, and the appropriate response actions, via plant training programs, visitor orientation, escort instructions, posted instructions, or within the content of audible messages.

   Dominion maintains the ability to notify individuals within the Protected Area within about 15 minutes of the declaration of any emergency requiring individual response actions, such as accountability or evacuation.

2. **Evacuation Routes and Transportation**

   Dominion has established evacuation routes to assembly areas consistent with Figure II-4. If the evacuation routes are rendered impassable, such as due to radiological or meteorological conditions, then provisions will be made to retain affected personnel on site.

   Affected individuals evacuate the site via personal vehicles. If any individual on site does not have access to a personal vehicle, the affected individual will evacuate with another evacuating individual. Dominion directs evacuees to a designated assembly area.

   Dominion informs individuals of the evacuation routes and appropriate instructions via plant training programs, visitor orientation, escort instructions, posted instructions, or within the content of audible messages.

   Should site evacuation via either designated evacuation route be determined to be inadvisable due to adverse conditions (e.g., weather-related, radiological, or traffic density conditions), Dominion will direct affected individuals to a safe onsite area (as determined by the *Emergency Coordinator* or designee) for accountability and, if necessary, contamination monitoring and decontamination.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

3. Personnel Monitoring and Decontamination

Dominion has established the primary and secondary assembly areas to provide a location for personnel monitoring. The *Emergency Coordinator* directs contamination monitoring of personnel, vehicles, and personal property arriving at the assembly area when there is a likelihood that individuals and their property may have become contaminated before or during the site evacuation.

4. Non-Essential Personnel Evacuation and Decontamination

In the event of a Site Area Emergency or General Emergency, Dominion may evacuate non-essential personnel (i.e., personnel who do not have an emergency response assignment) consistent with the provisions of Section II.J.2. Appropriate equipment and supplies are provided from the facility to the assembly areas to facilitate contamination monitoring.

5. Personnel Accountability

Dominion provides the capability to account for individuals within the Protected Area and to identify any missing individuals within 30 minutes following initiation of assembly and accountability measures. Dominion also provides a capability to account for individuals within the protected area continuously after the initial accountability. Dominion maintains these capabilities consistent with the requirements of the facility Security Plan.

6. Protective Measures

Dominion provides equipment and supplies to provide adequate protection for individuals remaining or arriving onsite during an emergency. The equipment and supplies include:

a. respiratory protection equipment;

b. protective clothing; and

c. radioprotective drugs.

Onsite supplies of protective clothing and respiratory protection equipment may be augmented by that provided by offsite responders, such as firefighters responding to the site.

In the event of a hostile attack against the site, conditions may dictate initiation of protective measures other than personnel assembly, accountability and evacuation. The *Emergency Coordinator* makes decisions regarding appropriate protective measures based on evaluation of site conditions, including input from the Security force. If, based on the judgment of the *Emergency Coordinator*, personnel assembly, accountability, and

evacuation may result in undue hazards to site personnel, the *Emergency Coordinator* may direct other protective measures, including:

- Evacuation of personnel from areas and buildings perceived as high-value targets
- Site evacuation by opening, while continuing to defend, security gates
- Dispersal of key personnel
- On-site sheltering
- Staging of ERO personnel in alternate locations pending restoration of safe conditions
- Implementation of accountability measures following restoration of safe conditions

Appendix 6 provides a description of the emergency response supplies and equipment to be provided.

7. Protective Action Recommendations and Bases

Public Protective Action Recommendations (PARs) are based on plant conditions, estimated offsite doses, or some combination of both. Dominion provides Protective Action Recommendations promptly to the Virginia EOC. EALs correspond to the projected dose to the population at risk and are determined consistent with the methodology described in Appendix 1.

If the *Emergency Coordinator* declares a General Emergency or a Site Area Emergency with a potential for loss of three fission product barriers, then Dominion will communicate to the Virginia EOC a PAR to evacuate a two mile radius around the facility, evacuate five miles downwind (downwind sector and adjacent sectors), and to shelter in place for the remainder of the plume exposure pathway EPZ.

In addition to the EAL-based PAR, Dominion provides PARs based on offsite dose projections. The Health Physics staff is responsible for conducting offsite dose projections periodically throughout any emergency during which there is an actual or potential release of an amount of radioactive material that is likely to result in offsite consequences. Implementing procedures will establish requirements for performing required calculations and projections.

The projected doses are compared to the Protective Action Guides shown in Table II-3, as derived from EPA 400-R-92-001, “Manual of Protective Action Guides and Protective Actions for Nuclear Incidents,” (Reference 15) and Protective Action Recommendations are developed based on the results of these comparisons.

Prior to activation of the EOF, the *Emergency Coordinator* is responsible for determining PARs and communicating the PARs to the Virginia EOC. Following activation of the EOF, *EOF Director* assumes these responsibilities. The *Emergency Coordinator* or *EOF Director* provides PAR to the Virginia EOC, which is responsible for implementing the

protective actions, using the communications systems discussed in Section II.H of this plan or by direct communications in the EOF.

Table II-3 Protective Action Guides

Projected Dose		
Total Effective Dose Equivalent (TEDE)	**Committed Dose Equivalent Thyroid (CDE Thyroid)**	**Protective Action Recommendation**
< 1 rem	< 5 rem	No protective action required based on projected dose
≥1 rem	≥5 rem	Evacuate affected zones and shelter the remainder of the plume exposure pathway EPZ

8. Evacuation Time Estimates

Dominion has conducted an Evacuation Time Estimate (ETE) (Reference 16) which is summarized in Appendix 4. The ETE is consistent with the guidance provided in Appendix 4 of NUREG-0654 and NUREG/CR-6863, "Development of Evacuation Time Estimate Studies for Nuclear Power Plants" (Reference 17). The ETE updates the information in SSAR Section 13.3.2.1. The ETE does not reveal the existence of any significant impediments to the development of emergency plans.

Population distribution and evacuation time estimates are summarized in Appendix 4.

9. Implementation of Protective Measures

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

10. Protective Measures Implementation

a. Radiological monitoring locations are shown in Figure II-5. Evacuation routes, evacuation areas, and locations of assembly areas are presented in Figures 10-1 through 10-4 of the ETE report.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Appendix 4 provides maps of the plume exposure pathway EPZ illustrating population distribution around the facility by evacuation area and in a sector format.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

c. Warnings to the public within the plume exposure pathway EPZ are the responsibility of Commonwealth of Virginia and risk jurisdiction officials. The primary method of warning the public is by the use of the Early Warning System sirens. Other warning methods may include telephone communications, television and radio Emergency Alert System stations, public address systems, bull horns from patrol cars and personal contact. There are currently no hospitals, prisons, or nursing homes within the plume exposure pathway EPZ.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

d. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

e. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

f. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

g. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

h. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

i. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

j. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

k. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

l. This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

m. Specific protective action recommendations, based on NUREG-0654, Supplement 3 (Reference 18) and on plant and meteorological conditions, are included in an implementing procedure.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

11. Protective Measures Specified by the Commonwealth

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

12. Registering and Monitoring Evacuees

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

Figure II-4 Map to North Anna Remote Assembly Areas

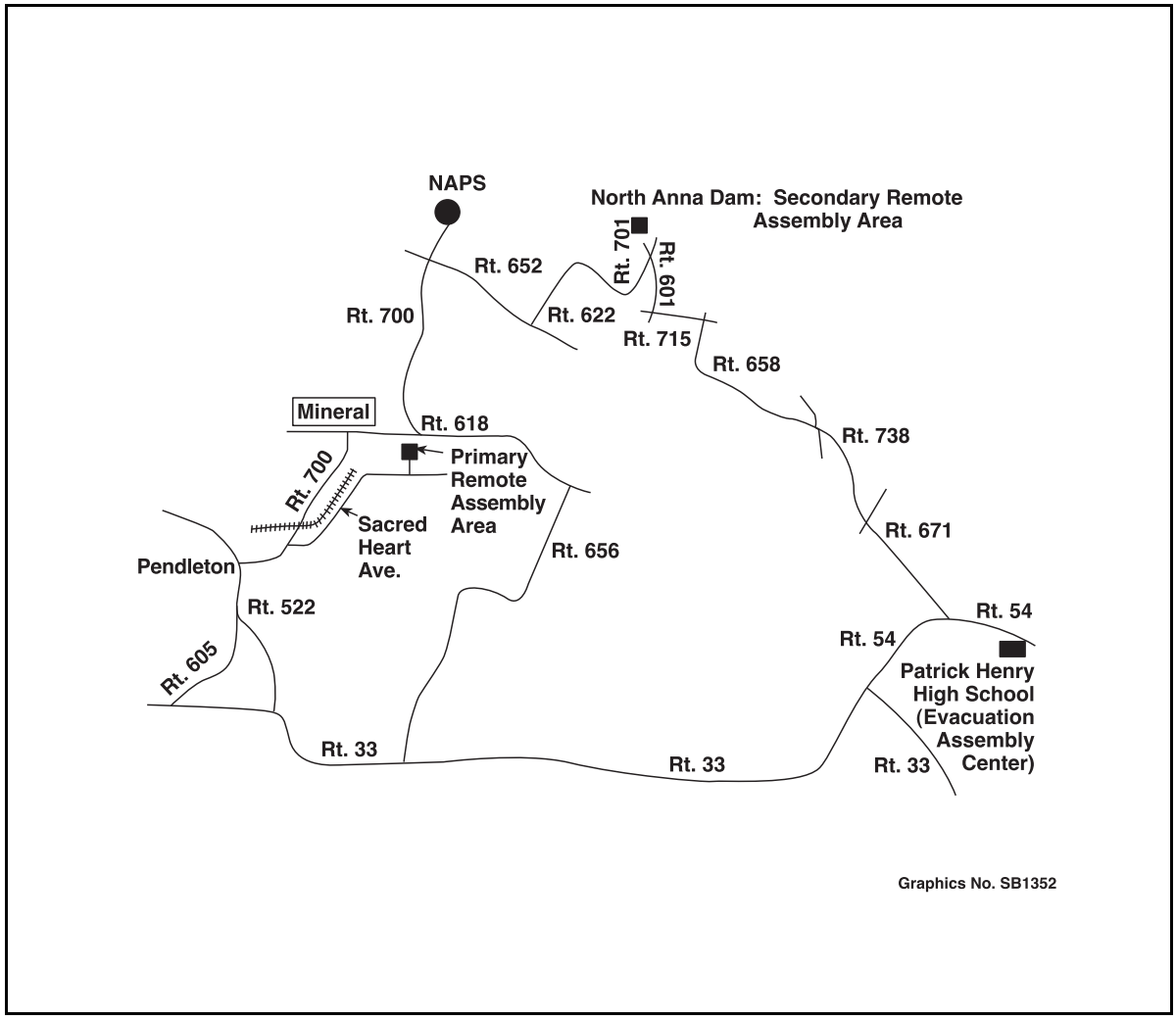
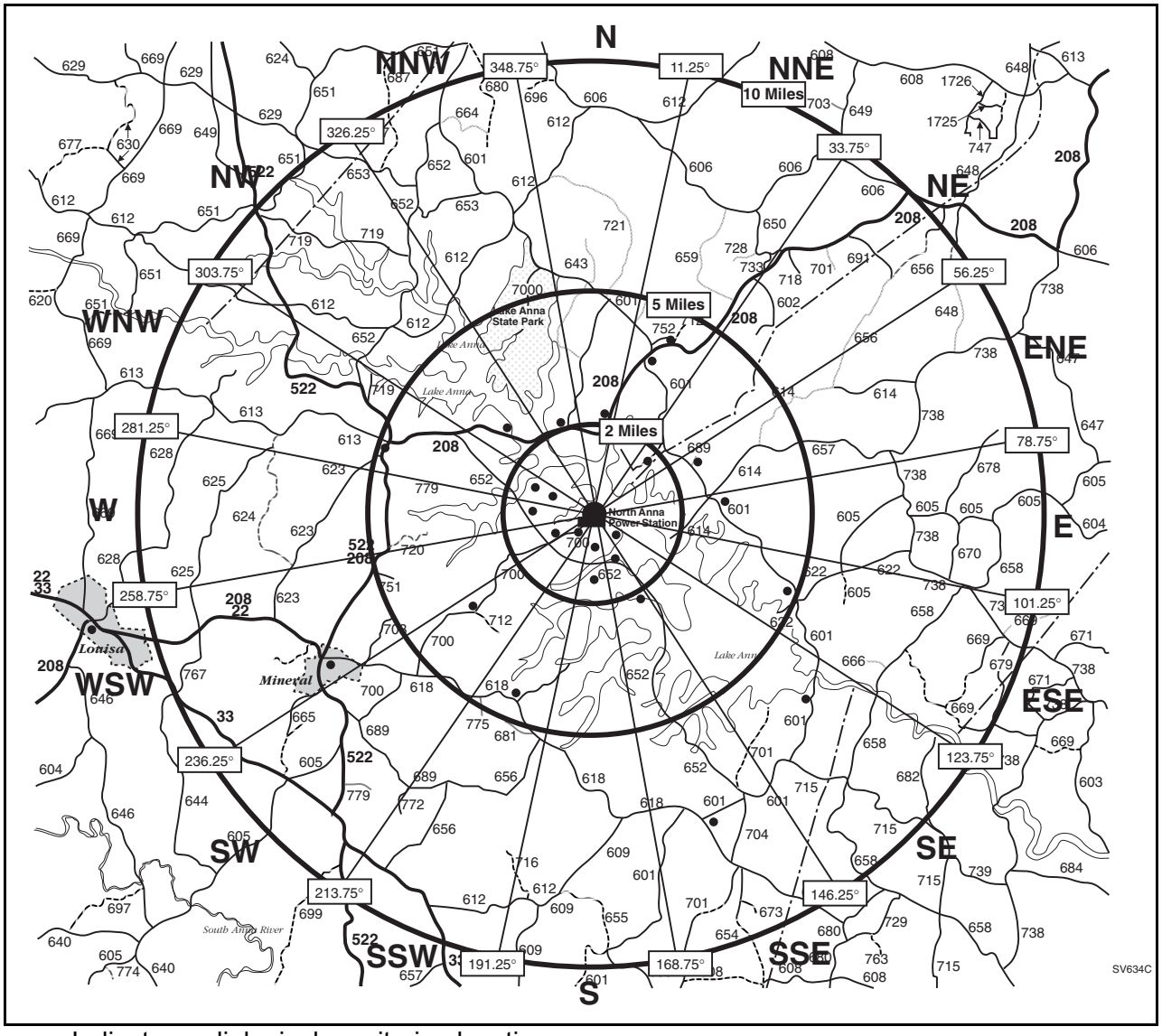


Figure II-5 Radiological Monitoring Locations



- Indicates radiological monitoring location

K. Radiological Exposure Control

The descriptions of radiological exposure control measures in SSAR Section 13.3.2.2.2.k are incorporated by reference.

1. On-Site Exposure Guidelines and Authorizations

Dominion implements onsite exposure guidelines for emergency response personnel consistent with those published in EPA 400-R-92-001, Table 2-2, “Guidance on Dose Limits for Workers Performing Emergency Services.” The applicable guidelines are provided in Table II-4.

Prior to activation of the EOF, the *Emergency Coordinator*, in consultation with facility Health Physics personnel, is responsible for authorization of any emergency exposures resulting in doses exceeding the numerical values of the occupational dose limits provided in 10 CFR Part 20. Following activation of the EOF, the *EOF Director*, in consultation with Health Physics personnel and the *Emergency Coordinator*, authorizes any exposures in excess of the numerical values of the occupational dose limits provided in 10 CFR Part 20. If exposures in excess of the numerical values of the occupational dose limits provided in 10 CFR Part 20 are required, these exposures will be limited to individuals who are properly trained and knowledgeable of the tasks to be completed and the risks associated with the exposures. Selection criteria for volunteer emergency workers include consideration of those who are in good physical health, are familiar with the consequences of emergency exposure, and are not a declared pregnant worker. It is preferable, though not mandatory, that volunteers be older than 45 years of age and not be a female capable of reproduction. Efforts are made to maintain personnel doses ALARA.

Table II-4 Emergency Worker Exposure Guidelines

	Dose Guideline in rem		
Activity	**TEDE**	**Lens of the Eye**	**Other Organs**
Any activity other than those specifically authorized below	5	15	50
Protecting Valuable Property	10	30	100
Lifesaving or Protection of Large Populations	25	75	250
Lifesaving or Protection of Large Populations[Note 1]	>25	>75	>250

Note 1: This guideline applies only to volunteers who are fully aware of the risks involved.

2. Radiation Protection Program

Chapter 12 of the FSAR describes a radiation protection program (RPP) consistent with the requirements of 10 CFR Part 20. The RPP, in concert with the EPIPs, to be developed prior to loading of nuclear fuel, includes provisions for implementing emergency exposure guidelines. Implementing procedures establish procedures for allowing onsite volunteers to receive radiation doses in the course of carrying out life-saving and other emergency response activities, including provisions for expeditious decision-making and consideration of the relative risks.

3. Dosimetry and Dose Assessment

a. Dominion maintains a site personnel radiation dosimetry program that includes the capability to determine both external and internal doses consistent with the requirements of 10 CFR Part 20. The external dosimetry program includes provisions and requirements for use of both permanent record and self-reading dosimeters (e.g., pocket or electronic dosimeters). Dosimeter ranges are sufficient to measure both planned routine and foreseeable accident photon doses. Plant procedures associated with this plan establish requirements for distributing dosimeters to emergency responders, including those individuals responding to the site from offsite locations. Internal doses are typically estimated through the use of whole body counting and/or in-vitro sampling and analysis routines. Plant procedures associated with this plan or the RPP establish requirements for determining internal doses based on in-vivo or in-vitro analyses results or by assessment of individual exposures to airborne radioactive materials.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Implementing procedures also establish guidance for wearers to periodically read their self-reading dosimeters to monitor compliance with emergency exposure guidelines. Dominion maintains individual dose records in accordance with the requirements of 10 CFR Part 20 and the RPP and its supporting procedures.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

4. Commonwealth of Virginia and Risk Jurisdiction Responder Exposure Authorizations

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

5. Decontamination Action Levels

a. Dominion implements requirements for personnel and area decontamination, including decontamination action levels and criteria for returning areas and items to normal use, in procedures supporting the RPP.

   Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Dominion implements procedures for decontamination of onsite emergency personnel wounds, supplies, instruments and equipment, and for waste disposal. Dominion provides decontamination supplies with emergency kits consistent with Appendix 6.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

6. Contamination Control Measures

a. The FSAR and Security Plan establish requirements for site access control from offsite locations. Following a site evacuation, law enforcement agencies control access to the owner-controlled area consistent with the requirements of the supporting Commonwealth of Virginia and risk jurisdiction plans. The site Security Force controls entry to the restricted area by individuals, including emergency responders, who must enter the site during an emergency. The RPP and its supporting procedures establish requirements for limiting access to areas having significant radiological hazards, consistent with the requirements of 10 CFR Part 20 and Chapter 12 of the FSAR.

b. Should the potential exist for contamination of onsite food or drinking water supplies that renders these supplies non-consumable, arrangements will be made for transport of non-contaminated offsite supplies to the site.

c. Dominion permits areas and items to be returned to normal (i.e., non-contaminated) use following conduct of appropriate surveys and verification that the contamination levels meet the criteria provided in the RPP or its supporting procedures.

7. Decontamination of Relocated Site Personnel

Dominion makes provisions for protective clothing, contamination monitoring, and decontamination, including decontamination of radioiodine contamination on the skin, at the offsite assembly area or other location as directed. Appendix 6 provides a description of the emergency equipment and supplies to be provided.

L. Medical and Public Health Support

The descriptions of plans for medical and public health support in SSAR Section 13.3.2.2.2.I are incorporated by reference.

1. Hospital and Medical Support

Dominion has established a certification letter with the Virginia Commonwealth University Medical Center (VCUMC) under which VCUMC will provide medical services for injured personnel from Unit 3. VCUMC has established a specialized area of the

hospital for treatment with appropriate Health Physics functions, and implements a coded system to alert hospital team members. Radiation monitoring equipment, dosimeters, and protective clothing are available at VCUMC.

VCUMC established and maintains the capability to evaluate the radiation exposure and/or uptake of accident victims and to handle contaminated victims. These capabilities are established and maintained through training courses consistent with Section II.O, periodic drills and exercises consistent with Section II.N, and services provided consistent with agreements between Dominion and the medical support providers.

In the event that a contaminated injured person is transported from Unit 3 to an offsite medical facility, Dominion may provide to the facility one or more technicians qualified to perform radiological monitoring if requested by the facility to support the radiological aspects of the medical treatment and post-treatment efforts.

Appendix 7 provides a copy of the relevant certification letter.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. On-Site First Aid Capability

Dominion maintains a trained First Aid Team at the site to provide 24 hour per day first aid support consistent with Section II.B. Dominion maintains First Aid Team readiness through training consistent with Section II.O and drills and exercises consistent with Section II.N.

3. Emergency Medical Facilities Within the Commonwealth

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

4. Medical Emergency Transportation

Contaminated injured personnel will be suitably clothed or prepared to prevent the spread of contamination in the transporting vehicle, if practical considering the medical condition of the injured person. Communication can be maintained with VCUMC from the station. The Station can also communicate with the site ambulance, if used, by use of an ultra-high frequency (UHF) radio, and the ambulance can communicate with VCUMC by way of the Hospital Emergency Alerting Radio (HEAR) system. In addition, arrangements have been made with local volunteer rescue squads to transport injured contaminated personnel to VCUMC. Response team members have received training concerning transportation of contaminated injured individuals. A Health Physics technician, with appropriate instrumentation, would normally accompany contaminated injured personnel to VCUMC. The approximate time to transport a patient to VCUMC is

75 minutes. The estimated time for local rescue squads to arrive at the station is 30 minutes.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

M. Recovery and Re-Entry

1. Recovery Plans and Procedures

Dominion implements recovery plans and procedures that provide guidance for a range of recovery and re-entry activities, including:

- Recovery/re-entry organization;
- Responsibilities for recovery/re-entry decision-making, including decisions for relaxing protective measures based on existing and potential hazardous conditions;
- Means for informing members of the emergency response organization that recovery operations are to be initiated and related changes in the organizational structure; and
- Methods for periodically updating estimates of total population exposure.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Recovery Organization

Under some circumstances, particularly those involving significant damage to the facility or offsite consequences, there may be a need for ongoing assessment and recovery actions following the cessation of emergency response activities. Prior to entering the recovery/re-entry phase of operations following an emergency, Dominion establishes a recovery organization consistent with the existing conditions and continuing organizational needs.

The recovery organization includes those management, technical, and administrative personnel necessary to provide for timely and effective recovery of the facility based on assessments of plant conditions and desired end states. The recovery process is further outlined in the EPIP specifically designed for administration of the recovery program. The basic organization may be modified, as required, to address the needs of the given situation. The *EOF Director* assumes control and direction of the recovery operation with the authority and responsibilities set forth in the EPIPs.

The recovery organization develops plans and procedures designed to address both immediate and long term actions. The necessity to maintain protective measures implemented during the emergency will be evaluated and, if deemed appropriate, the recovery organization will recommend relaxation of the protective measures. Because it is not possible to foresee all of the consequences of an event, specific recovery

procedures may need to be written to address specialized requirements. Where possible, existing station procedures are utilized. Any special recovery procedures require the same review and approval process accorded other station procedures.

Depending on plant conditions and the scope of required activities, the recovery organization may discharge its activities from one or more designated ERFs or from other locations as specified by the responsible recovery organization managers. As recovery operations progress, the recovery organization may be augmented or reduced as needed to maintain effectiveness and meet ongoing operational needs.

In general, Dominion would not expect a recovery organization to be necessary following declaration and termination of a Notification of Unusual Event or Alert.

3. Changes in Organizational Structure

The recovery process is implemented when the facility's emergency response organization managers, with concurrence of Commonwealth of Virginia and Federal agencies, have determined the station to be in a stable and controlled condition. Upon the determination, Dominion notifies the NRC Operations Center, the Virginia EOC, and the risk jurisdiction EOCs that the emergency has been terminated and any required recovery has commenced.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

4. Updating Total Population Exposure During Recovery Operations

Total population doses are periodically estimated in the affected sectors and zones utilizing population distribution data from within the affected areas. Health Physics personnel initially determine Total Effective Dose Equivalent (TEDE) due to external exposure from airborne material, external exposure from ground deposition, and internal exposure due to inhalation. Initial calculations also are performed for determination of Thyroid Committed Dose Equivalent (CDE) resulting from inhalation of radioiodines. The methodology used is consistent with that presented in EPA-400-R-92-001. Determination of total population doses includes assessments of exposure received from (but not necessarily limited to) immersion, inhalation, ground shine, and ingestion of radioactive materials.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

N. Exercises and Drills

Dominion implements a program of periodic drills and exercises to evaluate major portions of emergency response capabilities and to develop and maintain key emergency response skills. Identified deficiencies are corrected.

1. Exercises

a. Exercise Scope and Frequency

Dominion conducts emergency exercises in accordance with NRC and DHS rules (e.g., 10 CFR 50.47(b)(14) and 44 CFR 350.9). These exercises are developed and implemented to periodically test and evaluate major portions of the affected emergency plans, procedures, and organizations. Unless otherwise specified, emergency exercises simulate an emergency that results in offsite radiological releases requiring response by offsite authorities.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Exercise Scenarios and Participation

Dominion conducts exercises on a periodic basis. The exercises:

- Test the adequacy of timing and content of implementing procedures and methods
- Test emergency equipment and communications networks
- Test the public notification system
- Test the familiarity of emergency organization personnel with their duties

The scenario varies from year to year so that the major elements of the plans and preparedness organizations are tested within a six year period.

Dominion will conduct a full participation exercise (which tests as much of the licensee, Commonwealth of Virginia and risk jurisdiction emergency plans as is reasonably achievable without mandatory public participation) within two years before initiation of scheduled initial fuel loading. This exercise will include (consistent with existing DHS rules and guidance) participation by the Commonwealth of Virginia, State of Maryland and affected local governments within the plume exposure pathway EPZ and the ingestion exposure pathway EPZ.

If the full participation exercise is conducted more than one year prior to initial fuel loading, Dominion will conduct an exercise that tests the onsite emergency plans within one year before initiation of full power operations. This exercise may, but need not, have participation by the Commonwealth of Virginia and risk jurisdictions.

Dominion conducts an exercise of its onsite emergency plan every two years. The exercise may be included in the biennial full participation exercise discussed below.

Dominion conducts exercises involving full participation by offsite authorities having a role under the plan at least biennially. If any offsite authority has a role under a

radiological response plan for more than one site, Dominion offers that authority an opportunity to participate in one exercise every two years.

Dominion offers the Commonwealth of Virginia and State of Maryland, an opportunity to participate in the ingestion pathway portion of exercises, regardless of the state's participation in other licensed facility's emergency exercises.

At least once every 6 years, an exercise should be initiated during off-hours (between 6 pm and 4 am on a weekday or during a weekend). Dominion conducts unannounced exercises on a periodic basis, to the extent such exercises can be supported by affected internal and external organizations. To the extent practicable, as limited by the exercise planning process, some exercises are conducted under various weather conditions.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Drills

Dominion maintains adequate emergency response capabilities between biennial exercises by conducting drills, including at least one drill involving a combination of some of the principal functional areas of onsite emergency response capabilities. The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, protective action decision making, and plant system repair and corrective actions. Upon request, Dominion allows affected Commonwealth of Virginia and risk jurisdiction governments located within the plume exposure pathway EPZ to participate in the drills.

During these drills, activation of all of the ERFs may not be necessary. Dominion may use the drills to consider accident management strategies, provide supervised instruction, allow the operating staff to resolve problems and focus on internal training objectives. Dominion may include one or more drills as portions of an exercise.

The activities undertaken in the event of an actual declared emergency may be used to satisfy emergency drill requirements, provided that these activities demonstrate adequate execution of the specified activities.

The drill program includes the following:

a. Communications Drills

Dominion conducts monthly tests of communications with Commonwealth of Virginia and risk jurisdiction governments within the plume exposure pathway EPZ, as identified in Section II.A.

Dominion conducts quarterly tests of communications with Federal emergency response organizations, as identified in Section II.A.

Dominion conducts annual tests of communications between the facility, Virginia and risk jurisdiction EOCs, and field assessment teams.

Communications drills evaluate both the operability of the communications system(s) and the ability to understand message content.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

b. Fire Drills

Dominion conducts fire drills as required by Section 9.5.1 of the FSAR.

c. Medical Emergency Drills

Dominion conducts medical emergency drills that include a simulated contaminated injured individual and participation by the local support services agencies (i.e., medical transportation and offsite medical treatment facility) on a yearly basis.

Appendix 8 provides a cross-reference to the related provisions in risk jurisdiction RERPs.

d. Radiological Monitoring Drills

Dominion conducts radiological monitoring drills, involving both onsite and offsite radiological monitoring activities on a yearly basis. Radiological monitoring drills include collection and analysis of the sample media for which the facility is responsible, communications with monitoring teams, and recordkeeping activities. Dominion may coordinate radiological monitoring drills with those drills conducted by Commonwealth of Virginia and risk jurisdiction government entities or may conduct these drills independently.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

e. Health Physics Drills

Dominion conducts on-site Health Physics drills on a semi-annual basis. Health Physics drills include:

- Response to and analysis of simulated elevated airborne and liquid samples and direct radiation measurements in the environment
- Analysis of in-plant liquid samples with simulated or actual elevated radiation levels

Appendix 8 provides a cross-reference to the related provisions in the COVRERP.

3. Conduct of Drills and Exercises

Dominion develops drill and exercise scenarios and related materials that clearly establish the following:

a. Basic objectives and evaluation criteria

b. Date, time period, location, and participating organizations

c. Simulated events

d. Time schedule of real and simulated initiating events

e. Narrative summary describing the conduct of the exercise or drill, including items such as simulated casualties, offsite response to the facility, personnel rescue, use of protective equipment, monitoring team deployment, and public information activities

f. Arrangements for official observers and the advance materials to be provided to them

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

4. Exercise and Drill Evaluation

One or more qualified instructors/evaluators supervise and evaluate drills and exercises. A qualified instructor/evaluator is an individual whose knowledge, skills, and abilities have been evaluated by the Manager Emergency Preparedness or designee and determined to be sufficient for observing and evaluating the planned activities against the established criteria. For example, a qualified instructor/evaluator may be an individual who has been trained to fill the emergency response position to be observed or may be a supervisor or instructor for the position.

Exercises may be critiqued by Federal and Commonwealth of Virginia observers/evaluators.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

5. Drill and Exercise Critiques

Dominion conducts a critique following conduct of the exercise. Participants may include selected Dominion, NRC, Commonwealth of Virginia, risk jurisdiction, and other participants and observers/evaluators. Input from the critique participants, is evaluated to determine the need for changes to the plan, procedures, equipment, facilities, and other components of the emergency preparedness and response program.

Dominion tracks identified corrective actions to completion using the facility's corrective action program.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

O. Radiological Emergency Response Training

1. General

Dominion implements a training program that provides for initial training and retraining for individuals who have been assigned emergency response duties, including both onsite staff and offsite individuals who may be called on to provide assistance in the event of an emergency.

The description of the emergency preparedness training program in SSAR Section 13.3.2.2.2.o is incorporated by reference.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

a. Offsite Emergency Response Training

Dominion provides for the conduct of site-specific training for offsite personnel who may be called upon to provide assistance in the event of an emergency. This includes emergency responders employed by agencies identified in Section II.A.

Dominion offers training for affected hospital, ambulance/rescue, police, and firefighting personnel that includes their expected emergency response roles, notification procedures, and radiation protection precautions. For these and any other offsite emergency responders who may be required to enter the site under emergency conditions, Dominion offers training that addresses site access procedures and identifies (by position) the individual who will control their activities on site.

Training for offsite support personnel includes the following, to the extent appropriate to the assigned duties and responsibilities:

- The basic scope of the emergency plan
- Emergency classifications
- Notification methods
- Basic radiation protection
- Station access procedures
- The individual, by title, in the station emergency response organization who will direct their activities onsite

- Definition of support roles

Appendix 8 provides a cross-reference to these provisions in State and Local Plans, as applicable.

b. Mutual Aid Agreements

This NUREG-0654 criterion does not apply to the licensee, but to State and local plans. Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Onsite Emergency Response Training

The emergency response training program includes on-site Dominion personnel who may be called upon to respond to an emergency. The training program includes, to the extent appropriate, practical drills consistent with Section II.N, during which individuals demonstrate the ability to discharge the assigned emergency response function. The instructor/evaluator corrects any erroneous performance noted during these practical drills and, as appropriate, demonstrates proper performance consistent with approved procedures and accepted standards.

3. First Aid Team Training

Dominion provides first aid training equivalent to Red Cross Multi-Media Training (e.g., Red Cross First Aid/Cardiopulmonary Resuscitation (CPR), Automated External Defibrillation (AED) for the Workplace), consistent with the projected hazards and events, for those individuals assigned to render treatment during a medical emergency.

4. Emergency Response Training and Qualification

Dominion conducts a program for instructing and qualifying personnel who implement this plan. Individuals complete the required training prior to assignment to a position in the emergency response organization. The training program establishes the scope, nature, and frequency of the required training and qualification measures.

Emergency response personnel are trained in the following subjects, to the extent appropriate to their duties and responsibilities: emergency response organization; emergency classification system; personnel accountability; emergency exposure limits; ERFs; security access control and site evacuation process; and exposure control techniques.

Dominion implements a program to provide position-specific emergency response training for designated members of the emergency response organization. The content of the training program is appropriate for the duties and responsibilities of the assigned

position. The affected positions, and the scope of the associated training programs, include:

a. Emergency response directors and coordinators – Emergency condition assessment and classification, notification systems and procedures, organizational interfaces, site evacuation, radiation exposure controls, offsite support, and recovery.

b. Accident assessment personnel - Emergency condition assessment and classification, notification systems and procedures, organizational interfaces.

c. Radiological monitoring and analysis personnel – Dose assessment, emergency exposure evaluation, protective measures, protective actions, contamination control and decontamination, monitoring systems and procedures.

d. Police, Security and firefighting personnel - Notification of station personnel, facility activation, personnel accountability and evacuation, and access control. (Note: Offsite police and firefighting personnel will receive training consistent with Section II.O.1.a.)

e. Damage control/repair/corrective action teams - Damage control organization, communication systems, and planning and coordination of damage control tasks.

f. First aid/rescue personnel - Emergency organizational interfaces, firefighting, search and rescue procedures, and communications systems.

g. Local support services/emergency service personnel – Training consistent with Section II.O.1.a.

h. Medical support personnel - Training consistent with Section II.O.1.a.

i. Corporate office support personnel - Applicable procedures and organizational interfaces.

j. Emergency communicators - Notifications and reports to offsite authorities and communication systems as appropriate for individual position assignments.

Dominion offers to provide training for local support services personnel, including emergency service, police, and firefighting personnel, consistent with Section II.O.1.a.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

5. Retraining

Dominion conducts, or supports the conduct of, annual retraining for those categories of emergency response personnel listed in Section II.O. Failure of Dominion ERO members to successfully complete this training in a timely manner as specified in plant training program requirements results in the individual's removal from the ERO pending completion of the required training.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

P. Responsibility for the Planning Effort

Dominion implements an organizational structure and processes to periodically review, update, distribute, and control this plan consistent with facility quality assurance and document control requirements. Dominion also implements a program to provide training to personnel responsible for the emergency planning effort appropriate to their duties and responsibilities.

The descriptions of plans for maintaining emergency preparedness in SSAR Section 13.3.2.2.2.p are incorporated by reference.

1. Training

Dominion develops and implements a process to provide training to the Manager Emergency Preparedness and support staff. Training may include formal education, professional seminars, plant-specific training, industry meetings, and other activities and forums that provide for an exchange of pertinent information.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

2. Responsibility for Radiological Emergency Response Planning

The *Site Vice President* holds the overall authority and responsibility for ensuring that an adequate level of emergency preparedness is maintained.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

3. Manager Emergency Preparedness

Dominion establishes a Manager Emergency Preparedness position. The incumbent is responsible for developing and updating site emergency plans and coordination of these plans with other response organizations.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

4. Plan Reviews and Updates

The Manager Emergency Preparedness is responsible for conducting or coordinating an annual review of this plan to verify the plan and its supporting agreements are current. This review includes consideration of any changes that may be necessary to address issues identified during the course of drills, exercises, and actual emergency events. The Manager Emergency Preparedness also reviews and updates the plan and agreements as needed (e.g., following changes to Commonwealth of Virginia and risk jurisdiction plans that may affect the content of the facility's plan) to verify they remain current.

Upon completion of the annual review, the Manager Emergency Preparedness (or designee) incorporates any necessary changes. Changed pages are marked and dated to highlight the changes. The Manager Emergency Preparedness forwards the updated plan to the Facility Safety Review Committee (FSRC) for review and approval. If a proposed revision is judged to decrease the effectiveness of these documents with respect to the requirements of 10 CFR 50.47(b) or 10 CFR Part 50, Appendix E, the proposed changes are submitted to the NRC for approval in accordance with the requirements of 10 CFR 50.54(q) prior to implementation.

Following completion of the annual review and any required updates, the Manager Emergency Preparedness certifies the plan to be current.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

5. Distribution of Revised Plans

The facility's document control organization distributes the updated plan to organizations/individuals with responsibility for implementing the plans.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

6. Supporting Plans

The following list identifies supporting plans and their sources.

- Commonwealth of Virginia Plan (Virginia Emergency Operations Plan, Radiological Emergency Response Basic Plan)
- Louisa County Radiological Emergency Response Plan
- Spotsylvania County Radiological Emergency Response Plan
- Orange County Radiological Emergency Response Plan
- Caroline County Radiological Emergency Response Plan
- Hanover County Radiological Emergency Response Plan

- Virginia Commonwealth University Medical Center Radiation Emergency Plan
- Department of Energy – Federal Radiological Monitoring and Assessment Center Operations Plan

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

7. Implementing Procedures

Appendix 5 provides a topical listing of EPIPs that support this plan.

Certain emergency plan features recommended by NUREG-0654 (e.g., Evaluation Criterion D.1, which addresses identification of parameter values and status for each emergency class, and Evaluation Criterion I.3, which addresses methods and techniques for determining source terms and the magnitude of releases) are procedural in nature and have been more appropriately placed in plant procedures, including EPIPs. Changes to the affected portions of these procedures are developed and approved consistent with the requirements of 10 CFR 50.54(q).

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

8. Table of Contents

The format for this Emergency Plan directly follows the format of NUREG-0654, Rev. 1 as outlined in the Table of Contents.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

9. Emergency Plan Reviews

Dominion's independent assessment organization performs, or oversees the performance of, periodic independent reviews of the emergency preparedness program consistent with the requirements of 10 CFR 50.54(t). The reviews include, at a minimum, the following:

- The Emergency Plan
- Emergency plan implementing procedures and practices
- The emergency preparedness training program
- Readiness testing (e.g., drills and exercises)
- ERFs, equipment, and supplies
- Interfaces with Commonwealth of Virginia and risk jurisdiction government agencies

Dominion's independent assessment organization subjects review findings to management controls consistent with the facility's corrective action program.

Dominion's independent assessment organization documents review results and improvement recommendations and reports these results to Dominion management. Dominion makes those portions of the reviews that address the adequacy of interfaces with Commonwealth of Virginia and risk jurisdiction governments available to the affected governments.

Dominion retains review records for a period of at least five years in accordance with facility document control requirements.

10. Emergency Telephone Numbers

The Manager Emergency Preparedness is responsible for ensuring a review of the emergency personnel notification list is performed on a quarterly basis and for ensuring required revisions are incorporated. Documentation of this review shall be filed by the facility's records management organization.

Appendix 8 provides a cross-reference to the related provisions in the COVRERP and risk jurisdiction RERPs.

III. References and Appendices

A. Cited References

1. U.S. Nuclear Regulatory Commission, “Early Site Permits; Standard Design Certifications; And Combined Licenses For Nuclear Power Plants,” 10 CFR Part 52, as amended.

2. U.S. Nuclear Regulatory Commission, “Domestic Licensing Of Production And Utilization Facilities,” 10 CFR Part 50, as amended.

3. U.S. Nuclear Regulatory Commission, “Emergency Plans,” 10 CFR 50.47, as amended.

4. U.S. Nuclear Regulatory Commission, “Emergency Planning and Preparedness for Production and Utilization Facilities,” 10 CFR Part 50, Appendix E, as amended.

5. U.S. Nuclear Regulatory Commission, “Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants” NUREG-0654/FEMA-REP-1, Revision 1, October 1980.

6. U.S. Nuclear Regulatory Commission, “Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants,” NUREG 75/014 (WASH-1400), October 1975.

7. U.S. Nuclear Regulatory Commission, “Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants,” NUREG-0396; EPA 520/1-78-016, December 1978.

8. U.S. Nuclear Regulatory Commission, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors,” Regulatory Guide 1.183, July 2000.

9. Mitsubishi Heavy Industries, Ltd., “Design Control Document for the US-APWR.”

10. North Anna Power Station, Combined License Application, Part 2; Final Safety Analysis Report.

11. U.S. Department of Energy, “Federal Radiological Monitoring and Assessment Center Operations Plan,” DOE/NV 11718-080, December 2005.

12. U.S. Department of Homeland Security, “National Response Framework,” January 2008.

13. [Deleted]

14. U.S. Nuclear Regulatory Commission, “Emergency Planning and Preparedness for Nuclear Power Reactors,” Regulatory Guide 1.101, Revision 3, August 1992.

15. U.S. Environmental Protection Agency, “Manual of Protective Action Guides for Nuclear Incidents,” EPA-400-R-92-001, 1991.

16. KLD Associates, Inc., “Development of Evacuation Time Estimates for North Anna Power Station,” Revision 1, September 2008.

17. U.S Nuclear Regulatory Commission, “Development of Evacuation Time Estimate Studies for Nuclear Power Plants,” NUREG/CR-6863, January 2005.

18. U.S. Nuclear Regulatory Commission, “Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants - Criteria for Protective Action Recommendations for Severe Accidents,” NUREG-0654/FEMA-REP-1, Supplement 3, July 1996.

19. North Anna Early Site Permit Application, Part 2: Site Safety Analysis Report, Revision 9, September 2006.

B. Supplemental References

1. USNRC IN 91-77- Shift Staffing at Nuclear Power Plants

2. USNRC IN 93-81 – Implementation of Engineering Expertise On Shift

3. USNRC IN 95-48 – Results of Shift Staffing Study

4. USNRC IN 86-16 – NRC On-Scene Response During a Major Emergency

5. USNRC RIS 2002-21 – National Guard and Other Emergency Responders Located in the Licensee’s Controlled Area

6. NEI 99-01 – Methodology for Development of Emergency Action Levels

7. USNRC RIS 2003-18 - Use of NEI 99-01, Methodology for Development of Emergency Action Levels (including Supplements 1 and 2)

8. USNRC IN 97-05 – Offsite Notification Capabilities

9. USNRC RIS 00-011 – NRC Emergency Telecommunications System, including Supplement 1

10. USNRC IN 87-58 – Continuous Communications Following Emergency Notifications

11. USNRC IN 93-53 – Effect of Hurricane Andrew on Turkey Point Nuclear Generating Station and Lessons Learned
12. USNRC IN 97-05 – Offsite Notification Capabilities
13. USNRC IEB 79-18 – Audibility Problems Encountered on Evacuation of Personnel from High-Noise Areas
14. USNRC RIS 2002-16 – Current Incident Response Issues
15. FEMA-REP-11 – Guide to Preparing Emergency Public Information Materials
16. USNRC IEC 80-09 – Problems with Plant Internal Communications Systems
17. USNRC IN 85-44 – Emergency Communications System Monthly Test
18. USNRC IN 86-16 – NRC On-Scene Response During a Major Emergency
19. [Deleted]
20. USNRC IN 2004-19 – Problems Associated with Back-Up Power Supplies to Emergency Response Facilities and Equipment
21. USNRC IN 2002-14 – Ensuring a Capability to Evacuate Individuals, Including Members of the Public, from the Owner-Controlled Area
22. USNRC IN 88-15 – Availability of USFDA-Approved Potassium Iodide for Use in Emergencies Involving Radioactive Iodine
23. USNRC IN 96-19 – Failure of Tone alert Radios to Activate When Receiving a Shortened Activation Signal
24. USNRC IN 2002-25 – Challenges to Licensees' Ability to Provide Prompt Public Notification and Information During an Emergency Preparedness Event
25. USNRC IN 2005-06 – Failure to Maintain Alert and Notification System Tone Alert Radio Capability
26. USNRC RIS 01-016 – Update of Evacuation Time Estimates
27. USNRC RIS 2003-12 – Clarification of NRC Guidance for Modifying Protective Actions
28. USNRC RIS 2004-13 - Consideration of Sheltering in Licensee's Range of Protective Action Recommendations, including Supplement 1

29. USNRC RIS 2005-08 – Endorsement of NEI Guidance “Range of Protective Actions for Nuclear Power Plant Incidents”
30. FEMA-REP-10 – Guide for the Evaluation of Alert and Notification systems for Nuclear Power Plants
31. USNRC IN 98-020 – Problems with Emergency Preparedness Respiratory Protection Programs
32. USNRC IN 86-98 – Offsite Medical Services
33. 44 CFR 350, Review And Approval of State and Local Radiological Emergency Plans and Preparedness
34. USNRC IN 85-41 – Scheduling of Pre-Licensing Emergency Preparedness Exercises
35. USNRC IN 87-54 – Emergency Response Exercises
36. USNRC Bulletin 2005-02 – Emergency Preparedness and Response Actions for Security-Based Events
37. USNRC RIS 2005-02 – Clarifying the Process for Making Emergency Plan Changes, February 2005
38. USNRC RIS 2006-02 – Good Practices for Licensee Performance During the Emergency Preparedness Component of Force-on-force Exercises
39. USNRC RIS 2006-03 – Guidance on Requesting an Exemption from Biennial Emergency Preparedness Exercise Requirements
40. USNRC Generic Letter 80-34 – Clarification of NRC Requirements for Emergency Response Facilities at Each Site
41. USNRC Generic Letter 80-93 – Emergency Preparedness
42. USNRC Generic Letter 81-10 – Post-TMI Requirements for the Emergency Operations Facility
43. USNRC Generic Letter 89-15 – Emergency Response Data System
44. USNRC Generic Letter 91-14 – Emergency Telecommunications
45. USNRC IE Bulletin 80-15 – Possible Loss of Emergency Notification System (ENS) With Loss of Offsite Power

C. Appendices

Appendix 1 - Emergency Action Levels

Appendix 2 - Assessment and Monitoring for Actual or Potential Offsite Consequences of a Radiological Emergency

Appendix 3 - Public Alert and Notification System

Appendix 4 - Evacuation Time Estimates (summary)

Appendix 5 - Emergency Plan Implementing Procedures – Topical List

Appendix 6 - Emergency Equipment and Supplies

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Appendix 1–Emergency Action Levels

EMERGENCY CLASSIFICATION AND ACTION LEVEL SCHEME

NORTH ANNA POWER STATION UNIT 3 COMBINED LICENSE APPLICATION

FOREWORD

This Emergency Classification and Action Level Scheme for the North Anna Power Station (NAPS) Unit 3 document is based on NEI 99-01, *Methodology for Development of Emergency Action Levels*, Revision 5. Initiating Conditions and Emergency Action Levels associated with the digital control system are based on NEI 07-01, *Methodology for Development of Emergency Action Levels for Advanced Passive Light Water Reactors*, Revision 0 (July 2009).

Some detailed design information, such as setpoints and instrument numbers, are not yet available for the Mitsubishi US-APWR. In many cases this data is necessary to determine emergency action level thresholds. Appropriately, this Appendix provides the methodology to be employed to incorporate this information when it is available.

Contents

EXECUTIVE SUMMARY

Dominion must respond to a formal set of threshold conditions that require NAPS Unit 3 personnel to take specific actions with regard to notifying state and local governments and the public when certain off-normal indicators or events are recognized. Four emergency classes are identified in 10 CFR 50. Levels of response and the conditions leading to those responses are defined in joint NRC/FEMA guidelines contained in Appendix 1 of NUREG-0654/ FEMA-REP-1, Rev. 1, “Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants,” October 1980. The nuclear industry developed NEI 99-01, “Methodology for Development of Emergency Action Levels,” Revision 5, which is endorsed as an alternative approach to Appendix 1 of NUREG-0654. NEI 99-01, Revision 5 was used to develop North Anna Power Station Unit 3 Emergency Action Levels.

NAPS Unit 3 is a Mitsubishi US-APWR. The US-APWR is a pressurized water reactor (PWR). The core is surrounded by a steel neutron reflector which increases reactivity and reduces required U-235 enrichment. In addition, the US-APWR uses more advanced SGs (compared to the current generation PWRs) which create drier steam allowing for the use of higher efficiency turbines. Safety systems have enhanced redundancy, utilizing 4 trains each capable of supplying 50% of the needed makeup water instead of 2 trains capable of 100%. Also, more reliance is placed on the accumulators which have been redesigned and increased in size. The improvements in this passive system have led to the elimination of the LHSI System, an active system. Advancements in digital technology have been incorporated into the instrument and control system for the US-APWR.

Because the US-APWR is of conventional design, the guidance in NEI 99-01 applies with the exception of the digital instrument and control systems. NEI 07-01, “Methodology for Development of Emergency Action Levels for Passive Light Water Reactors,” includes information relevant to digital instrument and control systems and was useful in developing Initiating Conditions and Emergency Action Levels for North Anna Power Station Unit 3. Accordingly, the emergency classification and action level scheme was developed by modifying the generic guidance in NEI 99-01 to make it applicable to the US-APWR and adapting the guidance in NEI 07-01 for the digital control system to the US-APWR design.

ACRONYMS & ABBREVIATIONS

ac	Alternating Current
ARM	Area Radiation Monitor
CDE	Committed Dose Equivalent
CEDE	Committed Effective Dose Equivalent
CET	Core Exit Thermocouple
CFR	Code of Federal Regulations
CSF	Critical Safety Function
CSFST	Critical Safety Function Status Tree
CVCS	Chemical and Volume Control System
CVDT	Containment Vessel Reactor Coolant Drain Tank
DAS	Diverse Actuation System
dc	Direct Current
DCD	Design Control Document
EAL	Emergency Action Level
ECCS	Emergency Core Cooling System
EDE	Effective Dose Equivalent
ENS	Emergency Notification System
EOP	Emergency Operating Procedure
EPA	Environmental Protection Agency
ESW	Essential Service Water
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FSAR	Final Safety Analysis Report
GE	General Emergency
gpm	Gallons Per Minute
hr	Hour
IC	Initiating Condition
ID	Inner Diameter
K_{eff}	Effective Neutron Multiplication Factor
LCO	Limiting Condition for Operation
LHSI	Low Head Safety Injection
LOCA	Loss of Coolant Accident
µCi/gm	microcuries per gram
MHI	Mitsubishi Heavy Industries, Ltd.

mR	milliRoentgen
mrem	milliRoentgen Equivalent Man
NAPS	North Anna Power Station
NEI	Nuclear Energy Institute
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
NORAD	North American Aerospace Defense Command
NOUE	Notification Of Unusual Event
OBE	Operating Basis Earthquake
OCA	Owner Controlled Area
ODCM	Off-site Dose Calculation Manual
ORO	Off-site Response Organization
OSHA	Occupational Safety and Health Administration
PA/PL	Public Address/Page
PABX	Private Automatic Branch Telephone Exchange
PAG	Protective Action Guideline
PCMS	Plant Control and Monitoring System
PRA	Probabilistic Risk Assessment
PSMS	Protection and Safety Monitoring System
PWR	Pressurized Water Reactor
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RHR	Residual Heat Removal System
rem	Roentgen Equivalent Man
RPS	Reactor Protection System
RV	Reactor Pressure Vessel
RVWL	Reactor Vessel Water Level
SAE	Site Area Emergency
SCBA	Self Contained Breathing Apparatus
SG	Steam Generator
SI	Safety Injection
SFP	Spent Fuel Pit
T_{avg}	Average Reactor Coolant Temperature
TEDE	Total Effective Dose Equivalent
TOAF	Top of Active Fuel
TS	Technical Specifications
TSC	Technical Support Center

US	United States
US-APWR	Mitsubishi US Advanced Pressurized Water Reactor
V	Volt

1.0 METHODOLOGY FOR DEVELOPMENT OF EMERGENCY ACTION LEVELS

1.1 Background

In 1980, the United States Nuclear Regulatory Commission (NRC) promulgated guidance on a standard emergency classification and emergency action level (EAL) scheme. This guidance was provided in Appendix 1 of NUREG-0654/FEMA-REP-1, Revision 1, (NUREG-0654) (Reference 1). The guidance was event-based, initiating conditions (ICs) were not systematically selected, and consistent application of the guidance was never achieved by nuclear power plant (NPP) licensees. Through the Nuclear Energy Institute (NEI), the nuclear industry initiated an effort to provide a systematic approach to developing a standard emergency classification and EAL scheme resulting in a document that is now in its fifth revision: NEI 99-01, Revision 5 (Reference 2) was endorsed by the NRC staff in February 2008 (Reference 3).

More recently, the industry developed a separate guidance document, NEI 07-01, Revision 0 (Reference 4) applicable to passive light water reactor designs (e.g., Westinghouse AP-1000 and General Electric-Hitachi ESBWR). This document is under review by NRC with endorsement expected some time in 2010.

NAPS Unit 3 is a Mitsubishi US-APWR. The US-APWR is a pressurized water reactor (PWR). The core is surrounded by a steel neutron reflector which increases reactivity and reduces required U-235 enrichment. In addition, the US-APWR uses more advanced steam generators (SG) (compared to the current generation PWRs) which create drier steam allowing for the use of higher efficiency turbines. Safety systems have enhanced redundancy, utilizing 4 trains each capable of supplying 50% of the needed makeup water instead of 2 trains capable of 100%. Also, more reliance is placed on the accumulators which have been redesigned and increased in size. The improvements in this passive system have led to the elimination of the Low Head Safety Injection (LHSI) System, an active system. Advancements in digital technology have been incorporated into the instrument and control system for the US-APWR.

NRC has issued several guidance documents with respect to developing the emergency classification and EAL scheme. Regulatory Guide 1.101, Revision 4, (Reference 5) endorses the use of NEI 99-01, Revision 4. Revision 5 of NEI 99-01 was endorsed in a letter from the NRC to NEI on February 22, 2008. Regulatory Issue Summary 2003-18 (Reference 6) and its two supplements (Reference 7, Reference 8) provide recommendations to assist licensees in submitting emergency classification and EAL schemes for NRC approval.

Because the US-APWR is of conventional design, the guidance in NEI 99-01 applies with the exception of the digital control systems. NEI 07-01 includes information relevant to digital control systems and was useful in developing ICs and EALs for the US-APWR. Accordingly, the emergency classification and EAL scheme was developed by modifying the generic guidance in NEI 99-01 to make it applicable to the US-APWR and adapting the guidance in NEI 07-01 for the digital control system to the US-APWR design.

This Appendix provides information regarding what each IC and EAL addresses, and includes sufficient basis information for each EAL. The information is presented by Recognition Category:

R - Abnormal Rad Levels/Radiological Effluent

C - Cold Shutdown/Refueling System Malfunction

F - Fission Product Barrier

H - Hazards and Other Conditions Affecting Plant Safety

S - System Malfunction

Each of the EAL guides in Recognition Categories R, C, H, and S is structured in the following way:

- Recognition Category - As described above.
- Emergency Classification Levels – Notification of Unusual Event (NOUE), Alert, Site Area Emergency (SAE) or General Emergency (GE).
- Initiating Condition - Symptom- or Event-Based, Generic Identification and Title.
- Operating MODE Applicability - Power Operation, Hot Standby, Hot Shutdown, Cold Shutdown, Refueling, Defueled, All, or Not Applicable.
- Emergency Action Level Threshold(s) corresponding to the IC.
- Basis information for plant specific readings and factors that may relate to changing the generic IC or EAL to a different emergency classification level.
- EAL developer information – Information used to aid licensees in the development of site-specific EALs.

For Recognition Category F, the EAL information is presented in a matrix format. The presentation method was chosen to clearly show the synergism among the EALs and to support more accurate dynamic assessments. For category F, the EALs are arranged by safety function, or fission product barrier. Classifications are based on various combinations of function or barrier challenges.

The EAL information has the primary threshold for NOUE as operation outside the safety envelope for the plant as defined by plant Technical Specifications (TS), including Limiting Conditions for Operation (LCOs) and Action Statement Times. In addition, certain precursors of more serious events, such as loss of off-site alternating current (ac) power and earthquakes, are included in NOUE EALs. This provides a clear demarcation between the lowest emergency classification level and “non-emergency” notifications as specified by Title 10, Code of Federal Regulations 50.72 (10 CFR 50.72). (Reference 9).

2.0 CHANGES INCORPORATED WITH EMERGENCY PLAN REVISION 2

Revision 2 incorporates initiating condition and emergency action level information from the US-APWR R-COLA. Modifications to address site-specific information were incorporated to ensure applicability to the NAPS Unit 3 site.

3.0 DEVELOPMENT OF BASIS FOR GENERIC APPROACH

This Appendix addresses radiological emergency preparedness. Non-radiological events are included in the classification scheme only to the extent that these events represent challenges to the continued safety of the NPP and its operators. There are existing reporting requirements (United States Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA)) under which utilities operate for non-radiological emergencies. There are also requirements for emergency preparedness involving hazardous chemical releases. While the proposed classification structure could be expanded to include these non-radiological hazards, these events are beyond the scope of this Appendix.

This classification scheme is based on the four classification levels promulgated by the NRC as the standard for the United States (US). The NRC has determined that US nuclear facilities will continue to classify events using the four classification levels and that the NRC will re-classify the event in any international communication.

3.1 Definitions Used to Develop EAL Methodology

The following definitions apply to the NAPS Unit 3 Emergency Plan and are used throughout this document:

EMERGENCY CLASSIFICATION LEVEL: One of four emergency categories established by the NRC for grouping off-normal NPP conditions according to (1) their relative radiological seriousness, and (2) the time-sensitive on-site and off-site radiological emergency preparedness actions necessary to respond to such conditions. The existing radiological emergency classification levels, in ascending order of seriousness, are:

- Notification of Unusual Event (NOUE)
- Alert
- Site Area Emergency (SAE)
- General Emergency (GE)

INITIATING CONDITION (IC): One of a predetermined subset of NPP conditions where either the potential exists for a radiological emergency, or such an emergency has occurred.

EMERGENCY ACTION LEVEL (EAL): A pre-determined, observable threshold for an IC that places the plant in a given emergency classification level. An EAL can be: an instrument reading; an equipment status indicator; a measurable parameter (on-site or off-site); a discrete, observable event; results of analyses; entry into specific emergency operating procedures (EOPs); or another phenomenon which, if it occurs, indicates entry into a particular emergency classification level.

3.2 Perspective

This document defines EALs for NAPS Unit 3 based on the methodology presented in NEI 99-01. The approach is designed to be easily understood and applied by the individuals responsible for on-site and off-site emergency preparedness and response.

3.3 Recognition Categories

ICs and EALs are grouped in one of several schemes. These classification schemes include symptom-based, event-based, and barrier-based ICs and EALs.

The symptom based category for ICs and EALs refers to those indicators that are measurable over some continuous spectrum, such as core temperature, coolant levels, containment pressure, etc. The level of seriousness these symptoms indicate depends on the degree to which they have exceeded TS limits, the other symptoms or events that are occurring contemporaneously, and the capability of the licensed operators to gain control and bring the indicator back to safe levels.

Event based EALs and ICs refer to occurrences with potential safety significance, such as the failure of a SI pump, a safety valve failure, or a loss of electric power to some part of the plant. The range of seriousness of these “events” is dependent on the location, number of contemporaneous events, remaining plant safety margin, etc.

Barrier based EALs and ICs refer to the level of challenge to principal fission product barriers used to assure containment of radioactive materials contained within a NPP. These barriers are: fuel cladding, reactor coolant system (RCS) pressure boundary, and containment. The level of challenge to these barriers encompasses the extent of damage (loss or potential loss) and the number of barriers concurrently under challenge. In reality, barrier based EALs are a subset of symptom based EALs that deal with symptoms indicating fission product barrier challenges. These barrier based EALs are primarily derived from Critical Safety Functions (CSFs) identified in EOPs. Challenge to one or more barriers generally is initially identified through instrument readings and periodic sampling. Under these barrier-based EALs, deterioration of the RCS pressure boundary or the fuel clad barrier usually indicates an Alert condition, two barriers under challenge a Site Area Emergency, and loss of two barriers with the third barrier under challenge is a General Emergency. The fission product barrier table described in Section 5-F is a hybrid approach that recognizes that some events may represent a challenge to more than one barrier, and that the containment barrier is weighted less than the RCS pressure boundary and the fuel clad barriers.

Symptom based ICs and EALs are most easily identified when the plant is in a normal startup, operating or hot shutdown MODE of operation, with all of the barriers in place and the plant's instrumentation and emergency safeguards features fully operational as required by TS. It is under these circumstances that the operations staff has the most direct information of the plant's systems displayed in the Control Room. As the plant moves through the decay heat removal process toward cold shutdown and refueling, barriers to fission products are reduced (i.e., RCS pressure boundary may be open), and fewer of the safety systems required for power operation are required to be fully

operational. Under these plant operating MODEs, the identification of an IC in the plant's operating and safety systems becomes more event based, as the instrumentation to detect symptoms of a developing problem may not be fully effective; and engineered safeguards systems, such as the Emergency Core Cooling System (ECCS), may be partially disabled as permitted by the plant's TS.

Barrier based ICs and EALs also are heavily dependent on the ability to monitor instruments that indicate the condition of plant operating and safety systems. Fuel cladding integrity and reactor coolant levels can be monitored through several indicators when the plant is in a normal operating MODE, but this capability is much more limited when the plant is in a refueling MODE, when many of these indicators are disconnected or off-scale. The need for this instrumentation is lessened when the plant is shut down.

For some operating MODEs there may not be definitive and unambiguous indicators of containment integrity available to Control Room personnel. Therefore, barrier-based EALs do not place undue reliance on assessments of containment integrity in all operating MODEs. Generally, TS relax containment integrity requirements in shutdown or refuel MODEs in order to provide flexibility in performance of specific tasks during shutdown conditions. Containment pressure and temperature indications may not increase if there is a pre-existing breach of containment integrity. For the US-APWR, a large portion of the containment's exterior cannot be monitored for leakage by radiation monitors.

Several categories of emergencies have no instrumentation to indicate a developing problem, or the event may be identified before any other indications are recognized. A reactor coolant pipe could break; FIRE alarms could sound; radioactive materials could be released; and any number of other events could occur that would place the plant in an emergency condition with little warning. For emergencies related to the reactor system and safety systems, the ICs shift to an event based scheme as the plant MODE moves toward cold shutdown and refueling MODEs. For non-radiological events, such as FIRE, external floods, wind loads, etc., event based ICs are the norm.

In many cases, a combination of symptom, event, and barrier based ICs will be present as an emergency develops. In a loss of coolant accident (LOCA), for example:

- Coolant level is dropping; (symptom)
- There is a leak of some magnitude in the system (pipe break, safety valve stuck open) that exceeds plant capabilities to make up the loss; (barrier breach or event)
- Core (coolant) temperature is rising; (symptom) and
- At some level, fuel failure begins with indicators such as high off-gas, high coolant activity samples, etc. (barrier breach or symptom)

3.4 Characteristics

Seven characteristics incorporated into the EALs are identified below:

(1) Consistency (i.e., the EALs would lead to similar decisions under similar circumstances at other plants);

(2) Human engineering and user friendliness;

(3) Potential for classification upgrade only when there is an increasing threat to public health and safety;

(4) Ease of upgrading and downgrading;

(5) Technical completeness for each classification level;

(6) A logical progression in classification for multiple events; and

(7) Objective, observable values.

3.5 Emergency Classification Level Descriptions

There are three considerations related to emergency classification levels. These are:

(1) The potential impact on radiological safety, either as known now or as can be reasonably projected;

(2) How far the plant is beyond its predefined design, safety, and operating envelopes; and

(3) Whether or not conditions that threaten health are expected to be confined to within the site boundary.

The ICs deal explicitly with radiological safety impact by escalating from levels corresponding to releases within regulatory limits to releases beyond EPA Protective Action Guideline (PAG) (Reference 11) plume exposure levels. In addition, the “Discussion” sections below include off-site dose consequence considerations that were not included in NUREG-0654 Appendix 1.

NOTIFICATION OF UNUSUAL EVENT (NOUE):

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 off-site response or monitoring are expected unless further degradation of safety systems occurs.

Discussion: Potential degradation of the level of safety of the plant is indicated primarily by exceeding plant TS Limiting Condition for Operation (LCO) allowable action statement time for achieving required MODE change to a condition where the LCO is no longer applicable. Precursors of more serious events are also included because precursors do represent a potential degradation

in the level of safety of the plant. Minor releases of radioactive materials are included. In this emergency classification level; however, releases do not require monitoring or off-site response.

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 PAG exposure levels.

Discussion: Rather than discussing the distinguishing features of “potential degradation” and “potential substantial degradation,” a comparative approach would be to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency classification level is warranted, or whether de-escalation or termination of the emergency classification level declaration is warranted. Dose consequences from these events are small fractions of the EPA PAG plume exposure levels.

SITE AREA EMERGENCY (SAE):

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 PAG exposure levels beyond the site boundary.

Discussion: The discriminator (threshold) between Site Area Emergency and General Emergency is whether or not the EPA PAG plume exposure levels are expected to be exceeded outside the site boundary. This threshold, in addition to dynamic dose assessment considerations discussed in the EAL guidelines, clearly addresses NRC and off-site emergency response agency concerns as to timely declaration of a General Emergency.

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 PAG exposure levels off-site for more than the immediate site area.

Discussion: The bottom line for the General Emergency is whether evacuation or sheltering of the general public is indicated based on EPA PAGs, and therefore is interpreted to include radionuclide release regardless of cause. Uncertainties in systems or structures (e.g., containment) response, and events such as waste gas tank releases and severe spent fuel pool events postulated to occur

at high population density sites, are addressed. To better assure timely notification, EALs in this category are primarily expressed in terms of plant function status, with secondary reliance on dose projection. In terms of fission product barriers, loss of two barriers with loss or potential loss of the third barrier constitutes a General Emergency.

3.6 Emergency Classification Level Thresholds

The bases for establishing these emergency classification thresholds are the TS and setpoints that have been developed in the design basis calculations and the Final Safety Analysis Report (FSAR) or other appropriate indication, alarm, or assessment that represents a threshold requiring emergency classification and response.

For those conditions that are easily measurable and instrumented, the boundary is likely to be the EAL (observable by plant staff, instrument reading, alarm setpoint, etc.) that indicates entry into a particular emergency classification level. In addition to the continuously measurable indicators, such as coolant temperature, coolant levels, leak rates, containment pressure, etc., the FSAR provides indications of the consequences associated with design basis events.

The US-APWR probabilistic risk assessment (PRA) was considered in defining these boundaries. The PRA has been completed for the design as part of the licensing process. The PRA was considered in developing relevant ICs and risk associated with emergency conditions.

Another critical element of the analysis to arrive at these threshold (boundary) conditions is the time that the plant might stay in that condition before moving to a higher emergency class. The time dimension is critical to the EAL because the purpose of the emergency class for state and local officials is to notify them of the level of mobilization that may be necessary to handle the emergency. This is particularly true when a Site Area Emergency or General Emergency is IMMINENT.

3.7 Emergency Action Levels

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 plant's TS. Activities which cause the plant to operate beyond that allowed by TS, planned or UNPLANNED, may result in an EAL Threshold being met or exceeded. Planned evolutions to test, manipulate, repair, perform maintenance or modifications to systems and equipment that result in an EAL value 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.

Classifications are to be based on 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 definition is the need for timely assessment.

With the emergency classes defined, the thresholds that must be met for each EAL to be placed under the emergency class were determined. Two basic approaches to determining EALs were considered:

(1) EALs and emergency class boundaries coincide for those continuously measurable, instrumented ICs, such as radioactivity, core temperature, coolant levels, etc. For these ICs, the EAL is the threshold reading that most closely corresponds to the emergency class description using the best available information.

The Emergency Coordinator must remain alert to events or conditions that lead to the conclusion that exceeding the EAL Threshold is IMMINENT. Under certain plant conditions, an alternate instrument or a temporary instrument may be installed to facilitate monitoring the parameter. In addition, visual observation may be sufficient to detect that a parameter is approaching or has reached a classifiable threshold. In these cases, the classification of the event is appropriate even if the instrument normally used to monitor the parameter is inoperable or has otherwise failed to detect the threshold. If, in the judgment of the Emergency Coordinator, an IMMINENT situation is at hand, the classification should be made as if the threshold has been exceeded.

Note: For EALs including a time qualifier, the Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the EAL Threshold duration has been exceeded, or is IMMINENT. With regard to radiological release EALs, in the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown.

Note: Timely and accurate communication between Security Shift Supervision and the Control Room is crucial for the implementation of effective Security EALs.

(2) For discrete (discontinuous) events, the approach is somewhat different. In this category are internal and external hazards such as FIRE or earthquake. The purpose for including hazards in EALs is to assure that plant personnel and off-site emergency response organizations are prepared to deal with consequential damage these hazards may cause. If, indeed, hazards have caused damage to safety functions or fission product barriers, this should be confirmed by symptoms or by observation of such failures. Therefore, it may be appropriate to enter an Alert classification for events approaching or exceeding design basis limits such as Operating Basis Earthquake (OBE), design basis wind loads, FIRE within VITAL AREAs, etc. This would give the operating staff additional support and improved ability to determine the extent of plant damage. If damage to barriers or challenges to CSFs

have occurred or are identified, then the additional support can be used to escalate or terminate the Emergency Class based on what has been found. Security events must reflect potential for increasing security threat levels.

Plant EOPs are designed to maintain and/or restore a set of CSFs which are listed in the order of priority for restoration efforts during accident conditions. While the actual nomenclature of the CSFs may vary among plants, generally the PWR CSF set includes:

- Subcriticality
- Core cooling
- Heat sink
- Pressure-temperature-stress (RCS integrity)
- Containment
- RCS inventory

There are diverse and redundant plant systems to support each CSF. By monitoring the CSFs instead of the individual system component status, the impact of multiple events is inherently addressed, e.g., the number of OPERABLE components available to maintain the CSF.

The EOPs contain detailed instructions regarding the monitoring of these functions and provides a scheme for classifying the significance of the challenge to the functions. In providing EALs based on these schemes, the emergency classification can flow from the EOP assessment rather than being based on a separate EAL assessment. This is desirable as it reduces ambiguity and reduces the time necessary to classify the event.

PWR Owner's Group Emergency Response Guidelines (ERGs) classify challenges as YELLOW, ORANGE, and RED paths. If the core exit thermocouples (CETs) exceed 1200 degrees F (649 degrees C) or 700 degrees F (371 degrees C) with low reactor vessel water level, a RED path condition exists. The ERG considers a RED path as an extreme challenge to a plant function necessary for the protection of the public. It reasonably follows that if any CSF enters a RED path, a Site Area Emergency exists. A General Emergency could be considered to exist if core cooling CSF is in a RED path and the EOP function restoration procedures have not been successful in restoring core cooling.

Note: RU1, RA1, RS1, and RG1 EALs in NEI 99-01, related to perimeter radiation monitoring systems, are not included because NAPS does not have a perimeter radiation monitoring system. Similarly, for RU1 and RA1, EALs related to real-time dose assessment have not been included because NAPS does not have this capability.

Note: HA1, EAL #4 related to VISIBLE DAMAGE affecting safety systems from a turbine failure, identified in NEI 99-01, is not included for NAPS Unit 3, because of specific design features incorporated into the US-APWR design.

Note: F Recognition Category EALs include Critical Safety Function Status Tree (CSFST) methodology.

Note: SU3, SA4, and SS6 related to annunciator malfunctions, as presented in NEI 99-01, have been replaced with SA7 and SS7 to address the digital control systems in the US-APWR. The approach for digital control ICs/EALs presented in NEI-07-01 was generally adopted for the US-APWR and included as CU9, CA9, SA7, and SS7.

3.8 Treatment of Multiple Events and Classification Level Upgrading

When multiple simultaneous events occur, the emergency classification level is based on the highest EAL reached. For example, two Alerts remain in the Alert category or, an Alert and a Site Area Emergency is a Site Area Emergency. Further guidance is provided in Regulatory Information Summary, RIS 2007-02, Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events (Reference 12).

Although the majority of the EALs provide very specific thresholds, the Emergency Coordinator 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 Coordinator, an IMMINENT situation is at hand, the classification should be made as if the threshold has been exceeded. While this is particularly prudent at the higher emergency classification levels (as the early classification may provide for more effective implementation of protective measures), it is nonetheless applicable to all emergency classification levels.

3.9 Classifying Transient Events

There may be cases in which a plant condition that exceeded an EAL Threshold 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 and the guidance of NUREG-1022, (Reference 13) Event Reporting Guidelines 10 CFR 50.72 and 50.73 (Reference 14), should be applied.

Existing guidance for classifying transient events addresses the period of time of event recognition and classification (15 minutes). However, in cases when an EAL declaration criterion may be met momentarily during the normal expected response of the plant, declaration requirements should not be considered to be met when the conditions are a part of the designed plant response or result in appropriate operator actions.

3.10 Operating 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 level can be declared, the emergency classification level 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 EALs are applicable only to events that initiate in Hot Shutdown or higher.

3.11 Operating MODEs

(1)	Power Operations:	Reactor Power > 5%, $K_{eff} \geq 0.99$
(2)	Startup:	Reactor Power $\leq$ 5%, $K_{eff} \geq 0.99$
(3)	Hot Standby:	$T_{avg} \geq$ 350°F (177°C), $K_{eff} < 0.99$
(4)	Hot Shutdown:	200°F (93°C)$<T_{avg} <$ 350°F (177°C), $K_{eff} < 0.99$
(5)	Cold Shutdown:	$T_{avg} \leq$ 200°F (93°C), $K_{eff} < 0.99$
(6)	Refueling:	One or more vessel head closure bolts less than fully tensioned
	Defueled (None):	All reactor fuel removed from reactor pressure vessel (RV). (Full core off load during refueling or extended outage)

4.0 HUMAN FACTORS CONSIDERATIONS

Human factor considerations discussed in NEI 99-01 were adopted in this document.

5.0 EAL GUIDANCE

This document provides ICs and EALs for the NAPS Unit 3. The methodology to provide information that is not yet available at the current stage of design for the US-APWR is included in the Bases for affected EALs.

5.1 Generic Arrangement

The information is presented by Recognition Categories:

R - Abnormal Rad Levels/Radiological Effluent

C - Cold Shutdown/Refueling System Malfunction

F - Fission Product Barrier Degradation

H - Hazards and Other Conditions Affecting Plant Safety

S - System Malfunction

The ICs for each of the above Recognition Categories R, C, H, and S are in the order of NOUE, Alert, Site Area Emergency, and General Emergency. For all Recognition Categories, an IC matrix versus emergency classification level is first shown. The purpose of the IC matrices is to provide an overview of how the ICs are logically related under each emergency classification level.

EAL guides in Recognition Categories R, C, H, and S are structured in the following way:

- Recognition Category - As described above.
- Emergency Classification Level - NOUE, Alert, Site Area Emergency or General Emergency.
- Initiating Condition - Generic Identification and/or Title.
- Operating MODE Applicability - These MODEs are defined in US-APWR TS.
- Emergency Action Level Threshold(s) – These thresholds are conditions and indications that were considered to meet the criteria of the IC. The EALs are intended to be unambiguous, expressed in site-specific nomenclature, and be readily discernible from Control Room instrumentation.
- Basis – Provides information that explains the IC and EALs. The bases are also written to assist the personnel implementing the guidance into site-specific procedures. Attachment A provides a detailed basis for implementing the Abnormal Rad Levels/Radiological Effluent Recognition Category.

  For Recognition Category F, basis information is presented in a format consistent with Table 5-F-2. The presentation method shown for the Fission Product Barrier Function Table was chosen to clearly show the synergism among the EALs and to support more accurate dynamic assessments.

5.2 Generic Bases

The ICs and EALs are based on NEI 99-01 guidance that has the primary threshold for NOUEs as operation outside the safety envelope for the plant as defined by plant TS, including LCOs and Action Statement Times. In addition, certain precursors of more serious events, such as loss of off-site ac power and earthquakes, are included in NOUE IC/EALs. This provides a clear demarcation between the lowest emergency classification level and “non-emergency” notifications specified by 10 CFR 50.72.

For a number of Alerts, IC/EALs are chosen based on hazards which may cause damage to plant safety functions (e.g., tornadoes, hurricanes, FIRE in VITAL AREAS) or require immediate additional help directly (Control Room evacuation) and increased monitoring of the plant. The symptom-based and barrier-based IC/EALs are sufficiently anticipatory to address the results of multiple failures, regardless of whether there is or is not a common cause. Declaration of the Alert results in the staffing of the Technical Support Center (TSC) for assistance and additional monitoring making direct escalation to the Site Area Emergency unnecessary. Other Alerts, which

have been specified, correspond to conditions that are consistent with the emergency classification level description.

The basis for declaring a Site Area Emergency and General Emergency is primarily the extent and severity of fission product barrier challenges, based on plant conditions as presently known or as can be reasonably projected.

With regard to the Hazards and Other Conditions Affecting Plant Safety Recognition Category, the existence of a hazard that represents a potential degradation in the level of safety of the plant is the basis of NOUE classification. If the hazard results in VISIBLE DAMAGE to plant structures or equipment associated with safety systems, or if system performance is affected, the event may be escalated to an Alert. The reference to “duration” or to “damage” to safety systems is intended only to size the event. Consequential damage from such hazards, if observed, would be the basis for escalation to Site Area Emergency or General Emergency, by entry to System Malfunction or Fission Product Barrier IC/EALs.

Portions of the basis are specifically designated as information necessary for the development of the site-specific procedures and training. These developer information sections are in [*brackets and italicized*]. The information contained in these portions consists of references, examples, instructions for calculations, etc. These portions of the basis and applicable appendices need not be included in the technical basis document supporting the site-specific EALs. In some cases, the information developed from the developer information may be appropriate to include in the technical basis document.

5.3 Implementation at NAPS Unit 3

The information contained in this document contains NAPS Unit 3 specific ICs and EALs based on the NEI 99-01.

The ICs and EAL Thresholds serve a specific purpose. The ICs are intended to be the fundamental criteria for the declaration, whereas, the EAL Thresholds are intended to represent unambiguous conditions that meet the IC. There may be unforeseen events, or combinations of events, for which the EALs may not be exceeded, but in the judgment of the Emergency Coordinator, the intent of the IC may be met. The additional detail in the individual ICs will facilitate classifications over the broad guidance of the Emergency Coordinator judgment ICs.

These ICs and EALs have been reviewed with the Virginia Department of Emergency Management, Virginia Department of Health, Virginia State Police, Virginia Department of Game and Inland Fisheries, Caroline County Fire-Rescue and Emergency Management, Caroline County Sheriff, Hanover County Assistant Administrator, Hanover County Sheriff, Louisa County Administrator, Louisa County Sheriff, Louisa County Volunteer Firefighters Association, Emergency Medical Service Association of Louisa County, Orange County Administrator, Orange County Sheriff, Spotsylvania Fire, Rescue, and Emergency Management, and Spotsylvania County Sheriff.

The information contained in the bases for each EAL may assist the Emergency Coordinator in making classifications, particularly those involving judgment or multiple events. The basis information is useful in training, for explaining event classifications to off-site officials and facilitating regulatory review and approval of the classification scheme.

5.4 Definitions

In the IC/EALs, selected words have been set in all capital letters. These words are defined terms having specific meanings as they relate to this document. Definitions of these terms are provided below.

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.

CORE ALTERATION: As defined in TS, CORE ALTERATION is the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.

DOSE EQUIVALENT I-131: As defined in US-APWR TS, DOSE EQUIVALENT I-131 is the concentration of I-131 (microcuries/gram (μCi/gm)) that alone would produce the same committed effective dose equivalent (CEDE) as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The dose conversion factors used for this calculation shall be those listed in Table 2.1 of EPA Federal Guidance Report No. 11, “Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion,” EPA-520/1-88-020, September 1988 (Reference 15).

DOSE EQUIVALENT XE-133: As defined in US-APWR TS, DOSE EQUIVALENT Xe-133 is the concentration of Xe-133 (microcuries per gram (μCi/gm)) that alone would produce the same effective dose equivalent (EDE) as the quantity and isotopic mixture of noble gases (Kr-85m, Kr-85, Kr-87, Kr-88, Xe-133, and Xe-135) actually present. The dose conversion factors used for this calculation shall be those listed in Table III.1 of EPA Federal Guidance Report No. 12, “External Exposure to Radionuclides in Air, Water, and Soil,” EPA 402-R-93-081, September 1993 (Reference 16).

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

FAULTED: The existence of secondary side LEAKAGE that results in an uncontrolled drop in SG pressure or the SG being completely depressurized.

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.

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 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 (OCA)).

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

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur. Where IMMINENT timeframes are specified, they shall apply.

LEAKAGE: As defined in US-APWR Technical Specifications, LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank,

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE, or

3. RCS LEAKAGE through a SG to the Secondary System (primary to secondary LEAKAGE);

b. Unidentified LEAKAGE

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE, and

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE) through a nonisolable fault in an RCS component body, pipe wall, or vessel wall.

MODE: As defined in TS, MODE shall correspond to any one inclusive combination of core reactivity condition, power level, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Section 3.11 (Table 1.1-1 of TS) with fuel in the reactor vessel.

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

OPERABLE/OPERABILITY: As defined in TS, system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

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

PROTECTED AREA: The site-specific area that encompasses all controlled areas within the security PROTECTED AREA fence.

RUPTURED: Existence of primary-to-secondary LEAKAGE in a SG of a magnitude sufficient to require or cause a reactor trip and SI.

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: A breach or leak that cannot be promptly isolated.

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

VALID: An indication, report, or condition, is considered to be VALID when it is verified by (1) an instrument channel check, (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

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

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

5.5 Abnormal Rad Levels/Radiological Effluent EALs

Table 5-R-1: Recognition Category "R" Initiating Condition Matrix

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
RG1 Off-site dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 1000 mrem TEDE or 5000 mrem Thyroid CDE for the actual or projected duration of the release using actual meteorology. *Op. MODEs: All*	**RS1** Off-site dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 100 mrem TEDE or 500 mrem Thyroid CDE for the actual or projected duration of the release. *Op. MODEs: All*	**RA1** Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM Limit for 15 minutes or longer. *Op. MODEs: All*	**RU1** Any release of gaseous or liquid radioactivity to the environment greater than 2 times the ODCM Limit for 60 minutes or longer. *Op. MODEs: All*
		RA2 Damage to irradiated fuel or loss of water level that has resulted or will result in the uncovering of irradiated fuel outside the reactor vessel. *Op. MODEs: All*	**RU2** UNPLANNED rise in plant radiation levels. *Op. MODEs: All*
		RA3 Rise in radiation levels within the facility that impedes operation of systems required to maintain plant safety functions. *Op. MODEs: All*	

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

RU1

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Any release of gaseous or liquid radioactivity to the environment greater than 2 times the Off-site Dose Calculation Manual (ODCM) Limit for 60 minutes or longer.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2 or 3)

1. VALID reading on **ANY** of the following radiation monitors greater than the threshold for 60 minutes or longer:
   - High Sensitivity Main Steam Line Monitor (N-16 channel)
     (Threshold - 2 x High Alarm setpoint (R-65A, B, R-66A, B, R-67A, B, R-68A, B))
   - Turbine Building Floor Drain Radiation Monitor
     (Threshold – 2 x High Alarm setpoint (R-58))
2. VALID reading on **ANY** of the following effluent monitor reading greater than 2 times the alarm setpoint established by a current radioactivity discharge permit for 60 minutes or longer:
   - Plant Vent Radiation Gas Monitor
     (Threshold - 2 x ODCM limit (R-21A, B, R-80A, B))
   - Liquid Radwaste Discharge Monitor
     (Threshold - 2 x ODCM limit (R-35))
   - Essential Service Water (ESW) Radiation Monitor
     (Threshold - 2 x High Alarm setpoint (R-74A, B, C, D))
3. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates greater than 2 times {site-specific ODCM values} for 60 minutes or longer.

Basis:

Refer to Attachment A for a detailed basis of the radiological effluent IC/EALs.

This IC addresses a potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

The US-APWR incorporates design features intended to control the release of radioactive effluents to the environment. Administrative controls are established to prevent unintentional releases, or control and monitor intentional releases. The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of a degradation in these features and/or controls. The

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

ODCM multiples are specified in RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an off-site dose or dose rate, the emphasis in classifying these events is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

This EAL includes any release for which a radioactivity discharge permit was not prepared, or a release that exceeds the conditions on the applicable permit.

EAL #1

This EAL addresses radioactivity releases that cause effluent radiation monitor readings to exceed the threshold identified in the IC.

This EAL is for established effluent monitoring on non-routine release pathways for which a discharge permit would not normally be prepared.

The design basis secondary side steam activity is less than 1E-3 $\mu Ci/cm^3$ (from US-APWR Design Control Document (DCD) (Reference 17) Table 11.1-6). Two times the design base secondary side steam activity value is less than the lower range of Main Steam Line Monitor (1E-1 $\mu Ci/cm^3$). Therefore, Main Steam Line Monitor (R-87, R-88, R-89, R-90) is not used for EAL #1. For a Steam Generator (SG) tube leak, the High Sensitivity Main Steam Line Monitor (N-16 channel) can be used.

EAL #2

This EAL addresses radioactivity releases that cause effluent radiation monitor readings to exceed the threshold identified in the IC established by the radioactivity discharge permit. This value may be associated with a planned batch release or a continuous release path.

EAL #3

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

Note: For EALs #1, #2, #3, the ODCM setpoint is calculated using guidance provided in ODCM sections 6.2.1 and 6.3.1.

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RU2

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

UNPLANNED rise in plant radiation levels.

Operating MODE Applicability: All

Emergency Action Levels Thresholds: (1 or 2)

1. a. UNPLANNED water level drop in a reactor refueling pathway as indicated by:
   - Refueling Cavity Level Low Setpoint (362'-4" on L-401)
   - Spent Fuel Pit (SFP) Level Low Setpoint 362'-4" on L-650)
   - Visual observation

   AND

   b. VALID rise in Area Radiation Monitor (ARM) indication:
   - Containment High Range ARM (R-91A, B, R-92A, B, R-93A, B, R-94A, B)
   - Fuel Handling Area HVAC Radiation Gas Monitor (R-49)
   - SFP ARM (R-5)

2. UNPLANNED VALID ARM readings or survey results indicate a rise by a factor of 1000 over normal* levels in any area of the plant.

   *Normal is considered as the highest reading in the past twenty-four hours excluding the current peak value.

Basis:

This IC addresses increased radiation levels as a result of water level decreases above irradiated fuel or events that have resulted, or may result, in UNPLANNED increases in radiation dose rates within plant buildings. These radiation increases represent a loss of control over radioactive material and represent a potential degradation in the level of safety of the plant.

EAL #1

Water level indications on Refueling Cavity Level monitor (L-401) and SFP Level monitor (L-650) are used. The setpoint for the Low Level alarm on L-401 is 362'-4" and the setpoint for the Low Level alarm on L-650 is 362'-4". Other indications include local ARMs and personnel (e.g., refueling crew) reports. If available, video cameras may allow remote observation.

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The refueling pathway is a combination of cavities, tubes, canals and pools. While a radiation monitor could detect an increase in dose rate due to a drop in the water level, it might not be a reliable indication of whether or not the fuel is covered.

For example, a refueling bridge ARM or radiation survey reading may increase due to planned evolutions such as head lift, or even a fuel assembly being raised in the manipulator mast. Also, a monitor could in fact be properly responding to a known event involving transfer or relocation of a source, stored in or near the fuel pool or responding to a planned evolution such as removal of the reactor head. Generally, increased radiation monitor indications will need to be combined with another indicator (or personnel report) of water loss.

For refueling events where the water level drops below the RV flange, classification would be via CU2. This event escalates to an Alert per RA2 if irradiated fuel outside the reactor vessel is uncovered. For events involving irradiated fuel in the reactor vessel, escalation would be via the Fission Product Barrier Table for events in operating MODEs 1-4.

EAL #2

This EAL addresses increases in plant radiation levels that represent a loss of control of radioactive material resulting in a potential degradation in the level of safety of the plant.

This EAL excludes radiation level increases that result from planned activities such as use of radiographic sources and movement of radioactive waste materials. A specific list of ARMs is not required as it would restrict the applicability of the threshold. The intent is to identify loss of control of radioactive material in any monitored area.

This event escalates to an Alert per RA3 if the increase in dose rates impedes personnel access necessary for safe operation.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

RA1

Initiating Condition – ALERT

Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM Limit for 15 minutes or longer.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2 or 3)

1. VALID reading on **ANY** of the following radiation monitors greater than the threshold for 15 minutes or longer:
   - High Sensitivity Main Steam Line Monitor (N-16 channel)
     (Threshold - 200 x High Alarm setpoint (R-65A, B, R-66A, B, R-67A, B, R-68A, B))
   - Turbine Building Floor Drain Radiation Monitor
     (Threshold - 200 x High Alarm setpoint (R-58))
2. VALID reading on **ANY** of the following effluent monitor reading greater than 200 times the alarm setpoint established by a current radioactivity discharge permit for 15 minutes or longer:
   - Plant Vent Radiation Gas Monitor
     (Threshold - 200 x ODCM limit (R-21A, B, R-80,A, B))
   - Liquid Radwaste Discharge Monitor
     (Threshold - 200 x ODCM limit (R-35))
   - ESW Radiation Monitor
     (Threshold - 200 x High Alarm setpoint (R-74A, B, C, D))
3. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates greater than 200 times {site-specific ODCM values} for 15 minutes or longer.

Basis:

Refer to Attachment A for a detailed basis of the radiological effluent IC/EALs.

This IC addresses an actual or substantial potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

The US-APWR incorporates design features intended to control the release of radioactive effluents to the environment. Administrative controls are established to prevent unintentional releases, or

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control and monitor intentional releases. These controls are located in the ODCM. The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of a degradation in these features and/or controls.

The ODCM multiples are specified in RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an off-site dose or dose rate, the emphasis in classifying these events is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

Releases should not be prorated or averaged. For example, a release exceeding 600 x ODCM limit for 5 minutes does not meet the threshold.

This EAL includes any release for which a radioactivity discharge permit was not prepared, or a release that exceeds the conditions on the applicable permit.

EAL #1

This EAL is intended for sites that have established effluent monitoring on non-routine release pathways for which a discharge permit would not normally be prepared.

The design basis secondary side steam activity is less than 1E-3 $\mu Ci/cm^3$ (from DCD table 11.1-6). Two hundred times the design base secondary side steam activity value is less than the lower range of Main Steam Line Monitor (1E-1 $\mu Ci/cm^3$). Therefore, Main Steam Line Monitor (R-87, R-88, R-89, R-90) is not used for EAL #1. For a Steam Generator (SG) tube leak, the High Sensitivity Main Steam Line Monitor (N-16 channel) can be used.

EAL #2

This EAL addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed the threshold identified in the IC established by the radioactivity discharge permit. This value may be associated with a planned batch release or a continuous release path.

EAL #3

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

Note: For EALs #1, #2, #3, the ODCM setpoint is calculated using guidance provided in ODCM sections 6.2.1 and 6.3.1.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

RA2

Initiating Condition – ALERT

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

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2)

1. A water level drop in the reactor refueling cavity, spent fuel pool or fuel transfer canal that will result in irradiated fuel becoming uncovered as indicated by **ANY** of the following:
   - Refueling Cavity Level Low-Low Setpoint (El. 362'-4") on L-401
   - Spent Fuel Pit (SFP) Level Low-Low Setpoint (El. 362'-4") on L-650
   - Visual observation
2. A VALID alarm or elevated reading on **ANY** of the following due to damage to irradiated fuel or loss of water level.
   - Containment High Range ARM (R-91A, B, R-92A, B, R-93A, B, R-94A, B)
   - Fuel Handling Area HVAC Radiation Gas Monitor (R-49)
   - SFP ARM (R-5)

Basis:

This IC addresses increases in radiation dose rates within plant buildings, and may be a precursor to a radioactivity release to the environment. These events represent a loss of control over radioactive material and represent an actual or substantial potential degradation in the level of safety of the plant.

EAL #1

Water level indications on Refueling Cavity Level monitor (L-401) and SFP Level monitor (L-650) are used. The setpoint for the Low-Low Level alarm on L-401 is El. 362'-4" and the setpoint for the Low Level alarm on L-650 is El. 362'-4". If available, video cameras may allow remote observation.

EAL #2

This EAL addresses radiation monitor indications of fuel uncovery and/or fuel damage.

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Increased ventilation monitor readings may be indication of a radioactivity release from the fuel, confirming that damage has occurred. Increased background at the ventilation monitor due to water level decrease may mask increased ventilation exhaust airborne activity and needs to be considered.

While a radiation monitor could detect an increase in dose rate due to a drop in the water level, it might not be a reliable indication of whether or not the fuel is covered.

A refueling bridge ARM or radiation survey reading may increase due to planned evolutions such as head lift, or even a fuel assembly being raised in the manipulator mast. A monitor could in fact be properly responding to a known event involving transfer or relocation of a source, stored in or near the fuel pool or responding to a planned evolution such as removal of the reactor head. Generally, increased radiation monitor indications will need to be combined with another indicator (or personnel report) of water loss.

Escalation of this emergency classification level, if appropriate, would be based on RS1 or RG1.

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RA3

Initiating Condition – ALERT

Rise in radiation levels within the facility that impedes operation of systems required to maintain plant safety functions.

Operating MODE Applicability: All

Emergency Action Levels Threshold:

1. Dose rate greater than 15 milliRoentgen (mR)/hour (hr) in **ANY** of the following areas requiring continuous occupancy to maintain plant safety functions:
   - Main Control Room ARM (R-1)
   - Central Alarm Station ARM {site-specific Instrument Number}

Basis:

This IC addresses increased radiation levels that impact continued operation in areas requiring continuous occupancy to maintain safe operation or to perform a safe shutdown.

The cause and/or magnitude of the increase in radiation levels is not a concern of this IC. The Emergency Coordinator must consider the source or cause of the increased radiation levels and determine if any other IC may be involved.

At the NAPS site, this EAL could result in declaration of an Alert at one unit due to a radioactivity release or radiation shine resulting from a major accident at another unit. This is appropriate if the increase impairs operations at any of the operating units.

The value of 15 mR/hr is derived from the GDC 19 value of 5 rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, “Clarification of TMI Action Plan Requirements” (Reference 18), provides that the 15 mR/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30 day duration implies an event potentially more significant than an Alert.

Areas requiring continuous occupancy to maintain plant safety functions include the Control Room, and Central Alarm Station.

EAL #1 Threshold: The Central Alarm Station ARM instrument number will be filled in when it is available.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

RS1

Initiating Condition – SITE AREA EMERGENCY

Off-site dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 100 mrem TEDE or 500 mrem Thyroid CDE for the actual or projected duration of the release.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2 or 3)

1. VALID reading on **ANY** of the following radiation monitors greater than the threshold for 15 minutes or longer:
   - Plant Vent Radiation Gas Monitor
     (Threshold – {site-specific} $\mu Ci/cm^3$ (R-21A, B R-80,A, B))
   - Main Steam Line Monitor
     (Threshold - {site-specific} $\mu Ci/cm^3$ (R-87, R-88, R-89, and R-90))
2. Dose assessment using actual meteorology indicates doses greater than 100 mrem total effective dose equivalent (TEDE) or 500 mrem thyroid committed dose equivalent (CDE) at or beyond the site boundary.
3. Field survey results indicate closed window dose rates greater than 100 mR/hr expected to continue for 60 minutes or longer; or analyses of field survey samples indicate thyroid CDE greater than 500 mrem for one hour of inhalation, at or beyond the site boundary.

Basis:

Refer to Attachment A for a detailed basis of the radiological effluent IC/EALs.

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed 10% of the EPA PAGs. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public. While these failures are addressed by other ICs, this IC provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that for the more severe accidents the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

The EPA PAGs are expressed in terms of the sum of the EDE and the CEDE, or as the thyroid CDE. For the purpose of these IC/EALs, the dose quantity TEDE, as defined in 10 CFR 20

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

(Reference 19), is used in lieu of "…sum of EDE and CEDE…." The EPA PAG guidance provides for the use of adult thyroid dose conversion factors.

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

EAL #1

The monitor list in EAL #1 includes effluent monitors on all potential gaseous release pathways.

EAL #1 Threshold is based on a site specific boundary (or beyond) dose of 100 mrem whole body or 500 mrem thyroid in one hour. The meteorology used is the same as that used for determining RU1 and RA1 monitor reading EALs.

For the Plant Vent Radiation Gas Monitor, released activity (noble gas:8.4E+1 Ci/h, others: 9.1E+0 Ci/h) which results in target dose with annual average X/Q ({site-specific} s/m^3) at 1 hour is determined for each release path based on DCD chapter 15 results (dose: 6.6E+4 mrem thyroid, X/Q=5.0E-4 s/m^3), released activity: (noble gas) 3.5E+2Ci/h, (others) 3.8E+1 Ci/h (at 1 hour, from plant vent)). Then, the threshold is set by the way that the released activity is divided by exhaust flow (9.5E+3 m^3/h).

$$Q_t = \frac{D_t}{D_a} \times Q_a \times \frac{\chi/Q_a}{\chi/Q_t}$$

Where,
Q: Released activity
D: Dose
X/Q: Atmospheric dispersion factor
Subscript a: DCD chapter 15 case
Subscript t: EAL case

This calculation is based on a rod ejection accident (REA). Among accidents which have fuel damage due to accident and release path from plant vent in DCD chapter 15, a REA is expected to result in the lowest activity concentration at 1hour in plant vent.

Annual average X/Q for NAPS Unit 3 is {site-specific} s/m^3. This value is about {site-specific} times lower than annual average X/Q in the DCD. Therefore, this threshold for NAPS Unit 3 will be {site-specific} μCi/cm^3

For the Main Steam Line Monitor, released activity (noble gas: 2.0E+3 Ci/h, others: 7.0E+0 Ci/h) which results in target dose with annual average X/Q ({site-specific} s/m^3) at 1hour is determined for each release path based on DCD chapter 15 results (dose: 6.6E+4 mrem thyroid, X/Q=5.0E-4

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s/m^3), released activity: (noble gas) 8.5E+3 Ci/h, (others) 3.0E+1 Ci/h (at 1hour, from secondary system)). Then, the threshold is set by the way that the released activity is divided by released steam flow (1.9E+3 m^3/h).

This calculation is based on rod ejection accident (REA). Among accidents which have fuel damage due to accident and release path from secondary system in DCD chapter 15, a REA is expected to result in the lowest activity concentration at 1hour in secondary system.

Annual average X/Q for NAPS Unit 3 is {site-specific} s/m^3. This value is about {site-specific} times lower than annual average X/Q in DCD. Therefore, this threshold for NAPS Unit 3 will be {site-specific} μCi/cm^3.

EAL #1 Threshold: Use the site-specific X/Q value for NAPS, when determined to calculate threshold values using the methodology presented in the Basis discussion above.

EAL#2

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL is not, the results from these assessments may indicate that the classification is not warranted, or may indicate that a higher classification is warranted. For this reason, emergency implementing procedures should call for the timely performance of dose assessments using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EAL.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

RG1

Initiating Condition – GENERAL EMERGENCY

Off-site dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 1000 mrem TEDE or 5000 mrem Thyroid CDE for the actual or projected duration of the release using actual meteorology.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2 or 3)

1. VALID reading on **ANY** of the following radiation monitors greater than the threshold for 15 minutes or longer:
   - Plant Vent Radiation Gas Monitor
     (Threshold – {site-specific} $\mu Ci/cm^3$ (R-21A, B, R-80,A, B))
   - Main Steam Line Monitor
     (Threshold - {site-specific} $\mu Ci/cm^3$(R-87, R-88, R-89, and R-90))
2. Dose assessment using actual meteorology indicates doses greater than 1000 mrem TEDE or 5000 mrem thyroid CDE at or beyond the site boundary.
3. Field survey results indicate closed window dose rates greater than 1000 mR/hr expected to continue for 60 minutes or longer; or analyses of field survey samples indicate thyroid CDE greater than 5000 mrem for one hour of inhalation, at or beyond site boundary.

Basis:

Refer to Attachment A for a detailed basis of the radiological effluent IC/EALs.

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

The EPA PAGs are expressed in terms of the sum of the EDE and the CEDE, or as the thyroid committed dose equivalent (CDE). For the purpose of these IC/EALs, the dose quantity total effective dose equivalent (TEDE), as defined in 10 CFR 20, is used in lieu of "…sum of EDE and

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

CEDE….” The EPA PAG guidance provides for the use of adult thyroid dose conversion factors. The TEDE dose is set at the EPA PAG, while the 5000 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

EAL #1

The monitor list in EAL #1 includes US-APWR effluent monitors on all potential gaseous release pathways.

EAL#1 Thresholds are set at ten times the values provided in RS1 EAL#1.

EAL #1 Threshold: Calculate the RG1 EAL #1 threshold values using the site-specific thresholds provided in RS1 EAL #1 when determined.

EAL#2

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL is not, the results from these assessments may indicate that the classification is not warranted, or may indicate that a higher classification is warranted. For this reason, emergency implementing procedures should call for the timely performance of dose assessments using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EAL.

5.6 Cold Shutdown/Refueling System Malfunction EALs

Table 5-C-1: Recognition Category "C" Initiating Condition Matrix

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
CG1 Loss of RCS/RV inventory affecting fuel clad integrity with containment challenged. *Op. MODEs: Cold Shutdown, Refueling*	**CS1** Loss of RCS/RV inventory affecting core decay heat removal capability. *Op. MODEs: Cold Shutdown, Refueling*	**CA1** Loss of RCS/RV inventory. *Op. MODEs: Cold Shutdown, Refueling*	**CU1** RCS LEAKAGE. *Op. MODEs: Cold Shutdown*
			CU2 UNPLANNED loss of RCS/RV inventory. *Op. MODEs: Refueling*
		CA3 Loss of all Off-site and all On-site ac power to emergency busses for 15 minutes or longer. *Op. MODEs: Cold Shutdown, Refueling, Defueled*	**CU3** AC power capability to emergency busses reduced to a single power source for 15 minutes or longer such that any additional single failure would result in station blackout. *Op. MODEs: Cold Shutdown, Refueling*
		CA4 Inability to maintain plant in cold shutdown. *Op. MODEs: Cold Shutdown, Refueling*	**CU4** UNPLANNED loss of decay heat removal capability with irradiated fuel in the RV. *Op. MODEs: Cold Shutdown, Refueling*
			CU6 Loss of all On-site or Off-site communications capabilities. *Op. MODEs: Cold Shutdown, Refueling, Defueled*

Table 5-C-1: Recognition Category "C" Initiating Condition Matrix

	CU7 UNPLANNED loss of required dc power for 15 minutes or longer. *Op. MODEs: Cold Shutdown, Refueling*
	CU8 Inadvertent criticality. *Op. MODEs: Cold Shutdown, Refueling*
CA9 Inability to Monitor and Control the Plant for ≥ 15 Minutes. *Op. MODEs: Cold Shutdown*	**CU9** UNPLANNED Partial Loss of Indicating and Monitoring and Control Functions for ≥ 15 Minutes. *Op. MODEs: Cold Shutdown*

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU1

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

RCS LEAKAGE.

Operating MODE Applicability: Cold Shutdown

Emergency Action Level Threshold:

1. RCS LEAKAGE results in the inability to maintain or restore level within {site-specific pressurizer level target band on L-451, L-452, L-453, L-454} for 15 minutes or longer.

Basis:

This IC is considered to be a potential degradation of the level of safety of the plant. The inability to maintain or restore level is indicative of loss of RCS inventory.

Relief valve (e.g., Residual Heat Removal (RHR), Letdown Orifice, Volume Control Tank, etc.) normal operation should be excluded from this IC. However, a Relief valve that operates and fails to close per design should be considered applicable to this IC if the Relief valve cannot be isolated.

EAL Threshold #1: The pressurizer level band value will be inserted when this information becomes available.

Prolonged loss of RCS Inventory may result in escalation to the Alert emergency classification level via either CA1 or CA4.

Note: The difference between CU1 and CU2 deals with the RCS conditions that exist between cold shutdown and refueling MODEs. In the refueling MODE, the RCS is not intact and RV level and inventory are monitored by different means. In cold shutdown, the RCS will normally be intact and standard RCS inventory and level monitoring means are available.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU2

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

UNPLANNED loss of RCS/RV inventory.

Operating MODE Applicability:Refueling

Emergency Action Level Thresholds: (1 or 2)

1. UNPLANNED RCS/RV level drop indicated by RCS/RV water level drop below the RV flange {site-specific Threshold Value on RCS Level wide range (L-402)} for 15 minutes or longer.
2. RCS/RV level cannot be monitored with a loss of RCS/RV inventory as indicated by an unexplained level rise in **ANY** one of the following:
   - Refueling Water Storage Pit Level on L-1400, L-1401, L-1402, L-1403
   - Containment Vessel Reactor Coolant Drain Tank (CVDT) Level on L-1000
   - Pressurizer Relief Tank Level on L-560
   - CCW Surge Tank (Train A & B) Level on L-1200 and L-1201 for Train A, L-1210 and L-1211 for Train B
   - Containment Sump Level on L-1083

Basis:

This IC is a precursor of more serious conditions and considered to be a potential degradation of the level of safety of the plant.

Refueling evolutions that decrease RCS water level below the RV flange are carefully planned and procedurally controlled. An UNPLANNED event that results in water level decreasing below the RV flange, or the planned RCS water level for the given evolution (if the planned RCS water level is already below the RV flange), warrants declaration of a NOUE due to the reduced RCS inventory that is available to keep the core covered.

The allowance of 15 minutes was chosen because it is reasonable to assume that level can be restored within this time frame using one or more of the redundant means of refill that should be available. If level cannot be restored in this time frame then it may indicate a more serious condition exists.

Continued loss of RCS Inventory will result in escalation to the Alert emergency classification level via either CA1 or CA4.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

Note: The difference between CU1 and CU2 deals with the RCS conditions that exist between cold shutdown and refueling MODEs. In cold shutdown, the RCS will normally be intact and standard RCS inventory and level monitoring means are available. In the refueling MODE, the RCS is not intact and RV level and inventory are monitored by different means.

EAL #1

This EAL involves a decrease in RCS level below the top of the RV flange that continues for 15 minutes due to an UNPLANNED event. This EAL is not applicable to decreases in flooded reactor cavity level, which is addressed by RU2 EAL1 until such time as the level decreases to the level of the vessel flange.

If RV level continues to decrease and reaches the Outlet Nozzle Bottom Inner Diameter (ID) of the RCS Loop then escalation to CA1 would be appropriate.

EAL Threshold #1: The value for RCS Level wide range (L-402) will be inserted when this information becomes available.

EAL #2

This EAL addresses conditions in the refueling MODE when normal means of core temperature indication and RCS level indication may not be available. Redundant means of RV level indication is installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of LEAKAGE such as cooling water sources inside the containment to ensure they are indicative of RCS LEAKAGE.

Escalation to the Alert emergency classification level would be via either CA1 or CA4.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU3

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

AC power capability to emergency busses reduced to a single power source for 15 minutes or longer such that any additional single failure would result in station blackout.

Operating MODE Applicability: Cold Shutdown, Refueling

Emergency Action Level Threshold:

1. a. AC power capability to Class 1E emergency busses (MC-A, MC-B, MC-C, MC-D) reduced to a single power source for 15 minutes or longer.

   AND

   b. Any additional single power source failure will result in station blackout.

Basis:

The condition indicated by this IC is the degradation of the off-site and on-site ac power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of off-site power with a concurrent failure of all but one emergency generator to supply power to its emergency busses. The subsequent loss of this single power source would escalate the event to an Alert in accordance with CA3.

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

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU4

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

UNPLANNED loss of decay heat removal capability with irradiated fuel in the RV.

Operating MODE Applicability: Cold Shutdown, Refueling

Emergency Action Levels Threshold: (1 or 2)

1. UNPLANNED event results in RCS temperature exceeding 200 degrees F (93 degrees C).
2. Loss of all RCS temperature and RCS/RV level indication for 15 minutes or longer.

Basis:

This IC is a precursor of more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. In cold shutdown the ability to remove decay heat relies primarily on forced cooling flow. Operation of the systems that provide this forced cooling may be jeopardized due to the unlikely loss of electrical power or RCS inventory. Since the RCS usually remains intact in the cold shutdown MODE a large inventory of water is available to keep the core covered.

During refueling, the level in the RV will normally be maintained above the RV flange. Refueling evolutions that decrease water level below the RV flange are carefully planned and procedurally controlled. Loss of forced decay heat removal at reduced inventory may result in more rapid increases in RCS/RV temperatures depending on the time since shutdown.

Normal means of core temperature indication and RCS level indication may not be available in the refueling MODE. Redundant means of RV level indication are therefore procedurally installed to assure that the ability to monitor level will not be interrupted. However, if all level and temperature indication were to be lost in either the cold shutdown or refueling MODEs, EAL #2 would result in declaration of a NOUE if both temperature and level indication cannot be restored within 15 minutes from the loss of both means of indication. Escalation to Alert would be via CA1 based on an inventory loss or CA4 based on exceeding its temperature criteria.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU6

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

Loss of all On-site or Off-site communications capabilities.

Operating MODE Applicability: Cold Shutdown, Refueling, Defueled

Emergency Action Level Thresholds: (1 or 2)

1. Loss of all of the following on-site communication methods affecting the ability to perform routine operations:
   - Public Address/Page (PA/PL)
   - Private Automatic Branch Telephone Exchange (PABX)
   - Sound Powered Telephone System (SPTS)
   - Plant Radio System
2. Loss of all of the following off-site communication methods affecting the ability to perform off-site notifications:
   - Insta-phone Loop
   - Emergency Notification System
   - Health Physics Network
   - Reactor Safety Counterpart Link
   - Protective Measures Counterpart Link
   - Management Counterpart Link
   - Commercial Telephone (backup to Insta-phone Loop)
   - Private Automatic Branch Telephone Exchange (PABX)

Basis:

The purpose of this IC and its associated EALs is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate issues with off-site authorities. The loss of off-site communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

The availability of one method of ordinary off-site communications is sufficient to inform federal, state, and local authorities of plant issues. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from radio transmissions, individuals being sent to off-site locations, etc.) are being utilized to make communications possible.

Notifications of emergencies to State and local off-site agencies is accomplished with the Insta-phone Loop between each Control Room and the Commonwealth of Virginia and risk counties. Private telephone serves as backup to the Insta-phone Loop circuit. In addition, the NAPS has a Private Branch Exchange (PABX), which is used for routine telephone serve into and around the site. Emergency Notification System, Health Physics Network, Reactor Safety Counterpart Link, Protective Measures Counterpart Link, Management Counterpart Link are NRC telephone circuits.

EAL #2

The list for off-site communications loss encompasses the loss of all means of communications with off-site authorities. This includes the ENS, commercial telephone lines, telecopy transmissions, and dedicated phone systems that are routinely used for off-site emergency notifications.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU7

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Loss of required direct current (dc) power for 15 minutes or longer.

Operating MODE Applicability: Cold Shutdown, Refueling

Emergency Action Level Threshold:

1. Less than 105V (volts) on required vital dc busses (DCC-A, DCC-B, DCC-C, DCC-D) for 15 minutes or longer.

Basis:

The purpose of this IC and its associated EALs is to recognize a loss of dc power compromising the ability to monitor and control the removal of decay heat during Cold Shutdown or Refueling operations.

It is intended that the loss of the operating (OPERABLE) train is to be considered. If this loss results in the inability to maintain cold shutdown, the escalation to an Alert will be per CA4 “Inability to Maintain Plant in Cold Shutdown with Irradiated Fuel in the RV.”

105V bus voltage is the minimum bus voltage necessary for the operation of safety related equipment. This voltage value incorporates a margin of at least 15 minutes of operation before the onset of inability to operate those loads.

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

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU8

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Inadvertent criticality.

Operating MODE Applicability: Cold Shutdown, Refueling

Emergency Action Level Threshold:

1. UNPLANNED sustained positive startup rate observed on the nuclear instrumentation.

Basis:

This IC addresses criticality events that occur in Cold Shutdown or Refueling MODEs such as fuel mis-loading events and inadvertent dilution events. This IC indicates a potential degradation of the level of safety of the plant, warranting a NOUE classification.

This condition is identified using the startup rate monitor. The term “sustained” is used in order to allow exclusion of expected short term positive startup rates from planned fuel bundle or control rod movements during CORE ALTERATION. These short term startup rates are the result of the increase in neutron population due to subcritical multiplication.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

CU9

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

UNPLANNED Partial Loss of Indicating, Monitoring and Control Functions for ≥ 15 Minutes.

Operating Mode Applicability: Cold Shutdown, Refueling

Emergency Action Level Threshold:

1. UNPLANNED partial Loss of Protection and Safety Monitoring System (PSMS) and Plant Control and Monitoring System (PCMS) Indicating, Monitoring and Control Functions for 15 minutes or longer.

Basis:

This IC recognizes the difficulty associated with monitoring changing plant conditions without the use of a major portion of the control and indication systems.

This IC recognizes the challenge to the Control Room staff to monitor and control the plant due to partial loss of normal and safety indication and monitoring systems. A Notification of Unusual Event level is considered appropriate for this partial loss of indication and control IC due to the inherently safer condition of the core when in the cold condition. Escalation to an Alert will be via CA7 if a complete loss of control and indication occurs. Declaration of the Alert will provide the Control Room staff with additional personnel to assist in monitoring alternative indications, manipulating equipment and restoring the systems to full capability. The selection of 15 minutes was chosen to allow personnel sufficient time for restoration of required systems due to an inadvertent loss.

The PSMS provides the functions necessary to protect the plant during normal operations, to shutdown the plant, and to maintain the plant in a safe shutdown condition. The PCMS includes the control functions that provide for the control of the nuclear process, conversion of nuclear energy into heat energy, and transport of the heat energy from the nuclear reactor to the main steam turbine. The Diverse Actuation System (DAS) remains available to ensure monitoring and control capability. Loss of DAS would result in escalation to CA7.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA1

Initiating Condition – ALERT

Loss of RCS/RV inventory.

Operating MODE Applicability:Cold Shutdown, Refueling

Emergency Action Level Thresholds: (1 or 2)

1. Loss of RCS/RV inventory as indicated by level less than **ANY** one of the following:
   - RCS level
     {site-specific Threshold Value on L-402 (wide range) and L-404, L-405 (narrow range)}
     (only available in Refueling)
   - Reactor Vessel Water Level (RVWL)
     (Threshold Value – Top of Hot Leg (El 329'-5.17" on L-571, L-572)
     (only available in Cold Shutdown)
2. RCS/RV level cannot be monitored for 15 minutes or longer with a loss of RCS/RV inventory as indicated by an unexplained level rise in **ANY** one of the following:
   - Refueling Water Storage Pit Level on L-1400, L-1401, L-1402, L-1403
   - CVDT Level on L-1000
   - Pressurizer Relief Tank Level on L-560
   - CCW Surge Tank (Train A & B) Level on L-1200 and L-1201 for Train A, L-1210 and L-1211 for Train B
   - Containment Sump Level on L-1083

Basis:

These EALs serve as precursors to a loss of ability to adequately cool the fuel. The magnitude of this loss of water indicates that makeup systems have not been effective and may not be capable of preventing further RV level decrease and potential core uncovery. This condition will result in a minimum emergency classification level of an Alert.

EAL #1

The inability to restore and maintain level after reaching this setpoint would be indicative of a failure of the RCS barrier. The Alert is based on alarm setpoint below Mid Loop Operation (Low-Low) on

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

narrow range instruments (L-404 and L-405), corresponding to the level slightly above centerline of RCS loop.

EAL Threshold #1: The values for RCS Level wide range (L-402) will be inserted when this information becomes available.

EAL #2

In the cold shutdown MODE, normal RCS level and RV level instrumentation systems will usually be available. In the refueling MODE, normal means of RV level indication may not be available. Redundant means of RV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of LEAKAGE such as cooling water sources inside the containment to ensure they are indicative of RCS LEAKAGE.

The 15-minute duration for the loss of level indication was chosen because it is half of the CS1 SAE EAL duration. Significant fuel damage is not expected to occur until the core has been uncovered for greater than 1 hour per the analysis referenced in the CG1 basis. Therefore this EAL meets the definition for an Alert.

If RV level continues to lower then escalation to SAE will be via CS1.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA3

Initiating Condition – ALERT

Loss of all Off-site and all On-Site ac power to emergency busses for 15 minutes or longer.

Operating MODE Applicability: Cold Shutdown, Refueling, Defueled

Emergency Action Level Threshold:

1. Loss of all Off-Site and all On-Site ac Power to Class 1E emergency busses (MC-A, MC-B, MC-C, MC-D) for 15 minutes or longer.

Basis:

Loss of all ac power compromises all plant safety systems requiring electric power including RHR/Containment Spray System, ECCS, SFP Heat Removal and the Ultimate Heat Sink.

This event is classified as an Alert when in cold shutdown, refueling, or defueled MODE because of the significantly reduced decay heat and lower temperature, increasing the time available to restore one of the emergency busses.

Escalating to SAE, if appropriate, is by Abnormal Rad Levels/Radiological Effluent ICs.

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

Note: The companion IC is SS1.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA4

Initiating Condition - ALERT

Inability to maintain plant in cold shutdown.

Operating MODE Applicability: Cold Shutdown, Refueling

Emergency Action Level Thresholds: (1 or 2)

1. An UNPLANNED event results in RCS temperature greater than RCS Loop T_{hot} of 200 degrees F (93 degrees C) on (T-410, T-420, T-430, T-440) for greater than the specified duration on table.

   Table 5-C-2: RCS Reheat Duration Thresholds

RCS	CONTAINMENT CLOSURE	Duration
Intact (but not RCS Reduced Inventory)	N/A	60 minutes*
Not Intact or RCS Reduced Inventory	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, the EAL is not applicable.		

2. An UNPLANNED event results in RCS pressure increase greater than 10 psi due to a loss of RCS cooling. (This EAL does not apply in Solid Plant conditions.)

Basis:

For EAL #1, the RCS Reheat Duration Threshold table addresses complete loss of functions required for core cooling for greater than 60 minutes during refueling MODE and, in cold shutdown MODE when RCS integrity is established.

RCS integrity should be considered to be in place when the RCS pressure boundary is in its normal condition for the cold shutdown MODE of operation (e.g., no freeze seals or nozzle dams). The status of CONTAINMENT CLOSURE in this condition is immaterial given that the RCS is providing a high pressure barrier to fission product release to the environment. The 60 minute time frame should allow sufficient time to restore cooling without there being a substantial degradation in plant safety.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

The RCS Reheat Duration Threshold table also addresses the complete loss of functions required for core cooling for greater than 20 minutes during refueling and cold shutdown MODEs when CONTAINMENT CLOSURE is established but RCS integrity is not established (when in cold shutdown) or RCS inventory is reduced (e.g., mid-loop operations). The allowed 20 minute time frame was included to allow operator action to restore the heat removal function, if possible. The allowed time frame is consistent with the guidance provided by Generic Letter 88-17, “Loss of Decay Heat Removal” (Reference 20) (discussed later in this basis) and is believed to be conservative given that a low pressure Containment barrier to fission product release is established.

Finally, complete loss of functions required for core cooling during refueling and cold shutdown MODEs when neither CONTAINMENT CLOSURE nor RCS integrity are established.

Note: RCS integrity is in place when the RCS pressure boundary is in its normal condition for the cold shutdown MODE of operation (e.g., no freeze seals or nozzle dams). No delay time is allowed because the evaporated reactor coolant that may be released into the Containment during this heatup condition could also be directly released to the environment.

The asterisk (*) in Table 5-C-2 indicates that this EAL is not applicable if actions are successful in restoring an RCS heat removal system to operation and RCS temperature is being reduced within the specified time frame.

In EAL #2, the 10 psi pressure increase addresses situations where, due to high decay heat loads, the time provided to restore temperature control, should be less than 60 minutes. The RCS pressure setpoint chosen should be 10 psi or the lowest pressure that the site can read on installed instrumentation that is equal to or greater than 10 psi.

Escalation to SAE would be via CS1 should boiling result in significant RV level loss leading to core uncovery.

This IC and its associated EALs are based on concerns raised by Generic Letter 88-17, “Loss of Decay Heat Removal.” A number of phenomena such as pressurization, vortexing, SG U-tube draining, RCS level differences when operating at a mid-loop condition, decay heat removal system design, and level instrumentation problems can lead to conditions where decay heat removal is lost and core uncovery can occur. NRC analyses show that there are sequences that can cause core uncovery in 15 to 20 minutes and severe core damage within an hour after decay heat removal is lost.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

A loss of TS components alone is not intended to constitute an Alert. The same is true of a momentary UNPLANNED excursion above the TS cold shutdown temperature limit when the heat removal function is available.

The Emergency Coordinator 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 Coordinator, an IMMINENT situation is at hand, the classification should be made as if the threshold has been exceeded.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA9

Initiating Condition – ALERT

Inability to Monitor and Control the Plant for ≥ 15 Minutes.

Operating Mode Applicability: Cold Shutdown, Refueling

Example Emergency Action Level Threshold:

1. Loss of all PSMS, PCMS, and DAS Digital Monitoring and Control Function for 15 minutes or longer.

Basis:

This IC recognizes the inability of the Control Room staff to monitor and control the plant due to loss of normal and safety indication and monitoring systems, and diverse indication and control systems that allow the operators to monitor and safely shutdown the plant. An Alert level is considered appropriate for this IC due to the inherently safer condition of the core when in the cold condition. Declaration of the Alert will provide the Control Room staff with additional personnel to assist in monitoring alternative indications, manipulating equipment and restoring the systems to full capability. The selection of 15 minutes was chosen to allow personnel sufficient time for restoration of required systems due to an inadvertent loss.

The PSMS provides the functions necessary to protect the plant during normal operations, to shutdown the plant, and to maintain the plant in a safe shutdown condition. The PCMS includes the control functions that provide for the control of the nuclear process, conversion of nuclear energy into heat energy, and transport of the heat energy from the nuclear reactor to the main steam turbine. The DAS is a non-safety related system that provides a diverse backup to the protection system.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CS1

Initiating Condition – SITE AREA EMERGENCY

Loss of RCS/RV inventory affecting core decay heat removal capability.

Operating MODE Applicability: Cold Shutdown, Refueling

Emergency Action Level Thresholds: (1 or 2 or 3)

1. With CONTAINMENT CLOSURE not established, RCS/RV level less than:

   Bottom of Hot Leg indication (El 326'-7.29") on RVWL (L-571, L-572) (Cold Shutdown only)

   {site-specific value (corresponding to centerline of RCS loop)} on RCS level – wide range (L-402), narrow range (L-404, L-405) (Refueling only)

2. With CONTAINMENT CLOSURE established, RCS/RV level less than:

   Upper Core Plate indication (El 323'-9.42") on RVWL (L-571, L-572) (Cold Shutdown only))

   {site-specific level for Bottom ID of RCS loop} indication on Refueling Cavity Level (L-401) (Refueling only).

3. RCS/RV level cannot be monitored for 30 minutes or longer with a loss of RCS/RV inventory as indicated by **ANY** of the following:
   - Containment High Range ARM (R-91A/B, R-92A/B, R-93A/B, R-94A/B) reading greater than 2000 R/hr.
   - Erratic Source Range Monitor Indication.
   - Unexplained level rise in any of the following:
     - Refueling Water Storage Pit Level (L-1401, L-1402, L-1403)
     - CVDT Level (L-1000)
     - Pressurizer Relief Tank Level (L-560)
     - CCW Surge Tank (Train A & B) Levels (L-1200 and L-1201 for Train A, L-1210 and L-1211 for Train B)
     - Containment Sump Level (L-1083)

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

Basis:

Under the conditions specified by this IC, continued decrease in RCS/RV level is indicative of a loss of inventory control. Inventory loss may be due to an RCS breach, pressure boundary LEAKAGE, or continued boiling in the RV. Thus, declaration of a SAE is warranted.

Escalation to a GE is via CG1 or RG1.

EAL #1

In cold shutdown MODE, the bottom of the hot leg indication corresponds El 326'-7.29" on RVWL (L-571, L-572).

In Refueling MODE, the {site-specific value} corresponds to the centerline of the RCS loop, which is the lowermost measurable range of both wide and narrow range level instruments (L-402, L-404/L-405), therefore at this level, especially in case of off scale low, remote RCS level indication would be lost and loss of suction to decay heat removal system would occur. The centerline of the RCS loop was chosen as the threshold for this EAL instead of 6" below the bottom ID of the RCS loop specified in NEI 99-01 because US-APWR has no capability to monitor the 6” below the bottom ID of the RCS loop and this scheme is considered conservative and appropriate in light of the intent of this EAL.

EAL#1 Threshold: The value corresponding to the centerline of the RCS loop on L-402, and L-404/L-405 will be filled in when the information is available.

EAL #2

In cold shutdown, top of active fuel (TOAF) corresponds to Upper Core Plate indication (El 323'-9.42") on RVWL (L-571, L-572).

In Refueling MODE, {site-specific level} corresponds to the bottom ID of the RCS level, which is monitored by refueling cavity level instrument (L-401). This monitor was chosen because at this level, especially in case of off scale low, remote RV level indication would be lost and the RV level would be decreasing toward TOAF. (US-APWR has no level instruments capable to monitor the level for TOAF in Refueling MODE. The threshold of the level for bottom ID of the RCS loop is considered conservative and appropriate in light of the intent of this EAL.)

EAL#2 Threshold: The value corresponding to the bottom ID of the RCS loop indication on Refueling Cavity Level (L-401) will be filled in when the information is available.

EAL #3

In the cold shutdown MODE, normal RCS level and RV level instrumentation systems will usually be available. In the refueling MODE, normal means of RV level indication may not be available.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

Redundant means of RV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of LEAKAGE such as cooling water sources inside the containment to ensure they are indicative of RCS LEAKAGE.

The 30-minute duration allows sufficient time for actions to be performed to recover inventory control equipment.

As water level in the RV lowers, the dose rate above the core will increase. The dose rate at the point of Containment High Range ARM is approx. 2000 R/h using following calculation conditions;

- Source strength of fuel: 24 hr decayed (for refueling). 24hr is based on Technical Specifications.
- RV: open
- Water level TOAF

Therefore, EAL#3 Threshold is set 2000 R/h.

Note: Post-TMI studies indicate that the installed nuclear instrumentation will operate erratically when the core is uncovered and source range monitors can be used as a tool for making such determinations. The instrument reported an increasing signal about 30 minutes into the TMI accident. At that time, the reactor coolant pumps were running and the core was adequately cooled as indicated by the core outlet thermocouples. Hence, the increasing signal was the result of an increasing two-phase void fraction in the reactor core and vessel downcomer and the reduced shielding that the two-phase mixture provide to the source range monitor (Reference 21).

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CG1

Initiating Condition – GENERAL EMERGENCY

Loss of RCS/RV inventory affecting fuel clad integrity with containment challenged.

Operating MODE Applicability: Cold Shutdown, Refueling

Emergency Action Level Thresholds: (1 or 2)

1. a. RCS/RV level less than Upper Core Plate indication (El 323'-9.42") on RVWL (L-571, L-572) (Cold Shutdown only) OR {site-specific} level for Bottom ID of RCS loop indication on Refueling Cavity Level (L-401) (Refueling only) for 30 minutes or longer.

   AND

   b. **ANY** containment challenge indication (see Table 5-C-3):

2. a. RCS/RV level cannot be monitored and core uncovery is indicated by **ANY** of the following for 30 minutes or longer.
   - Containment High Range ARM reading greater than 2000 R/hr (R-91A/B, R-92A/B, R-93A/B, R-94A/B).
   - CET temperature greater than 700 degrees F (371 degrees C) (Cold Shutdown only)
   - Erratic source range monitor indication.
   - UNPLANNED level rise in any of the following:
     - Refueling Water Storage Pit Level (L-1400, L-1401, L-1402, L-1403)
     - CVDT Level (L-1000)
     - Pressurizer Relief Tank Level (L-560)
     - CCW Surge Tank (Train A & B) Levels (L-1200 and L-1201 for Train A, L-1210 and L-1211 for Train B)
     - Containment Sump Level (L-1083)

   AND

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b. **ANY** containment challenge indication (see Table 5-C-3):

Table 5-C-3: Containment Challenge Indications

• CONTAINMENT CLOSURE not established.
• Explosive mixture inside containment.
• UNPLANNED rise in containment pressure as indicated on P-950, P-951.

Basis:

This IC represents the inability to restore and maintain RV level to above the TOAF with containment challenged. Fuel damage is probable if RV level cannot be restored, as available decay heat will cause boiling, further reducing the RV level. With the CONTAINMENT breached or challenged then the potential for unmonitored fission product release to the environment is high. This represents a direct path for radioactive inventory to be released to the environment. This is consistent with the definition of a GE. The GE is declared on the occurrence of the loss or IMMINENT loss of function of all three barriers.

These EALs are based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal, SECY 91-283, Evaluation of Shutdown and Low Power Risk Issues (Reference 22), NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States (Reference 23), and, NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management (Reference 24).

A number of variables can have a significant impact on heat removal capability challenging the fuel clad barrier. Examples include:

- Mid-loop, reduced level/flange level, head in place, cavity flooded, RCS venting strategy, decay heat removal system design, vortexing pre-disposition, SG U-tube draining

Analysis indicates that core damage may occur within an hour following continued core uncovery; therefore, 30 minutes was conservatively chosen.

If CONTAINMENT CLOSURE is re-established prior to exceeding the 30 minute core uncovery time limit then escalation to GE would not occur.

In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gasses in Containment. However, Containment monitoring and/or sampling should be performed to verify this assumption and a GE declared if it is determined that an explosive mixture exists.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

EAL #1

TOAF for the US-APWR is considered as the upper core plate. RVWL (in the Cold Shutdown) measuring less than or equal 5.9 inches (15 cm) above the upper core plate is used for this EAL. In Refueling, level for the bottom ID of RCS loop monitored by Refueling Cavity level instrument (L-401) is used as the threshold for this EAL because RCS level instruments has no capability to monitor TOAF (or upper core plate) level and the bottom ID of RCS loop is the lowest measurable RV level by L-401.

EAL#1 Threshold: The value corresponding to the bottom ID of the RCS loop indication on Refueling Cavity Level (L-401) will be filled in when the information is available.

EAL #2

Sump and tank level increases must be evaluated against other potential sources of LEAKAGE such as cooling water sources inside the containment to ensure they are indicative of RCS LEAKAGE.

Note: In the cold shutdown MODE, normal RCS level and RV level instrumentation systems will usually be available. In the refueling MODE, normal means of RV level indication may not be available. Redundant means of RV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of LEAKAGE such as cooling water sources inside the containment to ensure they are indicative of RCS LEAKAGE.

As water level in the RV lowers, the dose rate above the core will increase. The dose rate at the point of Containment High Range ARM is approx. 2000 R/h using following calculation conditions;

- Source strength of fuel: 24 hr decayed (for refueling). 24hr is based on Technical Specifications.
- RV: open
- Water level TOAF

Therefore, EAL#2.a Threshold is set at 2000 R/h.

Note: Post-TMI studies indicate that the installed nuclear instrumentation will operate erratically when the core is uncovered and source range monitors can be used as a tool for making such determinations. The instrument reported an increasing signal about 30 minutes into the TMI accident. At that time, the reactor coolant pumps were running and the core was adequately cooled as indicated by the core outlet thermocouples. Hence, the increasing

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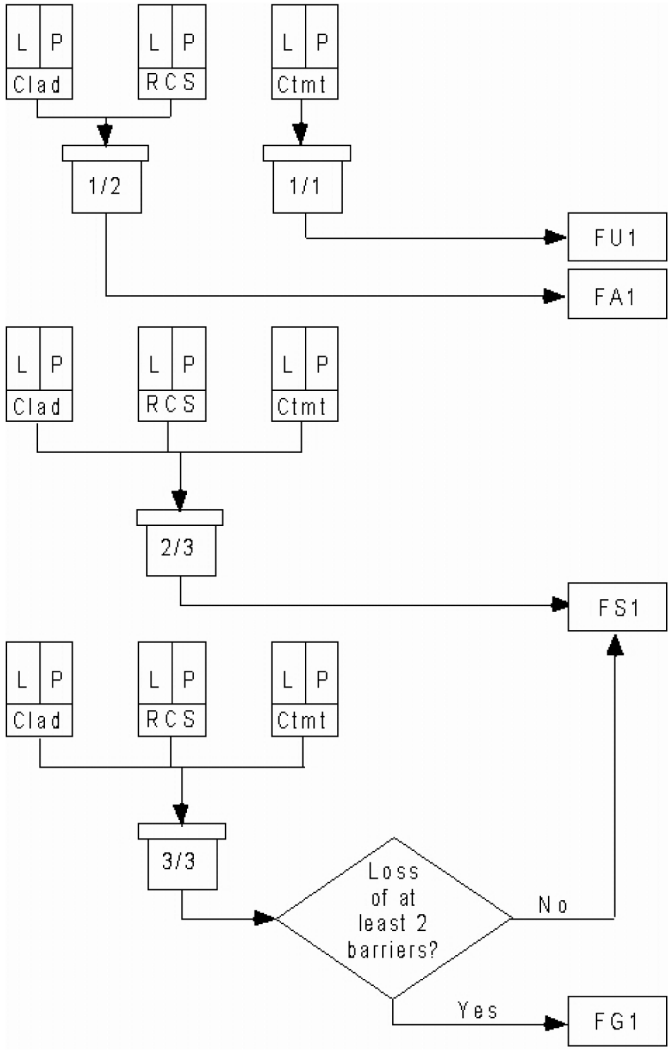
signal was the result of an increasing two-phase void fraction in the reactor core and vessel downcomer.

5.7 Fission Product Barrier EALs

Table 5-F-1: Recognition Category "F" Initiating Condition Matrix

See Table 5-F-2 for Thresholds

GENERAL EMERGENCY	
FG1	Loss of ANY Two Barriers AND Loss or Potential Loss of the third barrier. *Op. MODEs: Power Operation, Hot Standby, Startup, Hot Shutdown*
SITE AREA EMERGENCY	
FS1	Loss or Potential Loss of ANY two barriers. *Op. MODEs: Power Operation, Hot Standby, Startup, Hot Shutdown*
ALERT	
FA1	ANY Loss or ANY Potential Loss of EITHER Fuel Clad OR RCS. *Op. MODEs: Power Operation, Hot Standby, Startup, Hot Shutdown*
UNUSUAL EVENT	
FU1	ANY Loss or ANY Potential Loss of Containment. *Op. MODEs: Power Operation, Hot Standby, Startup, Hot Shutdown*



Notes:

The logic used for these ICs reflects the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier. NOUE ICs associated with RCS and Fuel Clad Barriers are addressed under System Malfunction ICs.
- At the SAE level, there must be some ability to dynamically assess how far present conditions are from the threshold for a GE. For example, if Fuel Clad and RCS Barrier “Loss” EALs existed, that, in addition to off-site dose assessments, would require continual assessments of radioactive inventory and containment integrity. Alternatively, if both Fuel Clad and RCS Barrier “Potential Loss” EALs existed, the Emergency Coordinator would have more assurance that there was no immediate need to escalate to a GE.
- The ability to escalate to higher emergency classification levels as an event deteriorates must be maintained. For example, RCS LEAKAGE steadily increasing would represent an increasing risk to public health and safety.
- The Containment Barrier should not be declared lost or potentially lost based on exceeding TS action statement criteria, unless there is an event in progress requiring mitigation by the Containment Barrier. When no event is in progress (Loss or Potential Loss of either Fuel Clad and/or RCS) the Containment Barrier status is addressed by TS.

Table 5-F-2: EAL Fission Product Barrier Table

Thresholds for LOSS or POTENTIAL LOSS of Barriers*

* Determine which combination of the three barriers are lost or have a potential loss and use the following key to classify the event. Also, multiple events could occur which result in the conclusion that exceeding the loss or potential loss thresholds is IMMINENT. In this IMMINENT loss situation use judgment and classify as if the thresholds are exceeded.

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of ANY two barriers AND Loss or Potential Loss of third barrier	Loss or Loss or Potential Loss of ANY two barriers.	ANY Loss or ANY Potential Loss of EITHER Fuel Clad or RCS.	ANY Loss or ANY Potential Loss of Containment

Fuel Clad Barrier Thresholds		RCS Barrier Thresholds		Containment Barrier Thresholds	
LOSS	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**
1. Critical Safety Function Status		**1. Critical Safety Function Status**		**1. Critical Safety Function Status**	
1. Core-Cooling Red Entry Conditions Met.	1. Core Cooling-Orange Entry Conditions Met. **OR** 2. Heat Sink-Red Entry Conditions Met.	Not Applicable	1. RCS Integrity-Red Entry Conditions Met. **OR** 2. Heat Sink-Red Entry Conditions Met.	Not Applicable	1. Containment-Red Entry Conditions Met.
2. Primary Coolant Activity Level		**2. RCS Leak Rate**		**2. Containment Pressure**	
1. DOSE EQUIVALENT I-131 of 300 μCi/gm OR DOSE EQUIVALENT XE-133 of 1500 μCi/gm as indicated on Primary Radiation Coolant Monitor R-70 or sample results.	Not Applicable	1. RCS leak rate greater than available makeup capacity as indicated by a loss of RCS subcooling.	1. RCS leak rate indicated greater than 180 gpm in the normal charging mode with Letdown isolated.	1. A containment pressure rise followed by a rapid unexplained drop in containment pressure. **OR** 2. Containment pressure or sump level response not consistent with LOCA conditions.	1. Containment Vessel pressure greater than 68 psig and rising. **OR** 2. Explosive mixture in Containment. **OR** 3.a. Pressure greater than Containment Spray actuation set point **AND** b. Less than two full trains of Containment Spray operating.

Table 5-F-2: EAL Fission Product Barrier Table

Thresholds for LOSS or POTENTIAL LOSS of Barriers*

* Determine which combination of the three barriers are lost or have a potential loss and use the following key to classify the event. Also, multiple events could occur which result in the conclusion that exceeding the loss or potential loss thresholds is IMMINENT. In this IMMINENT loss situation use judgment and classify as if the thresholds are exceeded.

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of ANY two barriers AND Loss or Potential Loss of third barrier	Loss or Loss or Potential Loss of ANY two barriers.	ANY Loss or ANY Potential Loss of EITHER Fuel Clad or RCS.	ANY Loss or ANY Potential Loss of Containment

Fuel Clad Barrier Thresholds		RCS Barrier Thresholds		Containment Barrier Thresholds	
LOSS	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**
3. Core Exit Thermocouple Readings		**3. Not Applicable**		**3. Core Exit Thermocouple Readings**	
1. CETs reading greater than 1200 degrees F (649 degrees C).	1. CETs reading greater than 700 degrees F (371 degrees C).	Not Applicable	Not Applicable	Not Applicable	1.a. CETs in excess of 1200 degrees F (649 degrees C) **AND** b. Restoration procedures not effective within 15 minutes. **OR** 2.a. CETs in excess of 700 degrees F (371 degrees C). **AND** b. RVWL indicates RCS level at Upper Core Plate **AND** c. Restoration procedures not effective within 15 minutes.

Table 5-F-2: EAL Fission Product Barrier Table

Thresholds for LOSS or POTENTIAL LOSS of Barriers*

* Determine which combination of the three barriers are lost or have a potential loss and use the following key to classify the event. Also, multiple events could occur which result in the conclusion that exceeding the loss or potential loss thresholds is IMMINENT. In this IMMINENT loss situation use judgment and classify as if the thresholds are exceeded.

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of ANY two barriers AND Loss or Potential Loss of third barrier	Loss or Loss or Potential Loss of ANY two barriers.	ANY Loss or ANY Potential Loss of EITHER Fuel Clad or RCS.	ANY Loss or ANY Potential Loss of Containment

Fuel Clad Barrier Thresholds		RCS Barrier Thresholds		Containment Barrier Thresholds	
LOSS	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**
4. Reactor Vessel Water Level		**4. SG Tube Rupture**		**4. SG Secondary Side Release with P-to-S LEAKAGE**	
Not Applicable	1. RVWL indicates RCS level at Upper Core Plate	1. RUPTURED SG results in an ECCS (SI) actuation.	Not Applicable	1. RUPTURED SG is also FAULTED outside of containment. **OR** 2.a. Primary-to-Secondary leak rate greater than 10 gpm. **AND** b. UNISOLABLE steam release from affected SG to the environment.	Not Applicable
5. Not Applicable		**5. Not Applicable**		**5. Containment Isolation Failure or Bypass**	
Not Applicable	Not Applicable	Not Applicable	Not Applicable	1.a. Failure of all valves in any one line to close. **AND** b. Direct downstream pathway to the environment exists after containment isolation signal.	Not Applicable

Table 5-F-2: EAL Fission Product Barrier Table

Thresholds for LOSS or POTENTIAL LOSS of Barriers*

* Determine which combination of the three barriers are lost or have a potential loss and use the following key to classify the event. Also, multiple events could occur which result in the conclusion that exceeding the loss or potential loss thresholds is IMMINENT. In this IMMINENT loss situation use judgment and classify as if the thresholds are exceeded.

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of ANY two barriers AND Loss or Potential Loss of third barrier	Loss or Loss or Potential Loss of ANY two barriers.	ANY Loss or ANY Potential Loss of EITHER Fuel Clad or RCS.	ANY Loss or ANY Potential Loss of Containment

Fuel Clad Barrier Thresholds		RCS Barrier Thresholds		Containment Barrier Thresholds	
LOSS	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**
6. Containment Radiation Monitoring		**6. Containment Radiation Monitoring**		**6. Containment Radiation Monitoring**	
1. Containment High Range ARM reading greater than 16 R/hr.	Not Applicable	1. Containment High Range ARM reading greater than 3.2 R/hr.	Not Applicable	Not Applicable	1. Containment High Range ARM reading greater than 15000 R/hr.
7. Other Indications		**7. Other Indications**		**7. Other Indications**	
1. Not applicable.	1. Not applicable.	1. Not applicable.	1. Not applicable.	1. Not applicable.	1. Not applicable.
8. Emergency Coordinator Judgment		**8. Emergency Coordinator Judgment**		**8. Emergency Coordinator Judgment**	
1. Any condition in the opinion of the Emergency Coordinator that indicates Loss of the Fuel Clad Barrier.	1. Any condition in the opinion of the Emergency Coordinator that indicates Potential Loss of the Fuel Clad Barrier.	1. Any condition in the opinion of the Emergency Coordinator that indicates Loss of the RCS Barrier.	1. Any condition in the opinion of the Emergency Coordinator that indicates Potential Loss of the RCS Barrier.	1. Any condition in the opinion of the Emergency Coordinator that indicates Loss of the Containment Barrier.	1. Any condition in the opinion of the Emergency Coordinator that indicates Potential Loss of the Containment Barrier.

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

FUEL CLAD BARRIER Thresholds: (1 or 2 or 3 or 4 or 6 or 8)

The Fuel Clad Barrier consists of the zircalloy fuel bundle tubes that contain the fuel pellets.

1. **Critical Safety Function Status**

Loss Threshold 1

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

Potential Loss Threshold 1

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

Potential Loss Threshold 2

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

2. **Primary Coolant Activity Level**

The value corresponds to DOSE EQUIVALENT I-131 of 300 µCi/gm or DOSE EQUIVALENT XE-133 of 1500 µCi/gm. This amount of coolant activity is well above that expected for iodine spikes and corresponds to less than 5% fuel clad damage. This amount of radioactivity indicates significant clad damage and thus the Fuel Clad Barrier is considered lost.

There is no Potential Loss Threshold associated with this item.

3. **Core Exit Thermocouple Readings**

The CETs provide an adequate measure of core temperatures to estimate temperatures at which potential cladding damage and core overheating may be occurring.

Loss Threshold #1

CETs with readings above 1200 degrees F (649 degrees C) indicate significant clad heating and the Loss of the Fuel Clad Barrier. This value corresponds to significant superheating of the coolant.

Potential Loss Threshold #1

The reading corresponds to loss of subcooling.

CETs with readings greater than 700 degrees F (371 degrees C) indicate the onset of inadequate core cooling.

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

4. **Reactor Vessel Water Level**

There is no Loss Threshold associated with this item.

The Potential Loss Threshold corresponds to the TOAF.

The value for the Potential Loss Threshold corresponds to the RVWL instrument Upper Core Plate indication.

5. **Not Applicable** (included for numbering consistency between Barrier tables)

6. **Containment Radiation Monitoring**

The reading of 16 R/hr on Containment High Range ARM (R-91A/B, R-92A/B, R-93A/B, R-94A/B) is a value which indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the containment. This reading is based on release and dispersal of the reactor coolant noble gas and iodine inventory associated with a concentration of DOSE EQUIVALENT I-131 of 300 µCi/gm or DOSE EQUIVALENT XE-133 of 1500 µCi/gm into the containment atmosphere.

Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within TS and are therefore indicative of fuel damage.

This value is higher than that specified for RCS Barrier Loss Threshold #6. Thus, this threshold indicates a Loss of both the Fuel Clad Barrier and RCS Barrier that appropriately escalates the emergency classification level to a SAE.

There is no Potential Loss Threshold associated with this item.

7. **Other Indications**

This subcategory is not applicable to the NAPS Unit 3 but has been preserved for consistency with NEI 99-01.

8. **Emergency Coordinator Judgment**

These thresholds address any other factors that are to be used by the Emergency Coordinator in determining whether the Fuel Clad Barrier is lost or potentially lost. In addition, the inability to monitor the Barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the Barrier may be considered lost or potentially lost.

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

RCS BARRIER THRESHOLDS: (1 or 2 or 4 or 6 or 8)

The RCS Barrier includes the RCS primary side and its connections up to and including the pressurizer safety valves, and other connections up to and including the primary isolation valves.

1. **Critical Safety Function Status**

Potential Loss Threshold 1

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

Potential Loss Threshold 2

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

There is no Loss Threshold associated with this item.

2. **RCS Leak Rate**

The Loss Threshold addresses conditions where LEAKAGE from the RCS is greater than available inventory control capacity such that a loss of subcooling has occurred. The loss of subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

The Potential Loss is based on the inability to maintain normal liquid inventory within the RCS by the Chemical and Volume Control System (CVCS), which is considered to be the flow equivalent to one charging pump discharging to the charging header. Isolating letdown is a standard abnormal operating procedure action and may prevent unnecessary classifications when a non-RCS LEAKAGE path such as a CVCS leak exists. The intent of this condition is met if attempts to isolate Letdown are NOT successful. Additional charging pumps being required is indicative of a substantial RCS leak.

3. **Not Applicable** (included for numbering consistency between Barrier tables)

4. **SG Tube Rupture**

This threshold addresses the full spectrum of SG tube rupture events in conjunction with Containment Barrier Loss Thresholds. It addresses RUPTURED SG(s) for which the LEAKAGE is large enough to cause actuation of ECCS (SI). This is consistent to the RCS Barrier Potential Loss Threshold.

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

By itself, this threshold will result in the declaration of an Alert. However, if the SG is also FAULTED (i.e., two barriers failed), the declaration escalates to a SAE per Containment Barrier Loss Thresholds.

There is no Potential Loss Threshold associated with this item.

5. **Not Applicable** (included for numbering consistency between Barrier tables)

6. **Containment Radiation Monitoring**

The reading of 3.2 R/hr on Containment High Range ARM (R-91A/B, R-92A/B, R-93A/B, R-94A/B) is a value which indicates the release of reactor coolant to the containment.

Assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with normal operating concentrations (i.e., within T/S) into the containment atmosphere."

The dose rate at the point of Containment High Range ARM is. 3.2 R/h using following calculation condition;

- Source strength of RCS: 1% fuel defect as design base source term.
- RCS leak rate: 180 gpm as stated RCS Barrier Threshold for Potential Loss #2
- RCS leak time: 15 min as stated EAL Containment Barrier Threshold for Potential Loss #3)
- Containment free volume: 2.8E+6 ft^3
- Thermal power: 4540 MWt (102% power)

There is no Potential Loss Threshold associated with this item.

7. **Other Indications**

This subcategory is not applicable to the NAPS Unit 3 but has been preserved for consistency with NEI 99-01.

8. **Emergency Coordinator Judgment**

These thresholds address any other factors that are to be used by the Emergency Coordinator in determining whether the RCS Barrier is lost or potentially lost. In addition, the inability to monitor the Barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the Barrier may be considered lost or potentially lost.

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

CONTAINMENT BARRIER THRESHOLDS: (1 or 2 or 3 or 4 or 5 or 6 or 8)

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

1. **Critical Safety Function Status**

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.

Conditions leading to a containment RED path result from RCS Barrier and/or Fuel Clad Barrier Loss. Thus, this threshold is primarily a discriminator between SAE and GE representing a Potential Loss of the third Barrier.

There is no Loss Threshold associated with this item.

2. **Containment Pressure**

Loss Thresholds #1 and #2

Rapid unexplained loss of pressure (i.e., not attributable to containment spray or condensation effects) following an initial pressure increase from a primary or secondary high energy line break indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

This indicator relies on operator recognition of an unexpected response for the condition and therefore does not have a specific value associated with it. The unexpected response is important because it is the indicator for a containment bypass condition.

Potential Loss Threshold #1

The 68 psig is based on the containment design pressure for the US-APWR.

Potential Loss Threshold #2

Existence of an explosive mixture means a hydrogen and oxygen concentration of at least the lower deflagration limit curve exists.

Potential Loss Threshold #3

This threshold represents a Potential Loss of containment in that the containment heat removal/depressurization system (i.e., Containment Spray, but not including containment venting

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

strategies) is either lost or performing in a degraded manner, as indicated by containment pressure greater than the setpoint at which the equipment was supposed to have actuated.

3. **Core Exit Thermocouple Readings**

There is no Loss Threshold associated with this item.

Potential Loss Threshold #1

The conditions in these thresholds represent an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with the Fuel Barrier CET criteria and RCS Barrier RCS leak rate criteria, this threshold would result in the declaration of a GE – Loss of two Barriers and the Potential Loss of a third. If the function restoration procedures are ineffective, there is no “success” path.

The function restoration procedures are those EOPs that address the recovery of the core cooling CSFs. The procedure is considered effective if the temperature is decreasing or if the vessel water level is increasing.

Severe accident analyses (e.g., NUREG-1150 (Reference 25)) have concluded that function restoration procedures can arrest core degradation within the reactor vessel in a significant fraction of the core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide a reasonable period to allow function restoration procedures to arrest the core melt sequence.

Whether or not the procedures will be effective should be apparent within 15 minutes. The Emergency Coordinator should make the declaration as soon as it is determined that the procedures have been, or will be ineffective.

4. **SG Secondary Side Release With Primary to Secondary LEAKAGE**

The Loss Threshold recognizes that SG tube LEAKAGE can represent a bypass of the Containment Barrier as well as a Loss of the RCS Barrier.

The two Loss Thresholds could be considered redundant, but the inclusion of a threshold that uses Emergency Procedure-commonly used terms like “RUPTURED and FAULTED” adds to the ease of the classification process and has been included based on this human factor concern.

This threshold results in a NOUE for smaller breaks that; (1) do not exceed the normal charging capacity threshold in RCS Barrier Potential Loss Threshold, or (2) do not result in ECCS actuation in RCS SG tube rupture Loss Threshold. For larger breaks, RCS Barrier threshold criteria would result in an Alert. For SG tube ruptures which may involve multiple SGs or UNISOLABLE secondary line breaks, this threshold would exist in conjunction with RCS Barrier thresholds and

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

would result in a SAE. Escalation to GE would be based on “Potential Loss” of the Fuel Clad Barrier.

Loss Threshold #1

This threshold addresses the condition in which a RUPTURED SG is also FAULTED. This condition represents a bypass of the RCS and Containment Barriers and is a subset of the second threshold. In conjunction with RCS Barrier Loss Threshold, this would always result in the declaration of a SAE.

Loss Threshold #2

This threshold addresses SG tube leaks that exceed 10 gallons per minute (gpm) in conjunction with an UNISOLABLE release path to the environment from the affected SG. The threshold for establishing the UNISOLABLE secondary side release is intended to be a prolonged release of radioactivity from the RUPTURED SG directly to the environment. This could be expected to occur when the main condenser is unavailable to accept the contaminated steam (i.e., SG tube rupture with concurrent loss of off-site power and the RUPTURED SG is required for plant cooldown or a stuck open relief valve). If the main condenser is available, there may be releases via air ejectors, gland seal exhausters, and other similar controlled, and often monitored, pathways. These pathways do not meet the intent of an UNISOLABLE release path to the environment. These minor releases are assessed using Abnormal Rad Levels/Radiological Effluent ICs.

TS limits (150 gallons per day) provide a defense in depth associated with alternate SG plugging criteria. The 150 gallons per day threshold is deemed too low for use as an emergency threshold. A pressure boundary LEAKAGE of 10 gpm was used as the threshold in IC SU5, RCS LEAKAGE, and is deemed appropriate for this threshold.

5. **Containment Isolation Failure or Bypass**

This threshold addresses incomplete containment isolation that allows direct release to the environment.

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

There is no Potential Loss Threshold associated with this item.

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

6. **Containment Radiation Monitoring**

There is no Loss Threshold associated with this item.

The 15000 R/hr reading on Containment High Range ARM (R-91A/B, R-92A/B, R-93A/B, R-94A/B) is a value which indicates significant fuel damage well in excess of the thresholds associated with both Loss of Fuel Clad and Loss of RCS Barriers. A major release of radioactivity requiring off-site protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant.

Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a Potential Loss of containment, such that a GE declaration is warranted.

NUREG-1228, *Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents*, (Reference 26) indicates that such conditions do not exist when the amount of clad damage is less than 20%. The Containment High Range ARM reading corresponds to 20% fuel clad damage and is based on the following calculation conditions;

- Source strength of fuel gap activity: 2.5%
- RG1.183 (alterative source term) states 5% fuel gap activity released to containment in 30 min during LOCA and release rate is constant. This EAL is assumed 15 min release. Therefore, source strength of fuel gap activity is half of RG 1.183 activity.
- RCS leak time: 15 min as stated EAL Threshold for Containment Potential Loss #3
- Containment free volume: 2.8E+6 ft^3
- Thermal power: 4540 MWt (102% power)

7. **Other Indications**

This subcategory is not applicable to the NAPS Unit 3 but has been preserved for consistency with NEI 99-01.

8. **Emergency Coordinator Judgment**

These thresholds address any other factors that are to be used by the Emergency Coordinator in determining whether the Containment Barrier is lost or potentially lost. In addition, the inability to monitor the Barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the Barrier may be considered lost or potentially lost.

The Containment Barrier should not be declared lost or potentially lost based on exceeding TS action statement criteria, unless there is an event in progress requiring mitigation by the

BASIS INFORMATION FOR EAL FISSION PRODUCT BARRIER TABLE 5-F-2

Containment Barrier. When no event is in progress (Loss or Potential Loss of either Fuel Clad and/or RCS) the Containment Barrier status is addressed by TS.

5.8 Hazards and Other Conditions Affecting Plant Safety EALs

Table 5-H-1: Recognition Category "H" Initiating Condition Matrix

GENERAL EMERGENCY		SITE AREA EMERGENCY		ALERT		UNUSUAL EVENT	
HG1	HOSTILE ACTION resulting in loss of physical control of the facility. *Op. MODEs: All*	**HS4**	HOSTILE ACTION within the PROTECTED AREA. *Op. MODEs: All*	**HA4**	HOSTILE ACTION within the Owner Controlled Area or airborne attack threat. *Op. MODEs: All*	**HU4**	Confirmed SECURITY CONDITION or threat which indicates a potential degradation in the level of safety of the plant. *Op. MODEs: All*
HG2	Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a General Emergency. *Op. MODEs: All*	**HS3**	Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a Site Area Emergency. *Op. MODEs: All*	**HA6**	Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of an Alert. *Op. MODEs: All*	**HU5**	Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a NOUE. *Op. MODEs: All*
		HS2	Control Room evacuation has been initiated and plant control cannot be established. *Op. MODEs: All*	**HA5**	Control Room evacuation has been initiated. *Op. MODEs: All*		
				HA1	Natural or destructive phenomena affecting VITAL AREAS. *Op. MODEs: All*	**HU1**	Natural or destructive phenomena affecting the PROTECTED AREA. *Op. MODEs: All*
				HA2	FIRE or EXPLOSION affecting the operability of plant safety systems required to establish or maintain safe shutdown. *Op. MODEs: All*	**HU2**	FIRE within the PROTECTED AREA not extinguished within 15 minutes of detection or EXPLOSION within the PROTECTED AREA. *Op. MODEs: All*

Table 5-H-1: Recognition Category "H" Initiating Condition Matrix

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT		UNUSUAL EVENT	
		HA3	Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases which jeopardize operation of OPERABLE equipment required to maintain safe operations or safely shutdown the reactor. *Op. MODEs: All*	**HU3**	Release of toxic, corrosive, asphyxiant, or flammable gases deemed detrimental to NORMAL PLANT OPERATIONS. *Op. MODEs: All*

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU1

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Natural or destructive phenomena affecting the PROTECTED AREA.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2 or 3 or 4)

1. Seismic event identified by **ANY** 2 of the following:
   - Seismic event confirmed by actuation of seismic system indicators
   - Earthquake felt in plant
   - National Earthquake Center
2. Tornado striking within PROTECTED AREA boundary or sustained high winds greater than 80 mph.
3. Internal flooding that has the potential to affect safety related equipment required by TS for the current operating MODE in **ANY** of the following areas:
   - Containment Vessel
   - Reactor Building
   - Power Source Buildings
4. Turbine failure resulting in casing penetration or damage to turbine or generator seals.

Basis:

These EALs are categorized on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators.

EAL #1

Damage may be caused to some portions of the site, but should not affect ability of safety functions to operate.

The National Earthquake Center can confirm if an earthquake has occurred in the area of the plant.

EAL #2

This EAL is based on a tornado striking (touching down) or sustained high winds within the PROTECTED AREA. The wind speed selected is a site-specific value that can be reliably

monitored by plant meteorological instrumentation. Although design basis for the US-APWR is 155 mph, this wind speed may not be available due to loss of meteorological instrumentation at sustained winds of this magnitude. Although site meteorological instrumentation can reliably measure wind speeds up to 100 mph, the sustained wind value used for NAPS Unit 3, 80 mph, was selected for consistency with the Units 1 & 2 EAL Threshold.

Escalation of this emergency classification level, if appropriate, would be based on VISIBLE DAMAGE, or by other in plant conditions, via HA1.

EAL #3

This EAL addresses the effect of internal flooding caused by events such as component failures, equipment misalignment, or outage activity mishaps.

The areas listed contain systems required for safe shutdown of the plant, which are not designed to be partially or fully submerged.

Escalation of this emergency classification level, if appropriate, would be based on VISIBLE DAMAGE via HA1, or by other plant conditions.

EAL #4

This EAL addresses main turbine rotating component failures of sufficient magnitude to cause observable damage to the turbine casing or to the seals of the turbine generator. Generator seal damage observed after generator purge does not meet the intent of this EAL because it did not impact normal operation of the plant.

Of major concern is the potential for LEAKAGE of combustible fluids (lubricating oils) and gases (hydrogen cooling) to the plant environs. Actual FIRES and flammable gas build up are appropriately classified via HU2 and HU3.

This EAL is consistent with the definition of a NOUE while maintaining the anticipatory nature desired and recognizing the risk to non-safety related equipment.

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HU2

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

FIRE within the PROTECTED AREA not extinguished within 15 minutes of detection or EXPLOSION within the PROTECTED AREA.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2)

1. FIRE not extinguished within 15 minutes of Control Room notification of a FIRE or receipt of a Control Room FIRE alarm in **ANY** of the following areas:
   - Containment Vessel
   - Reactor Building
   - Power Source Buildings
   - Cooling Tower Structures
   - Power Source Fuel Storage Vault
   - Power Source Fuel Pipe Tunnel
   - ESW Pipe Building
   - Auxiliary Building
   - Turbine Building
2. EXPLOSION within the PROTECTED AREA.

Basis:

This EAL addresses the magnitude and extent of FIRES or EXPLOSIONS that may be potentially significant precursors of damage to safety systems. It addresses the FIRE/EXPLOSION, and not the degradation in performance of affected systems that may result.

Detection of a FIRE may be based on visual observation and report by plant personnel or sensor alarm indication.

EAL #1

The 15 minute time period begins with a credible notification that a FIRE is occurring, or indication of a fire detection system alarm/actuation. Validation of a fire detection system alarm includes actions that can be taken within the Control Room or other nearby site-specific location to ensure

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

that it is not spurious. An alarm is assumed to be an indication of a FIRE unless it is disproved within the 15 minute period by personnel dispatched to the scene. In other words, a personnel report from the scene may be used to disprove a sensor alarm if received within 15 minutes of the alarm, but shall not be required to verify the alarm.

The intent of this 15 minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket).

The list includes buildings and areas in actual contact with or immediately adjacent to VITAL AREAS or other significant buildings or areas.

EAL #2

This EAL addresses only those EXPLOSIONS of sufficient force to damage permanent structures or equipment within the PROTECTED AREA.

No attempt is made to assess the actual magnitude of the damage. The occurrence of the EXPLOSION is sufficient for declaration.

The Emergency Coordinator also needs to consider any security aspects of the EXPLOSION, if applicable.

Escalation of this emergency classification level, if appropriate, would be based on HA2.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU3

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Release of toxic, corrosive, asphyxiant, or flammable gases deemed detrimental to NORMAL PLANT OPERATIONS.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2)

1. Toxic, corrosive, asphyxiant, or flammable gases in amounts that could adversely affect NORMAL PLANT OPERATIONS.

2. Report by local, county or state officials for evacuation or sheltering of site personnel based on an off-site event.

Basis:

This EAL is based on the release of toxic, corrosive, asphyxiant, or flammable gases of sufficient quantity to affect NORMAL PLANT OPERATIONS.

The fact that SCBA may be worn does not eliminate the need to declare the event.

This IC is not intended to require significant assessment or quantification. It assumes an uncontrolled process that has the potential to affect plant operations. This precludes small or incidental releases, or releases that do not impact structures needed for plant operation.

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.

Escalation of this emergency classification level, if appropriate, would be based on HA3.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU4

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Confirmed SECURITY CONDITION or threat which indicates a potential degradation in the level of safety of the plant.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2 or 3)

1. A SECURITY CONDITION that does NOT involve a HOSTILE ACTION as reported by the Security Shift Supervisor.
2. A credible site-specific security threat notification.
3. A validated notification from NRC providing information of an aircraft threat.

Basis:

Security events which do not represent a potential degradation in the level of safety of the plant are reported under 10 CFR 73.71 (Reference 27) or in some cases under 10 CFR 50.72. Security events assessed as HOSTILE ACTIONS are classifiable under HA4, HS4 and HG1.

A higher initial classification could be made based upon the nature and timing of the security threat and potential consequences. The licensee shall consider upgrading the emergency response status and emergency classification level in accordance with the site's Safeguards Contingency Plan and Emergency Plan.

EAL #1

Reference is made to Security Shift Supervisor because these individuals are the designated personnel on-site qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the NAPS Unit 3 Safeguards Contingency Plan.

This threshold is based on NAPS Unit 3 security plans. NAPS Unit 3 Safeguards Contingency Plans are based on guidance provided by NEI 03-12 (Reference 28).

EAL #2

This threshold is included to ensure that appropriate notifications for the security threat are made in a timely manner. This includes information of a credible threat. Only the plant to which the specific threat is made need declare the NOUE.

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The determination of “credible” is made through use of information found in the Safeguards Contingency Plan.

EAL #3

The intent of this EAL is to ensure that notifications for the aircraft threat are made in a timely manner and that Off-site Response Organizations (OROs) and plant personnel are at a state of heightened awareness regarding the credible threat. It is not the intent of this EAL to replace existing non-hostile related EALs involving aircraft.

This EAL is met when a plant receives information regarding an aircraft threat from NRC. Validation is performed by calling the NRC or by other approved methods of authentication. Only the plant to which the specific threat is made need declare the Unusual Event.

The NRC Headquarters Operations Officer will communicate to the licensee if the threat involves an airliner (airliner is meant to be a large aircraft with the potential for causing significant damage to the plant). The status and size of the plane may be provided by North American Aerospace Defense Command (NORAD) through the NRC.

Escalation to Alert emergency classification level via HA4 would be appropriate if the threat involves an airliner within 30 minutes of the plant.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU5

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a NOUE.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. Other conditions exist which in the judgment of the Emergency Coordinator 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 off-site response or monitoring are expected unless further degradation of safety systems occurs.

Basis:

This EAL addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the NOUE emergency classification level.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA1

Initiating Condition - ALERT

Natural or destructive phenomena affecting VITAL AREAS.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2 or 3 or 4 or 5)

1. a. Seismic event greater than {site-specific OBE value based on Ultimate Heat Sink OBE limit} as indicated by seismic instrumentation.

   AND

   b. Earthquake confirmed by **ANY** of the following:
   - Earthquake felt in plant
   - National Earthquake Center
   - Control Room indication of degraded performance of systems required for the safe shutdown of the plant

2. Tornado striking or sustained high winds greater than 80 mph resulting in VISIBLE DAMAGE to **ANY** of the following structures containing safety systems or components **OR** Control Room indication of degraded performance of those safety systems:
   - Containment Vessel
   - Reactor Building
   - Power Source Buildings
   - Cooling Tower Structures
   - Power Source Fuel Storage Vault
   - Power Source Fuel Pipe Tunnel
   - ESW Pipe Tunnel
   - Auxiliary Building
   - Turbine Building

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

3. Internal flooding in **ANY** of the following areas resulting in an electrical shock hazard that precludes access to operate or monitor safety equipment **OR** Control Room indication of degraded performance of those safety systems:
   - Containment Vessel
   - Reactor Building
   - Power Source Buildings
4. Vehicle crash resulting in VISIBLE DAMAGE to **ANY** of the following structures containing safety systems or components **OR** Control Room indication of degraded performance of those safety systems:
   - Containment Vessel
   - Reactor Building
   - Power Source Buildings
   - Cooling Tower Structures
5. Other occurrences resulting in VISIBLE DAMAGE to **ANY** of the following structures containing safety systems or components **OR** Control Room indication of degraded performance of those safety systems:
   - Containment Vessel
   - Reactor Building
   - Power Source Buildings
   - Cooling Tower Structure
   - Power Source Fuel Storage Vault
   - Power Source Fuel Pipe Tunnel
   - ESW Pipe Tunnel

Basis:

These EALs escalate from HU1 in that the occurrence of the event has resulted in VISIBLE DAMAGE to plant structures or areas containing equipment necessary for a safe shutdown, or has caused damage to the safety systems in those structures evidenced by Control Room indications of degraded system response or performance. The occurrence of VISIBLE DAMAGE and/or degraded system response is intended to discriminate against lesser events. The initial report should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The significance here is

not that a particular system or structure was damaged, but rather, that the event was of sufficient magnitude to cause this degradation.

Escalation of this emergency classification level, if appropriate, would be based on System Malfunction ICs.

EALs #2 - #5

These EALs specify structures or areas that contain safety systems, or components and functions required for safe shutdown of the plant.

EAL #1

Seismic events of this magnitude can result in a VITAL AREA being subjected to forces beyond design limits, and thus damage may be assumed to have occurred to plant safety systems.

The OBE limit for other US-APWR design is 0.1g. NAPS Unit 3 design of cooling towers includes an OBE limit, which may differ from US-APWR OBE limit. The National Earthquake Center can confirm if an earthquake has occurred in the area of the plant.

EAL#1 Threshold: The threshold will be based on the OBE limit for the cooling towers when it is determined.

EAL #2

This EAL is based on a tornado striking (touching down) or sustained high winds that have caused VISIBLE DAMAGE to structures containing functions or systems required for safe shutdown of the plant. The wind speed selected is a value that can be reliably monitored by plant meteorological instrumentation. Although design basis for the US-APWR is 155 mph, this wind speed may not be available due to loss of meteorological instrumentation at sustained winds of this magnitude. Although site meteorological instrumentation can reliably measure wind speeds up to 100 mph, the sustained wind value used for NAPS Unit 3, 80 mph, was selected for consistency with the Units 1 & 2 EAL Threshold.

EAL #3

This EAL addresses the effect of internal flooding caused by events such as component failures, equipment misalignment, or outage activity mishaps. It is based on the degraded performance of systems, or has created industrial safety hazards (e.g., electrical shock) that preclude necessary access to operate or monitor safety equipment. The inability to access, operate or monitor safety equipment represents an actual or substantial potential degradation of the level of safety of the plant.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Flooding as used in this EAL describes a condition where water is entering the room faster than installed equipment is capable of removal, resulting in a rise of water level within the room. Classification of this EAL should not be delayed while corrective actions are being taken to isolate the water source.

EAL #4

This EAL addresses vehicle crashes within the PROTECTED AREA that results in VISIBLE DAMAGE to VITAL AREAS or indication of damage to safety structures, systems, or components containing functions and systems required for safe shutdown of the plant.

EAL #5

This EAL addresses other site-specific phenomena that result in VISIBLE DAMAGE to VITAL AREAS or results in indication of damage to safety structures, systems, or components containing functions and systems required for safe shutdown of the plant (such as hurricane, flood, or seiche) that can also be precursors of more serious events.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA2

Initiating Condition – ALERT

FIRE or EXPLOSION affecting the operability of plant safety systems required to establish or maintain safe shutdown.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. FIRE or EXPLOSION resulting in VISIBLE DAMAGE to **ANY** of the following structures containing safety systems or components **OR** Control Room indication of degraded performance of those safety systems:
   - Containment Vessel
   - Reactor Building
   - Power Source Buildings
   - Cooling Tower Structures
   - Power Source Fuel Storage Vault
   - Power Source Fuel Pipe Tunnel
   - ESW Pipe Tunnel

Basis:

VISIBLE DAMAGE is used to identify the magnitude of the FIRE or EXPLOSION and to discriminate against minor FIRES and EXPLOSIONS.

The reference to structures containing safety systems or components is included to discriminate against FIRES or EXPLOSIONS in areas having a low probability of affecting safe operation. The significance here is not that a safety system was degraded but the fact that the FIRE or EXPLOSION was large enough to cause damage to these systems.

The use of VISIBLE DAMAGE should not be interpreted as mandating a lengthy damage assessment prior to classification. The declaration of an Alert and the activation of the TSC will provide the Emergency Coordinator with the resources needed to perform detailed damage assessments.

The Emergency Coordinator also needs to consider any security aspects of the EXPLOSION.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

This EAL specifies structures and areas that contain safety systems, or components and functions required for safe shutdown of the plant.

Escalation of this emergency classification level, if appropriate, will be based on System Malfunctions, Fission Product Barrier Degradation or Abnormal Rad Levels/Radiological Effluent ICs.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA3

Initiating Condition – ALERT

Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases which jeopardize operation of OPERABLE equipment required to maintain safe operations or safely shutdown the reactor.

Operating MODE Applicability: All

Emergency Action Level:

Note: If the equipment in the stated area was already inoperable, or out of service, before the event occurred, then this EAL should not be declared as it will have no adverse impact on the ability of the plant to safely operate or safely shutdown beyond that already allowed by TS at the time of the event.

1. Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases which jeopardize operation of systems required to maintain safe operations or safely shutdown the reactor.

Basis:

Gases in a VITAL AREA can affect the ability to safely operate or safely shutdown the reactor.

The fact that SCBA may be worn does not eliminate the need to declare the event.

Declaration should not be delayed for confirmation from atmospheric testing if the atmosphere poses an immediate threat to life and health or an immediate threat of severe exposure to gases. This could be based upon documented analysis, indication of personal ill effects from exposure, or operating experience with the hazards.

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.

An uncontrolled release of flammable gasses within a facility structure has the potential to affect safe operation of the plant by limiting either operator or equipment operations due to the potential for ignition and resulting equipment damage/personnel injury. Flammable gasses, such as hydrogen and acetylene, are routinely used to maintain plant systems (hydrogen) or to repair

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

equipment/components (acetylene - used in welding). This EAL assumes concentrations of flammable gasses which can ignite/support combustion.

Escalation of this emergency classification level, if appropriate, will be based on System Malfunctions, Fission Product Barrier Degradation or Abnormal Rad Levels/Radioactive Effluent ICs.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA4

Initiating Condition – ALERT

HOSTILE ACTION within the Owner Controlled Area or airborne attack threat.

Operating MODE Applicability:All

Emergency Action Level Thresholds: (1 or 2)

1. A HOSTILE ACTION is occurring or has occurred within the OCA as reported by the Security Shift Supervisor.

2. A validated notification from NRC of an airliner attack threat within 30 minutes of the site.

Basis:

These EALs address the contingency for a very rapid progression of events, such as that experienced on September 11, 2001. They are not premised solely on the potential for a radiological release. Rather the issue includes the need for rapid assistance due to the possibility for significant and indeterminate damage from additional air, land or water attack elements.

The fact that the site is under serious attack or is an identified attack target with minimal time available for further preparation or additional assistance to arrive requires a heightened state of readiness and implementation of protective measures that can be effective (such as on-site evacuation, dispersal or sheltering).

EAL #1

This EAL addresses the potential for a very rapid progression of events due to a HOSTILE ACTION. It is not intended to address incidents that are accidental events or acts of civil disobedience, such as small aircraft impact, hunters, or physical disputes between employees within the OCA. Those events are adequately addressed by other EALs.

This EAL is applicable for any HOSTILE ACTION occurring, or that has occurred, in the OCA.

Although nuclear plant security officers are well trained and prepared to protect against HOSTILE ACTION, it is appropriate for OROs to be notified and encouraged to begin activation (if they do not normally) to be better prepared should it be necessary to consider further actions.

If not previously notified by the NRC that the airborne HOSTILE ACTION was intentional, then it would be expected, although not certain, that notification by an appropriate Federal agency would follow. In this case, appropriate federal agency is intended to be NORAD, Federal Bureau of

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Investigation (FBI), Federal Aviation Administration (FAA) or NRC. However, the declaration should not be unduly delayed awaiting Federal notification.

EAL #2

This EAL addresses the immediacy of an expected threat arrival or impact on the site within a relatively short time.

The intent of this EAL is to ensure that notifications for the airliner attack threat are made in a timely manner and that OROs and plant personnel are at a state of heightened awareness regarding the credible threat. Airliner is meant to be a large aircraft with the potential for causing significant damage to the plant.

This EAL is met when a plant receives information regarding an airliner attack threat from NRC and the airliner is within 30 minutes of the plant. Only the plant to which the specific threat is made need declare the Alert.

The NRC Headquarters Operations Officer will communicate to the licensee if the threat involves an airliner (airliner is meant to be a large aircraft with the potential for causing significant damage to the plant). The status and size of the plane may be provided by NORAD through the NRC.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA5

Initiating Condition – ALERT

Control Room evacuation has been initiated.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. {Site-specific procedure} requires Control Room evacuation.

Basis:

With the Control Room evacuated, additional support, monitoring and direction through the TSC and/or other emergency response facilities may be necessary.

EAL Threshold #1: The site-specific procedure number will be inserted when determined.

Inability to establish plant control from outside the Control Room will escalate this event to a SAE via HS2.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA6

Initiating Condition – ALERT

Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of an Alert.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. Other conditions exist which in the judgment of the Emergency Coordinator 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 PAG exposure levels.

Basis:

This EAL addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the Alert emergency classification level.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS2

Initiating Condition – SITE AREA EMERGENCY

Control Room evacuation has been initiated and plant control cannot be established.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. a. Control Room evacuation has been initiated.

   AND

   b. Control of the plant cannot be established per {site-specific procedure} 15 minutes.

Basis:

The intent of this IC is to capture those events where the Control Room has been evacuated and control of the plant cannot be reestablished in a timely manner. In this case, expeditious transfer of control of safety systems has not occurred (although fission product barrier damage may not yet be indicated).

The intent of the EAL is to establish control of important plant equipment and knowledge of important plant parameters in a timely manner. Primary emphasis should be placed on those components and instruments that supply protection for and information about safety functions. Typically, these safety functions are reactivity control, RCS inventory, and secondary heat removal.

The determination of whether or not control is established at the remote shutdown panel is based on Emergency Coordinator judgment. The Emergency Coordinator is expected to make a reasonable, informed judgment within the site-specific time for transfer that the licensee has control of the plant from the remote shutdown panel.

Escalation of this emergency classification level, if appropriate, would be by Fission Product Barrier Degradation or Abnormal Rad Levels/Radiological Effluent EALs.

EAL #1.b Threshold: The NAPS Unit 3 procedure number will be included when determined.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS3

Initiating Condition – SITE AREA EMERGENCY

Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a Site Area Emergency.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. Other conditions exist which in the judgment of the Emergency Coordinator 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 PAG exposure levels beyond the site boundary.

Basis:

This EAL addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for SAE.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS4

Initiating Condition – SITE AREA EMERGENCY

HOSTILE ACTION within the PROTECTED AREA.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervisor.

Basis:

This condition represents an escalated threat to plant safety above that contained in the Alert in that a HOSTILE FORCE has progressed from the OCA to the PROTECTED AREA.

This EAL addresses the contingency for a very rapid progression of events, such as that experienced on September 11, 2001. It is not premised solely on the potential for a radiological release. Rather the issue includes the need for rapid assistance due to the possibility for significant and indeterminate damage from additional air, land or water attack elements.

The fact that the site is under serious attack with minimal time available for further preparation or additional assistance to arrive requires ORO readiness and preparation for the implementation of protective measures.

This EAL addresses the potential for a very rapid progression of events due to a HOSTILE ACTION. It is not intended to address incidents that are accidental events or acts of civil disobedience, such as small aircraft impact, hunters, or physical disputes between employees within the PROTECTED AREA. Those events are adequately addressed by other EALs.

Although nuclear plant security officers are well trained and prepared to protect against HOSTILE ACTION, it is appropriate for OROs to be notified and encouraged to begin preparations for public protective actions (if they do not normally) to be better prepared should it be necessary to consider further actions.

If not previously notified by NRC that the airborne HOSTILE ACTION was intentional, then it would be expected, although not certain, that notification by an appropriate Federal agency would follow. In this case, appropriate federal agency is intended to be NORAD, FBI, FAA or NRC. However, the declaration should not be unduly delayed awaiting Federal notification.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Escalation of this emergency classification level, if appropriate, would be based on actual plant status after impact or progression of attack.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HG1

Initiating Condition – GENERAL EMERGENCY

HOSTILE ACTION resulting in loss of physical control of the facility.

Operating MODE Applicability: All

Emergency Action Level Thresholds: (1 or 2)

1. A HOSTILE ACTION has occurred such that plant personnel are unable to operate equipment required to maintain safety functions.

2. A HOSTILE ACTION has caused failure of Spent Fuel Cooling Systems and IMMINENT fuel damage is likely.

Basis:

EAL #1

This EAL encompasses conditions under which a HOSTILE ACTION has resulted in a loss of physical control of VITAL AREAS (containing vital equipment or controls of vital equipment) required to maintain safety functions and control of that equipment cannot be transferred to and operated from another location.

These safety functions are reactivity control (ability to shut down the reactor and keep it shutdown), RCS inventory (ability to cool the core), and secondary heat removal (ability to maintain a heat sink).

Loss of physical control of the Control Room or remote shutdown capability alone may not prevent the ability to maintain safety functions per se. Design of the remote shutdown capability and the location of the transfer switches should be taken into account. Primary emphasis should be placed on those components and instruments that supply protection for and information about safety functions.

If control of the plant equipment necessary to maintain safety functions can be transferred to another location, then the threshold is not met.

EAL #2

This EAL addresses failure of spent fuel cooling systems as a result of HOSTILE ACTION if IMMINENT fuel damage is likely, such as when a recently off-loaded reactor core is in the SFP.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HG2

Initiating Condition – GENERAL EMERGENCY

Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a General Emergency.

Operating MODE Applicability: All

Emergency Action Level Threshold:

1. Other conditions exist which in the judgment of the Emergency Coordinator 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 PAG exposure levels off-site for more than the immediate site area.

Basis:

This EAL addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for GE.

5.9 System Malfunction EALs

Table 5-S-1: Recognition Category "S" Initiating Condition Matrix

GENERAL EMERGENCY		SITE AREA EMERGENCY		ALERT		UNUSUAL EVENT	
SG1	Prolonged loss of all Off-site and all On-site ac power to emergency busses. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*	**SS1**	Loss of all Off-site ac power and On-Site ac power capability to emergency busses for 15 minutes or longer. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*	**SA5**	AC power capability to emergency busses reduced to a single power source for 15 minutes or longer such that any additional single failure would result in station blackout. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*	**SU1**	Loss of all Off-site ac power to emergency busses for 15 minutes or longer. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*
		SS3	Loss of all vital dc power for 15 minutes or longer. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*				
SG2	Automatic Trip and all manual actions fail to shutdown the reactor and indication of an extreme challenge to the ability to cool the core exists. *Op. MODEs: Power Operation, Startup*	**SS2**	Automatic Trip fails to shutdown the reactor and manual actions taken in the Control Room are not successful in shutting down the reactor. *Op. MODEs: Power Operation, Startup*	**SA2**	Automatic Trip fails to shutdown the reactor and the manual actions taken Control Room are successful in shutting down the reactor. *Op. MODEs: Power Operation, Startup*	**SU8**	Inadvertent criticality. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*
						SU2	Inability to reach required shutdown within Technical Specification limits. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*

Table 5-S-1: Recognition Category "S" Initiating Condition Matrix

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
			SU4 Fuel Clad degradation. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*
			SU5 RCS LEAKAGE. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*
			SU6 Loss of all On-site or Off-site communications capabilities. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*
	SS7 Inability to Monitor and Control the Plant for ≥ 15 Minutes. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*	**SA7** UNPLANNED Partial Loss of Indicating and Monitoring and Control Functions for ≥ 15 Minutes. *Op. MODEs: Power Operation, Startup, Hot Standby, Hot Shutdown*	

SYSTEM MALFUNCTIONS

SU1

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Loss of all Off-site ac power to emergency busses for 15 minutes or longer.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. Loss of all off-site ac power to Class 1E emergency busses (MC-A, MC-B, MC-C, MC-D) for 15 minutes or longer.

Basis:

Prolonged loss of off-site ac power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of ac power to emergency busses.

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

SYSTEM MALFUNCTIONS

SU2

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Inability to reach required shutdown within Technical Specification limits.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. Plant is not brought to required operating MODE within TS LCO Action Statement Time.

Basis:

LCOs require the plant to be brought to a required operating MODE when the TS required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by the site TS requires a four hour report under 10 CFR 50.72 (b) Non-emergency events. The plant is within its safety envelope when being shut down within the allowable action statement time in the TS. An immediate NOUE is required when the plant is not brought to the required operating MODE within the allowable action statement time in the TS. Declaration of a NOUE is based on the time at which the LCO-specified action statement time period elapses under the plant TS and is not related to how long a condition may have existed.

SYSTEM MALFUNCTIONS

SU4

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Fuel Clad degradation.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Thresholds: (1 or 2)

1. Primary Coolant Monitor (R-70) Radiation Level High Alarm.
2. DOSE EQUIVALENT I-131 greater than 60 µCi/gm OR DOSE EQUIVALENT XE-133 greater than 300 µCi/gm for more than 6 hours as determined by sampling and analysis.

Basis:

This EAL is included because it is a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant.

Escalation of this EAL to the Alert level is via the Fission Product Barriers.

EAL #1

This threshold addresses Primary Coolant Monitor readings that provide indication of a degradation of fuel clad integrity.

EAL #2

This threshold addresses coolant samples exceeding coolant TS for transient iodine spiking and xenon limits.

SYSTEM MALFUNCTIONS

SU5

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

RCS LEAKAGE.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Levels: (1 or 2)

1. Unidentified or pressure boundary LEAKAGE greater than 10 gpm.
2. Identified LEAKAGE greater than 25 gpm.

Basis:

This IC is included as a NOUE because it may be a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. The value for the unidentified LEAKAGE (including the pressure boundary) was selected as it is observable with normal Control Room indications and is 10 times the TS limit. Lesser values must generally be determined through time-consuming surveillance tests (e.g., mass balances).

Relief valve normal operation should be excluded from this IC. However, a relief valve that operates and fails to close per design should be considered applicable to this IC if the relief valve cannot be isolated.

The EAL for identified LEAKAGE is set at a higher value due to the lesser significance of identified LEAKAGE in comparison to unidentified or pressure boundary LEAKAGE and is 2.5 times the TS limit. In either case, escalation of this IC to the Alert level is via Fission Product Barrier Degradation ICs.

SYSTEM MALFUNCTIONS

SU6

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Loss of all On-site or Off-site communications capabilities.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Thresholds: (1 or 2)

1. Loss of all of the following on-site communication methods affecting the ability to perform routine operations.
   - PA/PL
   - PABX
   - SPTS
   - Plant Radio System
2. Loss of all of the following off-site communication methods affecting the ability to perform off-site notifications.
   - Insta-phone Loop
   - Emergency Notification System
   - Health Physics Network
   - Reactor Safety Counterpart Link
   - Protective Measures Counterpart Link
   - Management Counterpart Link
   - Commercial Telephone (backup to Insta-phone Loop)
   - PABX

Basis:

The purpose of this IC and its associated EALs is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate issues with off-site authorities. The loss of off-site communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

SYSTEM MALFUNCTIONS

The availability of one method of ordinary off-site communications is sufficient to inform federal, state, and local authorities of plant issues. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from radio transmissions, individuals being sent to off-site locations, etc.) are being utilized to make communications possible.

Notifications of emergencies to State and local off-site agencies is accomplished with the Insta-phone Loop between each Control Room and the Commonwealth of Virginia and risk counties. Private telephone serves as backup to the Insta-phone Loop circuit. In addition, the NAPS has a Private Branch Exchange (PABX), which is used for routine telephone serve into and around the site. Emergency Notification System, Health Physics Network, Reactor Safety Counterpart Link, Protective Measures Counterpart Link, Management Counterpart Link are NRC telephone circuits.

EAL #2

The list for off-site communications loss encompasses the loss of all means of communications with off-site authorities. This includes the ENS, commercial telephone lines, telecopy transmissions, and dedicated phone systems that are routinely used for off-site emergency notifications.

SYSTEM MALFUNCTIONS

SU8

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Inadvertent criticality.

Operating MODE Applicability: Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. UNPLANNED sustained positive startup rate observed.

Basis:

This IC addresses inadvertent criticality events. This IC indicates a potential degradation of the level of safety of the plant, warranting a NOUE classification. This IC excludes inadvertent criticalities that occur during planned reactivity changes associated with reactor startups (e.g., criticality earlier than estimated).

This condition can be identified using startup range and intermediate range rate indication.

Escalation would be by the Fission Product Barrier Table, as appropriate to the operating MODE at the time of the event.

SYSTEM MALFUNCTIONS

SA2

Initiating Condition – ALERT

Automatic Trip fails to shutdown the reactor and the manual actions taken in the Control Room are successful in shutting down the reactor.

Operating MODE Applicability: Power Operation, Startup

Emergency Action Level Threshold:

1. a. An automatic trip failed to shutdown the reactor.

   AND

   b. Manual actions taken in the Control Room successfully shutdown the reactor as indicated by Power Range (N-41, N-42, N-43, N-44) less than 5% and Intermediate Range (N-35, N-36) indicate an decreasing trend.

Basis:

Manual trip actions taken in the Control Room are any set of actions by the reactor operator(s) which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor.

This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient. Thus the plant safety has been compromised because design limits of the fuel may have been exceeded. An Alert is indicated because conditions may exist that lead to potential loss of fuel clad or RCS and because of the failure of the Reactor Protection System (RPS) to automatically shutdown the plant.

If manual actions taken in the Control Room fail to shutdown the reactor, the event would escalate to a SAE.

SYSTEM MALFUNCTIONS

SA5

Initiating Condition – ALERT

AC power capability to emergency busses reduced to a single power source for 15 minutes or longer such that any additional single failure would result in station blackout.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. a. AC power capability to Class 1E emergency busses (MC-A, MC-B, MC-C, MC-D) reduced to a single power source for 15 minutes or longer.

   AND

   b. Any additional single power source failure will result in station blackout.

Basis:

This IC and the associated EALs are intended to provide an escalation from IC SU1, “Loss of All Off-site ac Power To Emergency Busses for Greater Than 15 Minutes.”

The condition indicated by this IC is the degradation of the off-site and on-site ac power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of off-site power with a concurrent failure of all but one gas turbine generator to supply power to its emergency busses. Another related condition could be the loss of all on-site gas turbine generators with only one train of emergency busses being backfed from off-site power. The subsequent loss of this single power source would escalate the event to a SAE in accordance with SS1.

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

SYSTEM MALFUNCTIONS

SA7

Initiating Condition – ALERT

UNPLANNED Partial Loss of Indicating, Monitoring and Control Functions for ≥ 15 Minutes.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. UNPLANNED Loss of All Protection and Safety Monitoring System (PSMS) and Plant Control and Monitoring System (PCMS) Indicating and Monitoring Functions for 15 minutes or longer.

Basis:

This IC recognizes the difficulty associated with monitoring changing plant conditions without the use of a major portion of the control and indication systems.

This IC recognizes the challenge to the Control Room staff to monitor and control the plant due to partial loss of normal and safety indication and monitoring systems. An Alert is considered appropriate if the Control Room staff requires additional personnel to assist in monitoring alternative indications, manipulate equipment and restore the systems to full capability. The selection of 15 minutes was chosen to allow personnel sufficient time for restoration of required systems due to an inadvertent loss.

The PSMS provides the functions necessary to protect the plant during normal operations, to shutdown the plant, and to maintain the plant in a safe shutdown condition. The PCMS includes the control functions that provide for the control of the nuclear process, conversion of nuclear energy into heat energy, and transport of the heat energy from the nuclear reactor to the main steam turbine. The Diverse Actuation System (DAS) remains available to ensure monitoring and control capability. Loss of DAS would result in escalation to SS7 due to the operating crew being unable to monitor and control the plant.

SYSTEM MALFUNCTIONS

SS1

Initiating Condition - SITE AREA EMERGENCY

Loss of all Off-site ac power and On-Site ac power capability to emergency busses for 15 minutes or longer.

Operating MODE Applicability:Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. Loss of all Off-Site ac power and On-site ac power capability to Class 1E emergency busses (MC-A, MC-B, MC-C, MC-D) for 15 minutes or longer.

Basis:

Loss of all off-site ac power to emergency busses compromises all plant safety systems requiring electric power including RHR, ECCS, Containment Heat Removal and the Ultimate Heat Sink. Prolonged loss of all ac power to emergency busses will lead to loss of Fuel Clad, RCS, and Containment, thus this event can escalate to a GE.

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

Escalation to GE is via Fission Product Barrier Degradation or IC SG1, “Prolonged Loss of All Off-site Power and Prolonged Loss of All On-site ac Power.”

SYSTEM MALFUNCTIONS

SS2

Initiating Condition – SITE AREA EMERGENCY

Automatic Trip fails to shutdown the reactor and manual actions taken in the Control Room are not successful in shutting down the reactor.

Operating MODE Applicability: Power Operation, Startup

Emergency Action Level Threshold:

1. a. An automatic trip failed to shutdown the reactor.

   AND

   b. Manual actions taken in the Control Room DO NOT shutdown the reactor as indicated by Power Range (N-41, N-42, N-43, N-44) greater than 5%.

Basis:

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful. A SAE is warranted because conditions exist that lead to IMMINENT loss or potential loss of both fuel clad and RCS.

Manual trip actions taken in the Control Room are any set of actions by the reactor operator(s) which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor.

Manual trip actions are not considered successful if action away from the Control Room is required to trip the reactor. This EAL is still applicable even if actions taken away from the Control Room are successful in shutting the reactor down because the design limits of the fuel may have been exceeded or because of the gross failure of the RPS.

Escalation of this event to a GE would be due to a prolonged condition leading to an extreme challenge to either core-cooling or heat removal.

SYSTEM MALFUNCTIONS

SS3

Initiating Condition – SITE AREA EMERGENCY

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

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. Less than 105V on ALL vital dc Busses (DCC-A, DCC-B, DCC-C, DCC-D) for 15 minutes or longer.

Basis:

Loss of all dc power compromises ability to monitor and control plant safety functions. Prolonged loss of all dc power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the reactor system.

105V bus voltage is the minimum bus voltage necessary for the operation of safety related equipment. This voltage value incorporates a margin of at least 15 minutes of operation before the onset of inability to operate those loads.

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

Escalation to a GE would occur by Abnormal Rad Levels/Radiological Effluent, Fission Product Barrier Degradation.

SYSTEM MALFUNCTIONS

SS7

Initiating Condition – SITE AREA EMERGENCY

Inability to Monitor and Control the Plant for ≥15 minutes.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. Loss of all PSMS, PCMS, and DAS Digital Monitoring and Control Function for 15 minutes or longer.

Basis:

This IC recognizes the inability of the Control Room staff to monitor the plant due to loss of normal and safety indication and monitoring systems, and diverse indication and control systems that allow the operators to monitor and safety shutdown the plant. A SAE is considered to exist if the Control Room staff cannot monitor safety functions needed for protection of the public. The selection of 15 minutes was chosen to allow personnel sufficient time for restoration of required systems due to an inadvertent loss

The PSMS provides the functions necessary to protect the plant during normal operations, to shutdown the plant, and to maintain the plant in a safe shutdown condition. The PCMS includes the control functions that provide for the control of the nuclear process, conversion of nuclear energy into heat energy, and transport of the heat energy from the nuclear reactor to the main steam turbine. The DAS remains available to ensure monitoring and control capability. The DAS is a non-safety related system that provides a diverse backup to the protection system.

SYSTEM MALFUNCTIONS

SG1

Initiating Condition – GENERAL EMERGENCY

Prolonged loss of all Off-site and all On-Site ac power to emergency busses.

Operating MODE Applicability: Power Operation, Startup, Hot Standby, Hot Shutdown

Emergency Action Level Threshold:

1. a. Loss of all off-site and all on-site ac power to Class 1E emergency busses (MC-A, MC-B, MC-C, MC-D) for greater than 15 minutes.

   AND

   b. **EITHER** of the following:

   - Restoration of at least two emergency busses in less than 8 hours is not likely.
   - Indication of continuing degradation of core cooling based on Fission Product Barrier monitoring as indicated by CETs reading greater than 1200 degrees F (649 degrees C).

Basis:

Loss of all ac power to emergency busses compromises all plant safety systems requiring electric power including RHR, ECCS, Containment Heat Removal and the Ultimate Heat Sink. Prolonged loss of all ac power to emergency busses will lead to loss of fuel clad, RCS, and containment, thus warranting declaration of a GE.

The 8 hours to restore ac power is based on US-APWR blackout coping analysis. Appropriate allowance for off-site emergency response including evacuation of surrounding areas should be considered. Although this IC may be viewed as redundant to the Fission Product Barrier Degradation IC, its inclusion is necessary to better assure timely recognition and emergency response.

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

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

In addition, under these conditions, fission product barrier monitoring capability may be degraded.

SYSTEM MALFUNCTIONS

Although it may be difficult to predict when power can be restored, it is necessary to give the Emergency Coordinator a reasonable idea of how quickly (s)he may need to declare a GE based on two major considerations:

1. Are there any present indications that core cooling is already degraded to the point that loss or potential loss of Fission Product Barriers is IMMINENT?

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

Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Coordinator judgment as it relates to IMMINENT loss or potential loss of fission product barriers and degraded ability to monitor fission product barriers.

SYSTEM MALFUNCTIONS

SG2

Initiating Condition – GENERAL EMERGENCY

Automatic Trip and all manual actions fail to shutdown the reactor and indication of an extreme challenge to the ability to cool the core exists.

Operating MODE Applicability: Power Operation, Startup

Emergency Action Level Threshold: (1 or 2)

1. a. An automatic trip failed and ALL manual actions failed to shutdown the reactor

   AND

   b. All manual actions do not shutdown the reactor as indicated by Trip Breaker Status, Control Rod Bottom Indication, Neutron Flux greater than 5% (N-41, N-42, N-43, N-44).

   AND

   c. **EITHER** of the following exist or have occurred due to continued power generation:

   - Core Cooling RED with Subcriticality RED

   OR

   - Heat Sink RED with Subcriticality RED.

2. a. An automatic trip failed and ALL manual actions failed to shutdown the reactor

   AND

   b. All manual actions do not shutdown the reactor as indicated by Trip Breaker Status, Control Rod Bottom Indication, Neutron Flux greater than 5% (N-41, N-42, N-43, N-44).

   AND

   c. **EITHER** of the following exist or have occurred due to continued power generation:

   - Indications exist that core cooling is extremely challenged as indicated by CETs greater than 1200 degrees F (649 degrees C).

   OR

   - Indications exist that heat removal is extremely challenged as indicated by {site-specific EOPs}.

SYSTEM MALFUNCTIONS

Basis:

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful.

The reactor should be considered shutdown when it is producing less heat than the maximum decay heat load for which the safety systems are designed.

Challenges to heat removal capability are indicated by any of the following as described in site-specific EOPs: secondary heat removal via main steam safety valves, main steam relief valves, main steam depressurization valves, turbine bypass, EFW flow, SG level, other indications.

In the event either of these challenges exists at a time that the reactor has not been brought below the power associated with the safety system design a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the GE declaration is intended to be anticipatory of the fission product barrier table declaration in order to allow off-site agencies time to prepare for appropriate response.

EAL #2 Threshold: The EOP procedure numbers will be provided when available.

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Attachment A–Basis for Radiological Effluent EALs

Introduction

This attachment supplements the basis information provided in Section 5 for ICs RU1, RA1, RS1, and RG1.

This appendix contains seven major sections. They are:

1. Purpose of the effluent ICs/EALs and their relationship to other ICs/EALs
2. Explanation of the ICs
3. Explanation of the EALs and their relationship to the ICs
4. Interface between the ICs/EALs and the ODCM
5. Monitor setpoints versus EALs.
6. The impact of meteorology
7. The impact of source term

A.1 Purpose of the Effluent ICs/EALs

ICs RU1, RA1, RS1, and RG1 provide classification thresholds for UNPLANNED and/or uncontrolled releases of radioactivity to the environment. Inasmuch as the purpose of emergency planning at NPPs is to minimize the consequences of radioactivity releases to the environment, these ICs would appear to be controlling. However, classification of emergencies on the basis of radioactivity releases is not optimum, particularly those classifications based on radiation monitor indications. Such classifications can be deficient for several reasons, including:

- In significant emergency events, a radioactivity release is seldom the initiating event, but rather, is the consequence of some other condition. Relying on an indication of a release may not be sufficiently anticipatory.
- The relationship between an effluent monitor indication caused by a release and the off-site conditions that result is a function of several parameters (e.g., meteorology, source term) which can change in value by orders of magnitude between normal and emergency conditions and from event to event. The appropriateness of these classifications is dependent on how well the parameter values assumed in pre-establishing the classification thresholds match those that are present at the time of the incident.

Accurate assessment and classification of events is extremely important in assuring the appropriate response to an emergency by the utility and ORO. It is extremely important to recognize that over-classification, as well as under-classification, should be avoided. Primary emphasis is intended to be placed on plant conditions in classifying emergency events. Effluent ICs were

included, however, to provide a basis for classifying events that cannot be readily classified on the basis of plant conditions alone. Plant condition ICs are included to address the precursors to radioactivity release in order to ensure anticipatory action. The effluent ICs do not stand alone, nor do the plant condition ICs. The inclusion of both categories more fully addresses the potential event spectrum and compensates for potential deficiencies in either. This is a case in which the whole is greater than the sum of the parts.

From the discussion that follows, it should become clear how the various aspects of the effluent ICs/EALs work together to provide for reasonably accurate and timely emergency classifications. While some aspects of the radiological effluent EALs may appear to be potentially non-conservative, one also needs to consider IC/EALs in other recognition categories that compensate for this condition. During site-specific implementation of these ICs/EALs, changes to some of these aspects might appear advantageous. While site-specific changes are anticipated, caution must be used to ensure that these changes do not impact the overall effectiveness of the ICs/EALs.

A.2 Initiating Conditions

The four radiological effluent ICs and the fundamental basis for the ultimate classification are:

GE (RG1) Off-site Dose Resulting from an Actual or IMMINENT Release of Gaseous Radioactivity Exceeds 1000 mrem TEDE or 5000 mrem Thyroid CDE for the Actual or Projected Duration of the Release Using Actual Meteorology.

SAE (RS1) Off-site Dose Resulting from an Actual or IMMINENT Release of Gaseous Radioactivity Exceeds 100 mrem TEDE or 500 mrem Thyroid CDE for the Actual or Projected Duration of the Release.

Alert (RA1) Any Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological TS for 15 Minutes or Longer.

NOUE (RU1) Any Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times Radiological TS for 60 Minutes or Longer.

The fundamental basis of RU1 and RA1 ICs differs from that for RS1 and RG1 ICs. It is important to understand the differences.

- The controls in the ODCM are associated with particular off-site doses and dose rate limits. For showing compliance with these limits, facility ODCMs establish methodologies for establishing effluent monitor alarm setpoints based on defined source term and meteorology assumptions.
- RU1 and RA1 are **NOT** based on these particular values of off-site dose or dose rate, but rather on the loss of plant control implied by a radiological release that exceeds a specified multiple of the ODCM release limits for a specified period of time.

- The ODCM multiples are specified only to distinguish RU1 and RA1 from non-emergency conditions and from each other. While these multiples obviously correspond to an off-site dose, the classification emphasis is on a release that does not comply with a license commitment for an extended period of time.
- While some of the EALs for RU1 and RA1 use indications of off-site dose rates as **symptoms** that the ODCM may be exceeded, the IC, and the classification, are **NOT** concerned with the particular value of off-site dose. While there may be quantitative inconsistencies involved with this protocol, the qualitative basis of the EAL, i.e., loss of plant control, is not affected.
- The basis of the RS1 and RG1 ICs **IS** a particular value of off-site dose for the event duration. RG1 is set to the value of the EPA PAG. RS1 is a fraction (10%) of the EPA PAG. As such, these ICs are consistent with the fundamental definitions of a SAE and GE.

A.3 Emergency Action Level Thresholds

EALs and bases are provided for each of the classifications. The EALs correspond numerically with the thresholds expressed in the respective IC. Two cases are applicable to the effluent EALs:

1. The EAL corresponds numerically to the threshold in the respective IC. For example, a field survey result of 1000 mrem/hr for a projected condition of one hour corresponds directly to RG1.

2. The EAL corresponds numerically to the threshold in the respective IC under certain assumed conditions. For example, an effluent monitor reading that equates to 100 mrem for the projected duration of the release corresponds numerically to RS1 *if* the actual meteorology, source term, and release duration match those used in establishing the monitor thresholds.

There are four typical EALs:

- Effluent Monitor Readings: These EALs are pre-calculated values that correspond to the condition identified in the IC for a given set of assumptions.
- Field Survey Results: These EALs are included to provide a means to address classifications based on results from field surveys.
- Dose Assessment Results: These EALs are included to provide a means to address classifications based on dose assessments.

A.3.1 Effluent Monitor Readings

As noted above, these EALs are pre-calculated values that correspond to the condition identified in the IC for a given set of assumptions. The degree of correlation is dependent on how well the assumed parameters (e.g., meteorology, source term, etc.) represent the actual parameters at the time of the emergency.

RS1 and RG1

Classifications should be made under these EALs if VALID (e.g., channel check, comparison to redundant/diverse indication, etc.) effluent radiation monitor readings exceed the pre-calculated thresholds. In a change from previous versions of this methodology, confirmation by dose assessments is no longer required as a prerequisite to the classification. Nonetheless, dose assessments are important components of the overall accident assessment activities when significant radioactivity releases have occurred or are projected. Dose assessment results, when they become available, may serve to confirm the validity of the effluent radiation monitor EAL, may indicate that an escalation to a higher classification is necessary, or may indicate that the classification wasn't warranted. RS1 and RG1 both provide that, if dose assessment results are available, the classification should be based on the dose assessment result rather than the effluent radiation monitor EAL.

RU1 and RA1

ODCMs provide a methodology for determining default and batch-specific effluent monitor alarm setpoints. The applicable limits are 500 mrem/year whole body or 3000 mrem/year skin from noble gases. (Inhalation dose rate limits are not addressed here because the specified surveillance involves collection and analysis of composite samples. This after-the-fact assessment could not be made in a timely manner conducive to accident classification.) These setpoints are calculated using default source terms or batch-specific sample isotopic results and annual average χ/Q. Because the meteorology data is pre-defined, there is a direct correlation between the monitor setpoints and the ODCM limits. Although the actual χ/Q may be different, NUREG-1022, "Event Reporting Guidelines 10 CFR 50.72 and 50.73," provided *"…Annual average meteorological data should be used for determining off-site airborne concentrations of radioactivity to maintain consistency with the Technical Specifications for reportability thresholds.*" The ODCM methodology is based on long-term continuous releases. However, its use here in a short term release situation is appropriate. Remember that the RU1 and RA1 ICs are based on a loss of plant control indicated by the failure to comply with a multiple of the ODCM release limits for an extended period and that the ODCM provides the methodology for showing compliance with the ODCM.

To obtain the thresholds, multiply the ODCM setpoint for each monitor by 2 (RU1) or 200 (RA1). It would be preferable to reference "*2 x ODCM Setpoint"* or *"200 x ODCM Setpoint"* as the threshold. In this manner, the EAL would always change in step with changes in the ODCM setpoint (e.g., for a batch or special release). In actual practice, there may be a "warning" and a "high" alarm setpoint. The setpoint that is closest in value to the ODCM limit should be used. Facility ODCMs may lower the actual setpoint to provide an administrative "safety margin." Also, if there is more than one unit

or release stack on the site, the ODCM limits may be apportioned. Two possible approaches to obtain the thresholds are:

- The *"2x"* and *"200x"* multiples could be increased to address the reduced setpoints. For example, if the stack monitor was set to 50% of the ODCM limit, the threshold could be set to *"4x"* and *"400x"* the setpoint on that monitor.
- The reduced setpoints could be ignored and the "2x" and "200x" multiples used as specified. While numerically conservative, using a single set of multipliers would probably be desirable from a human engineering standpoint.

Confirmation by dose assessments is not required as a prerequisite to the classification. While assessments with real meteorology may have provided a basis for escalating to RS1 (or RG1), the assessments could not confirm the RU1 or RA1 classifications because compliance with the ODCM is demonstrated using *annual average* meteorology – not actual meteorology.

Nonetheless, dose assessments are important components of the overall accident assessment activities when significant radioactivity releases have occurred or are projected. Dose assessment results, when they become available, may indicate that an escalation to a higher classification is necessary. RS1 and RG1 both provide that, if dose assessment results are available, the classification should be based on the basis of the dose assessment result rather than the effluent radiation monitor EAL.

In typical practice, the radiological effluent monitor alarms would have been set, on the basis of ODCM requirements, to indicate a release that could exceed the ODCM limits. Alarm response procedures call for an assessment of the alarm to determine whether or not ODCM limits have been exceeded. Utilities typically have methods for rapidly assessing an abnormal release in order to determine whether or not the situation is reportable under 10 CFR 50.72. Because a radioactivity release of a magnitude comparable to the ODCM limits will not create a need for off-site protective measures, it would be reasonable to use these abnormal release assessment methods to initiate dose assessment techniques using actual meteorology and projected source term and release duration.

A.3.2 Field Survey Results, Dose Projection Results

RS1 and RG1

The field survey results are included to provide a means for classification based on actual measurements. There is a 1:1 correlation (with consideration of release duration) between these EALs and the IC because all are dependent on actual meteorology.

Dose projection result EALs are included to provide a basis for classification based on results from assessments triggered at lower emergency classifications. If the dose assessment results are available at the time that the classification is made, the results should be used in conjunction with this EAL for classifying the event rather than the effluent radiation monitor EAL.

Although the IC references TEDE and thyroid CDE as criteria, field survey results will generally not be reported in these dose quantities, but rather in terms of a dose rate. For this reason, the field survey EALs are based on a β-γ dose rate and a thyroid CDE value, both assuming one hour of exposure (or inhalation). If individual site analyses indicate a longer or shorter duration for the period in which the substantial portion of the activity is released, the longer duration should be used for the field survey EALs.

RU1 and RA1

As discussed previously, the threshold in these ICs is based on exceeding a multiple of the ODCM for an extended period. While these three EALs are also expressed in dose rate, they are dependent on *actual* meteorology. However, compliance with the ODCM is demonstrated using *annual average* meteorology. Due to this, the only time that there would be a 1:1 correlation between the IC and these EALs is when the value of the actual meteorology matched the annual average - an unlikely situation. For this reason, these EALs can only be indirect indicators that the ODCM may be exceeded. The three EALs are consistent with the fundamental basis of RU1 and RA1, that of an uncontrolled radioactivity release that indicates a loss of plant control. A dose rate, at or beyond the site boundary, greater than 0.1 mR/hr for 60 minutes or 10.0 mR/hr for 15 minutes is consistent with this fundamental basis, regardless of the lack of numerical correlation to the ODCM. The time periods chosen for the NOUE RU1 (60 minutes) and Alert RA1 (15 minutes) are indicative of the relative risks based on the loss of ability to terminate a release.

The numeric values shown in RU1 and RA1 are based on a release rate not exceeding 500 mrem per year, converted to a rate of: 500 ÷ 8766 = 0.057 mR/hr. If we take a multiple of 2, as specified in the NOUE threshold, this equates to a dose rate of about 0.11 mR/hr, which rounds to the 0.1 mR/hr specified in RU1. Similarly for the RA1 EALs, we obtain 10 mR/hr.

A.4 Interface Between ODCM and ICs/EALs

For RU1 and RA1, a strong link was established with the facility's ODCM. The RU1 and RA1 EALs are indexed to the ODCM alarm setpoints. This was done for several reasons:

- To allow the EALs to use the monitor setpoints already in place in the facility ODCM, thus eliminating the need for a second set of values as the EALs. The EAL could reference “2x ODCM Setpoint” or “200x ODCM Setpoint” for the monitors addressed in the ODCM. Extensive calculations would only be necessary for monitors not addressed in the ODCM.
- To take advantage of the alarm setpoint calculational methodology already documented in the facility ODCM.
- To ensure that the operators had an alarm to indicate the abnormal condition. If the monitor threshold was less than the default ODCM setpoint, the operators could be in the position of having exceeded an EAL and not knowing it.

- To simplify the IC/EAL by eliminating the need to address planned and UNPLANNED releases, continuous or batch releases, monitored or unmonitored releases. Any release that complies with the ODCM controls would not exceed a monitor threshold.
- To eliminate the possibility of a planned release (e.g., containment/primary containment purge) resulting in effluent radiation monitor readings that exceed a classification threshold that was based on a different calculation method. ODCMs typically require specific alarm setpoints for such releases. If the release can be authorized under the provisions of the ODCM, an emergency classification is not warranted. If the monitor threshold is indexed to the ODCM setpoint (e.g., *"...2 x ODCM setpoint..."*) the monitor EAL will always change in step with the ODCM setpoint.
- Although the ODCM addresses long term routine releases, its use here for short term releases is appropriate. The IC is specified in terms of a release that exceeds ODCM for an extended period of time. Compliance to the ODCM is shown using the ODCM methodology.

A.5 Setpoints versus Monitor EALs

Effluent monitors have provision for two separate alarm setpoints associated with the level of measured radioactivity. (There may be other alarms for parameters such as low sample flow.) These setpoints are typically established by the facility ODCM. As such, at most sites the values of the monitor thresholds will not be implemented as actual alarm setpoints, but would be tabulated in the classification procedure. If the monitor thresholds are calculated as suggested herein they will be higher than the ODCM alarm setpoints by at least a factor of two (i.e., RU1). This alarm alerts the operator to compare the monitor indication to the thresholds.

A.6 The Impact of Meteorology

The existence of uncertainty between actual event meteorology and the meteorology assumed in establishing the EALs was identified above. It is important to note that uncertainty is present regardless of the meteorology data set assumed. The magnitude of the potential difference and, hence, the degree of conservatism will depend on the data set selected. Data sets that are intended to ensure low probability of under-conservative assessments have a high probability of being over-conservative. For NPPs, there are different sets of meteorological data used for different purposes. The two primary sets are:

- For accident analyses purposes, sector χ/Q values are set at that value that is exceeded only 0.5% of the hours wind blows into the sector. The highest of the 16 sector values is the maximum sector χ/Q value. The site χ/Q value is set at that value that is exceeded only 5% of the hours for all sectors. The higher of the sector or site χ/Q values is used in accident analyses.
- For routine release situations, annual average χ/Q values are calculated for specified receptor locations and at standard distances in each of the 16 radial sectors. In setting ODCM alarm setpoints, the annual average χ/Q value for the most restrictive receptor at or beyond the site boundary is used. The sector annual average χ/Q value is normalized for the percentage of time

that the wind blows into that sector. In an actual event, the wind direction may be into the affected sector for the entire release duration. Many sites experience typical sector χ/Qs that are 10-20 times higher than the calculated annual average for the sector.

Annual average meteorology is used for establishing effluent monitor thresholds. This decision was based on the following considerations.

- Use of the accident χ/Qs, may be too conservative. For some sites, the difference between the accident χ/Q and the annual average χ/Q can be a factor of 100-1000. With this difference in magnitude, the calculated monitor EALs for RS1 or RG1 might actually be less than the ODCM alarm setpoints, resulting in unwarranted classifications for releases that might be in compliance with ODCM limits.
- The ODCM is based in part on annual average χ/Q (non-normalized). ODCMs provide alarm setpoints based on annual average χ/Q that could be used for RU1 and RA1.
- Use of a χ/Q more restrictive than the χ/Q used to establish ODCM alarm setpoints could create a situation in which the EAL value would be less than the ODCM setpoint. In this case, the operators would have no alarm indication to alert them of the emergency condition.
- Use of one χ/Q value for RU1 and RA1 and another for RS1 and RG1 might result in monitor EALs that would not progress from low to high classifications. Instead, the RS1 and RA1 EALs might overlap.

The impact of the differences between the assumed annual average meteorology and the actual meteorology depends on the particular EAL.

- For the RU1 and RA1 effluent monitor EALs, there is no impact because the IC and the EALs are based on annual average meteorology by definition.
- For the field survey and dose assessment results EALs in RS1 and RG1, there is no impact because the IC and these EALs are based on actual meteorology.
- For the RS1 and RG1 effluent monitor EALs, there may be differences because the IC is based on actual meteorology and the monitor EALs are calculated on the basis of annual average meteorology or, on a site-specific basis, one of the more conservative derivatives of annual average meteorology. This is considered as acceptable in that dose assessments using actual meteorology will be initiated for significant radioactivity releases. Needed escalations can be based on the results of these assessments. As discussed previously, this delay was deemed to be acceptable because, in significant release situations, the plant condition EALs should provide the anticipatory classifications necessary for the implementation of off-site protective measures.
- For the field survey and dose assessment results EALs in RU1 and RA1, there is an impact. These three EALs are dependent on actual meteorology. However, the threshold values for all of the RU1 and RA1 EALs are based on the assumption of annual average meteorology. If the actual and annual average meteorology were equal, the IC and all of the EALs would correlate.

Because it is likely that the actual meteorology will exceed the annual average meteorology, there will be numerical inconsistencies between these EALs and the IC. The three EALs are consistent with the fundamental basis of RU1 and RA1, that of an uncontrolled radioactivity release that indicates a loss of plant control. A dose rate, at or beyond the site boundary, greater than 0.1 mR/hr for 60 minutes or 10.0 mR/hr for 15 minutes is consistent with this fundamental basis, regardless of the lack of numerical correlation to the ODCM.

A.7 The Impact of Source Term

The ODCM methodology should be used for establishing the monitor thresholds for these ICs. The ODCM provides a default source term based on expected releases. In many cases, the ODCM source term is derived from expected and/or design releases tabulated in the FSAR.

For RS1 and RG1, the bases use the same source terms used for establishing monitor thresholds for RU1 and RA1, or an accident source term if deemed appropriate. This approach promotes proper escalations, use of realistic values, and correlation between radiological monitor values and dose assessment results. Other source terms may be appropriate to achieve these goals.

Even if the same source term is used for all four ICs, the analyst must consider the impact of overly conservative iodine to noble gas ratios. The RU1 and RA1 IC thresholds are based on external noble gas exposure. The RS1 and RG1 ICs are based on either TEDE or thyroid CDE. TEDE includes a contribution from inhalation exposure (i.e., CEDE) while the thyroid CDE is due solely to inhalation exposure. The inhalation exposure is sensitive to the iodine concentration in the source term. Because RU1 and RA1 are based on noble gases, and RS1 and RG1 are dependent on noble gases and iodine, an overly conservative iodine to noble gas ratio could result in RS1 and RG1 monitor thresholds that either overlap or are too close to the RA1 monitor thresholds.

As with meteorology, assessment of source terms has uncertainty. This uncertainty is compensated for by the anticipatory classifications provided by ICs in other recognition categories.

Appendix 2–Assessment and Monitoring for Actual or Potential Offsite Consequences of a Radiological Emergency

1.0 Introduction

This appendix provides information regarding atmospheric transport and diffusion assessment discussed in Appendix 2 to NUREG-0654, Rev. 1, "Meteorological Criteria for Emergency Preparedness at Operating Nuclear Power Plants."[1] Three topics are identified in Appendix 2 to NUREG-0654:

- Meteorological measurements
- Atmospheric transport and diffusion assessment
- Remote interrogation

Since they are discussed in FSAR Section 2.3, only a brief discussion of meteorological measurements is provided in this Appendix. Similarly, information regarding remote interrogation is included in SSAR Section 2.3 and is only briefly discussed below. This Appendix describes the conceptual design of the software used for the atmospheric transport and diffusion assessment models used by Dominion for its nuclear power plants, including Unit 3.

2.0 Discussion

10 CFR 50.47 requires that the emergency plan provide "adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition are in use."[2] 10 CFR 50, Appendix E, requires emergency facilities and equipment shall include "equipment for determining the magnitude of and for continuously assessing the impact of the release of radioactive materials to the environment."[3]

2.1 Meteorological Measurements

Appendix 2 to NUREG-0654, Rev. 1 clarifies that in order to address the requirement in Appendix E, "the nuclear power plant operator shall have meteorological measurements from primary and backup systems."[4] The design of the system for meteorological measurement system is discussed in FSAR Section 2.3. This design addresses the guidance provided in Supplement 1 to NUREG-0737.[5]

1. U.S. Nuclear Regulatory Commission, NUREG-0654/FEMA REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Washington, DC, November 1980.
2. 10 CFR 50.47(b)(9)
3. 10 CFR 50, Appendix E, IV.E.2
4. NUREG-0654, Rev. 1, Appendix 2, "Meteorological Criteria for Emergency Preparedness at Operating Nuclear Power Plants," Washington, DC, November 1980.
5. U.S. Nuclear Regulatory Commission, NUREG-0737, Supplement 1, "Clarification of TMI Action Plan Requirements," Washington, DC, January 1983

2.2 Atmospheric Transport and Diffusion Assessment

Atmospheric transport and diffusion assessment requirements are discussed in Appendix E to 10 CFR 50 which states, "the means to be used for determining the magnitude of and for continually assessing the impact of the release of radioactive material shall be described."[1] Two classes of atmospheric transport and diffusion models are discussed in NUREG-0654. This Appendix discusses the software used for Unit 3, which addresses guidance associated with the "Class B" model described in Appendix 2 of NUREG-0654, Rev. 1: "a numerical model which predicts the spatial and temporal variations of plume distribution and provides estimates of deposition and relative concentration of radioactivity within the plume exposure and ingestion pathway emergency planning zones for the duration of any radioactive materials releases during a declared emergency."[2]

2.3 Remote Interrogation

Guidance concerning remote interrogation is also discussed in Appendix 2 of NUREG-0654, Rev. 1. The guidance supports the requirement in 10 CFR 50, Appendix E for "provisions for communications among the nuclear power reactor control room, the onsite technical support center and the near-site emergency operations facility; and among the nuclear facility, the principal State and local emergency operations centers, and field assessment teams."[3] Provisions related to remote interrogation and communications are discussed in SSAR Section 2.3.

3.0 Design Description: Atmospheric Transport and Diffusion Assessment

The remainder of this Appendix focuses on the conceptual design for the atmospheric transport and diffusion assessment models used by Dominion. Inspections, tests, analyses, and acceptance criteria (ITAAC) address requirements in 10 CFR 50.47(b)(9), discussed previously in this Appendix, and address evaluation criteria from NUREG-0654, Rev. 1 that are discussed in Section II.I of this plan. The conceptual design addresses the following program elements for accident assessment:

- The means exist to provide initial and continuing radiological assessment throughout the course of an accident. This addresses both ITAAC 6.1 (COLA Part 10, Table B-1) and the requirements of SSAR Section 13.3.2.2.2.i.
- The means exist to determine the source term of releases of radioactive material within plant systems, and the magnitude of the release of radioactive materials based on plant system parameters and effluent monitors. This addresses both ITAAC 6.2 (COLA Part 10, Table B-1) and the requirements of SSAR Section 13.3.2.2.2.h.3.

1. 10 CFR 50, Appendix E, IV.B
2. NUREG-0654, Rev. 1, Appendix 2, "Meteorological Criteria for Emergency Preparedness at Operating Nuclear Power Plants," Washington, DC, November 1980.
3. 10 CFR 50, Appendix E, IV.E.9.c

- The means exist to continuously assess the impact of the release of radioactive materials to the environment, accounting for the relationship between effluent monitor readings, and onsite and offsite exposures and contamination for various meteorological conditions. This addresses both ITAAC 6.1 (COLA Part 10, Table B-1) and the requirements of SSAR Section 2.3.3.1.1.
- The means exist to make rapid assessment of potential magnitude and locations of any radiological hazards through gaseous release pathways. This addresses both ITAAC 6.5 (COLA Part 10, Table B-1) and the requirements of SSAR Section 13.3.2.2.2.i.1.
- The means exist to estimate integrated dose from the projected and actual dose rates, and for comparing these estimates with the EPA protective action guides (PAGs). This addresses both ITAAC 6.7 (COLA Part 10, Table B-1) and the requirements of SSAR Section 13.3.2.2.2.k.3.

3.1 Overview, Introduction, and Functions

The software system is designed for use by Dominion's nuclear power plant units to address their emergency preparedness and accident analyses needs. This software is referred to as MIDAS (Meteorological Information and Dose Assessment System) or MIDAS-NU (MIDAS-Nuclear). Section 3.2 discusses the accident and routine release calculations. Section 3.3 is divided into general categories such as "data acquisition," "data summary display," and "utilities."

3.1.1 Summary and Purpose

The MIDAS system is comprised of a series of software components that function in a multi-tasked Microsoft Windows™ environment. The computer receives data from external devices including meteorological and plant effluent monitors. Data can be received via serial port devices or over a local area network (LAN)/wide area network (WAN) connection. Reports are displayed on the screen and printed out. Also, reports can be sent via LAN/WAN connection to central control units.

Input data are available periodically from measuring devices on a meteorological tower and from effluent monitors that measure concentrations or dose. Calculations are made in the computer that can be used to determine the health impact of the release. The user schedules runs from a Graphic User Interface (GUI).

The released material is tracked in the environment as it is carried by the wind and dispersed. The three most important parameters are wind speed, wind direction, and atmospheric turbulence. The wind speed determines the initial dilution and plume travel speed. The wind direction determines the effluent plume trajectory. The turbulence determines the rate of spread or growth of the plume. These factors, along with assumptions related to the rate of deposit of particulate matter, are used to determine plume concentration and deposition as a function of location and time.

The accumulated doses to a stationary person are computed based on the estimated variation of the effluent concentration and deposition. The plume tracks are plotted on site maps.

The time-integrated doses resulting from a longer exposure or release can be calculated and results plotted or printed in tabular form. For proper display of time-integrated long-term releases, doses from each release are added on the grid and an isopleth (filled contour showing potentially dangerous areas) is plotted.

3.1.2 General Software Specifications

Software is written in ANSI 1977 compatible FORTRAN, Visual Basic 5 (compiled), or C. The modular nature of the software facilitates modifications. Software modifications follow established quality assurance procedures. Each computer is run under the Microsoft Windows™ operating system as a stand-alone unit. Separate files are available for receipt of meteorological and effluent monitor data. Running of the plume model calculations does not interfere with ongoing, real-time data acquisition and storage.

3.1.3 User Interface

The software is written to interact with the user from the GUI. The user is prompted for information needed from a series of input screens. The software checks for invalid entries insofar as practicable. The user is not allowed to confirm an input screen until requirements for input from that screen are satisfied. Entries are made with the mouse including those on the keypad pop-up menu.

3.2 Accident Calculations

The primary functions of the MIDAS system are to collect and process data, perform atmospheric dispersion calculations, prompt the user for minimum input, estimate dose due to radiological exposure, and display results in a color graphics format. MIDAS-NU incorporates a fast-running, time-dependent, variable trajectory, Gaussian plume segment atmospheric dispersion model. The transport portion of model enables the plume direction and location to vary every 15 minutes as the wind speed, direction, and other weather conditions change. Radiation doses/exposures are accumulated in a polar grid, enabling plume direction changes when the meteorological conditions vary. Results are contoured and displayed on a map. Wind fields are computed from onsite meteorological data input to the system.

MIDAS-NU also has a simple model that estimates transport and dispersion of releases in a uniform wind field, with no changes in the meteorological or release parameters. This is used only in the back calculation module.

It is important to note that the models used in MIDAS-NU are estimating tools. MIDAS-NU results are highly dependent on the accuracy of the current local weather conditions and other input data (e.g., terrain, building characteristics, and amount of material released) that are processed within MIDAS-NU. The more accurate the data that is supplied to MIDAS-NU, the more accurate its predictive estimates will be. Due to uncertainties associated with input information and inherent in dispersion models in general, MIDAS-NU predictions should not necessarily be regarded as fact.

3.3 Data Acquisition

Meteorological and field sensor data is collected and its quality checked to assure that an adequate database is available for dispersion calculations and support of emergency operations. Hardware and software specific to the data being collected may be needed in order to collect the data and transmit it to the MIDAS system. The collected data are stored within the overall MIDAS system and therefore available for calculations in the future. Fifteen-minute averages of meteorological data are computed from the data collected and written into the appropriate files. Bad or missing data will be flagged by the data codes for each record. There are a number of tasks in MIDAS that can be used to display or edit the data. A task is a discrete processing action within the software that performs an important function. For each function selected a different task list will be shown. The tasks are selected by clicking on the task text and then “Run Task” to execute. These tasks are accessed using the MDVDCOLL icon. When selected the user will be presented with the menu shown below. Every task may not be available on every system.

Calculations assume that the hourly average is representative of the 15 minute period centered on each 15 minute period (00, 15, 30, 45) (e.g., the time on the hour is from 7.5 minutes before the hour to 7.5 minutes after the hour.).

For the hourly averaging, the following technique is used:

- Speeds, delta temperatures, temperatures, and miscellaneous sensors are averaged. Directions are vector averaged.
- Rain is accumulated.
- Field radiation monitor data are reported as rad/hr.
- Cloud cover is in percent.
- Effluent monitor data are averaged.

3.4 Data Summary Displays

After the databases have been conditioned, the file contents can be inspected using a series of data summary displays described in the following sections. The resulting function/task menu is displayed.

When the Average display tasks are selected the user will enter parameters to describe the data to be displayed. These parameters will include the amount of data displayed for each parameter (time groups), the sensors to be displayed, the date range (start date and end date), averaging time for the data (data frequency) and the type of data (raw or workspace). Similar data are required for Data Quality.

3.4.1 Meteorological Displays

A task is provided to print the hour or 15 minute meteorological parameter averages received over any specified time period (within the bounds of the file). The “trend plot” tasks can be used to plot meteorological data making it easy to spot problem areas in the data. The data summary routines can be used in conjunction with edits to inspect and correct data. The summaries may show, for example, that a particular edit was not successful or resulted in data that was suspect. Further edits of data would then be in order.

3.4.2 Radiological Displays

Radiation monitors typically send gamma dose rate measurements (in R/hr). Averages would be updated every 15 minutes.

3.5 Utilities

The system incorporates a series of utilities that are separate from standard Microsoft WINDOWS™ utilities. These include the ability to initialize raw data and other types of files as appropriate. They also include capability to save (archive) from or restore to workspace or raw data files. Other utilities necessary for system startup will be provided along with any data that must be loaded.

Appendix 3–Public Alert and Notification System

The Public Alert and Notification System is the same as that used for NAPS Units 1 and 2. COVRERP Appendix 3 provides a description of the Public Alert and Notification System.

Appendix 4–Evacuation Time Estimates (summary)*

*Note: Attachment 4 is the executive summary from the full report.

EXECUTIVE SUMMARY

This report describes the analyses undertaken and the results obtained by a study to develop Evacuation Time Estimates (ETE) for the North Anna Power Station (NAPS) located in Louisa County, Virginia. ETE are part of the required planning basis and provide NAPS and State and local governments with site-specific information needed for Protective Action decision-making.

In the performance of this effort, all available prior documentation published by Federal Government agencies and relevant to Evacuation Time Estimates was reviewed. Most important of these are:

- Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG 0654/FEMA-REP-1, Rev. 1, November 1980.
- Analysis of Techniques for Estimating Evacuation Times for Emergency Planning Zones, NUREG/CR-1745, November 1980.
- Development of Evacuation Time Estimates for Nuclear Power Plants, NUREG/CR-6863, January 2005.

Overview of Project Activities

This project began in May, 2007 and extended over a period of 7 months. This report was revised in 2008 in response to RAI from the NRC. These revisions included a refinement of the calculations performed earlier. The major activities performed are briefly described in chronological sequence:

- Attended "kick-off" meetings with Dominion Generation personnel and emergency management personnel representing state and local governments.
- Reviewed prior ETE reports prepared for NAPS.
- Studied Geographical Information Systems (GIS) maps of the area in the vicinity of NAPS, then conducted a detailed field survey of the highway network.
- Obtained GIS shapefiles of address points within the EPZ from Virginia Department of Emergency Management (VDEM) and estimated 2008 population from this data.
- Synthesized this information to create an analysis network representing the highway system topology and capacities within the Emergency Planning Zone (EPZ), plus a "Shadow" area extending 15 miles radially from the plant.
- Designed and sponsored a telephone survey of residents within the EPZ to gather focused data needed for this ETE study that were not contained within the

census database. The survey instrument was reviewed and modified by State and county personnel prior to the survey.

- Data collection forms (provided to the counties at the kickoff meeting) were returned with data pertaining to employment, transients, and special facilities in each county.
- The traffic demand and trip-generation rates of evacuating vehicles were estimated from the gathered data. The trip generation rates reflected the estimated mobilization time (i.e., the time required by evacuees to prepare for the evacuation trip) computed using the results of the telephone survey of EPZ residents.
- Following Federal guidelines, the EPZ is subdivided into 25 Protective Action Zones (PAZ). These PAZ are then grouped within circular areas or "keyhole" configurations (circles plus radial sectors) that define a total of 27 Evacuation Regions.
- The time-varying external circumstances are represented as Evacuation Scenarios, each described in terms of the following factors: (1) Season (Summer, Winter); (2) Day of Week (Midweek, Weekend); (3) Time of Day (Midday, Evening); and (4) Weather (Good, Rain, and Snow). Two special scenarios – construction of a new unit with and without refueling at the operating unit – were considered.
- The Planning Basis for the calculation of ETE is:
  - A rapidly escalating accident at NAPS that quickly assumes the status of General Emergency such that the Advisory to Evacuate is virtually coincident with the siren alert.
  - While an unlikely accident scenario, this planning basis will yield ETE, measured as the elapsed time from the Advisory to Evacuate until the last vehicle exits the impacted Region, that represent "upper bound" estimates. This conservative Planning Basis is applicable for all initiating events.
- If the emergency occurs while schools are in session, the ETE study assumes that the children will be evacuated by bus directly to specified Evacuation Assembly Centers (EAC) located outside the EPZ. Parents, relatives, and neighbors are advised to not pick up their children at school prior to the arrival of the buses dispatched for that purpose. The ETE for school children are calculated separately.
- Evacuees who do not have access to a private vehicle will either ride-share with relatives, friends or neighbors, or be evacuated by buses provided as specified in the county evacuation plans. Those in special facilities will likewise be evacuated with public transit, as needed: bus, van, or ambulance, as required. Separate ETE are calculated for the transit-dependent evacuees and for those

evacuated from special facilities.

- In response to RAI obtained from the NRC, refinements to the IDYNEV input data were introduced and a second set of ETE calculations were undertaken using updated transient population estimates. In addition, two snow scenarios were introduced.

Computation of ETE

A total of 378 ETE were computed for the evacuation of the general public. Each ETE quantifies the aggregate evacuation time estimated for the population within one of the 27 Evacuation Regions to completely evacuate from that Region, under the circumstances defined for one of the 14 Evacuation Scenarios (27 x 14 = 378). Separate ETE are calculated for transit-dependent evacuees, including school children for applicable scenarios.

Except for Region R03, which is the evacuation of the entire EPZ, only a portion of the people within the EPZ would be advised to evacuate. That is, the Advisory to Evacuate applies only to those people occupying the specified impacted region. It is assumed that 100 percent of the people within the impacted region will evacuate in response to this Advisory. The people occupying the remainder of the EPZ outside the impacted region may be advised to take shelter.

The computation of ETE assumes that a portion of the population within the EPZ but outside the impacted region, will elect to "voluntarily" evacuate. In addition, a portion of the population in the "Shadow" region beyond the EPZ that extends to a distance of 15 miles from NAPS, will also elect to evacuate. These voluntary evacuees could impede those who are evacuating from within the impacted region. The impedance that could be caused by voluntary evacuees is considered in the computation of ETE for the impacted region.

The computational procedure is outlined as follows:

- A link-node representation of the highway network is coded. Each link represents a unidirectional length of highway; each node usually represents an intersection or merge point. The capacity of each link is estimated based on the field survey observations and on established procedures.
- The evacuation trips are generated at locations called "zonal centroids" located within the EPZ. The trip generation rates vary over time reflecting the mobilization process, and from one location (centroid) to another depending on population density and on whether a centroid is within, or outside, the impacted area.
- The computer models compute the routing patterns for evacuating vehicles that

are compliant with federal guidelines (outbound relative to the location of NAPS), then simulate the traffic flow movements over space and time. This simulation process estimates the rate that traffic flow exits the impacted region.

- The ETE statistics provide the elapsed times for 50 percent, 90 percent, 95 percent and 100 percent, respectively, of the population within the impacted region, to evacuate from within the impacted region. These statistics are presented in tabular and graphical formats.
- All ETE presented in this report reflect the work performed in 2008.

Traffic Management

This study includes the development of a comprehensive traffic management plan designed to expedite the evacuation of people from within an impacted region. This plan, which should be reviewed by State and local law enforcement personnel, is also designed to control access into the EPZ after returning commuters have rejoined their families.

The plan is documented in the form of detailed schematics specifying: (1) the directions of evacuation travel to be facilitated, and other traffic movements to be discouraged; (2) the traffic control personnel and equipment needed (cones, barricades) and their deployment; (3) the locations of these "Traffic Control Points" (TCP); (4) the priority assigned to each traffic control point indicating its relative importance and how soon it should be manned relative to others; and (5) the number of traffic control personnel required.

Selected Results

A compilation of selected information is presented on the following pages in the form of Figures and Tables extracted from the body of the report; these are described below.

- Figure 3-1 displays a map of the NAPS site showing the layout of the 25 PAZ that comprise, in aggregate, the Emergency Planning Zone (EPZ).
- Table 3-1 presents the estimates of permanent resident population and vehicles for 2008 in each PAZ based on the data provided by VDEM and on the results of the telephone survey.
- Table 6-1 defines each of the 27 Evacuation Regions in terms of their respective groups of PAZ.
- Table 6-2 lists the 14 Evacuation Scenarios.
- Tables 7-1C and 7-1D are compilations of Evacuation Time Estimates (ETE).

These data are the times needed to *clear the indicated regions* of 95 and 100 percent of the population occupying these regions, respectively. These computed ETE include consideration of mobilization time, and of estimated voluntary evacuations from other regions within the EPZ and from the shadow region.

- Table 8-3A presents ETE for the schoolchildren in good weather.
- Table 8-5A presents ETE for the transit-dependent population in good weather.

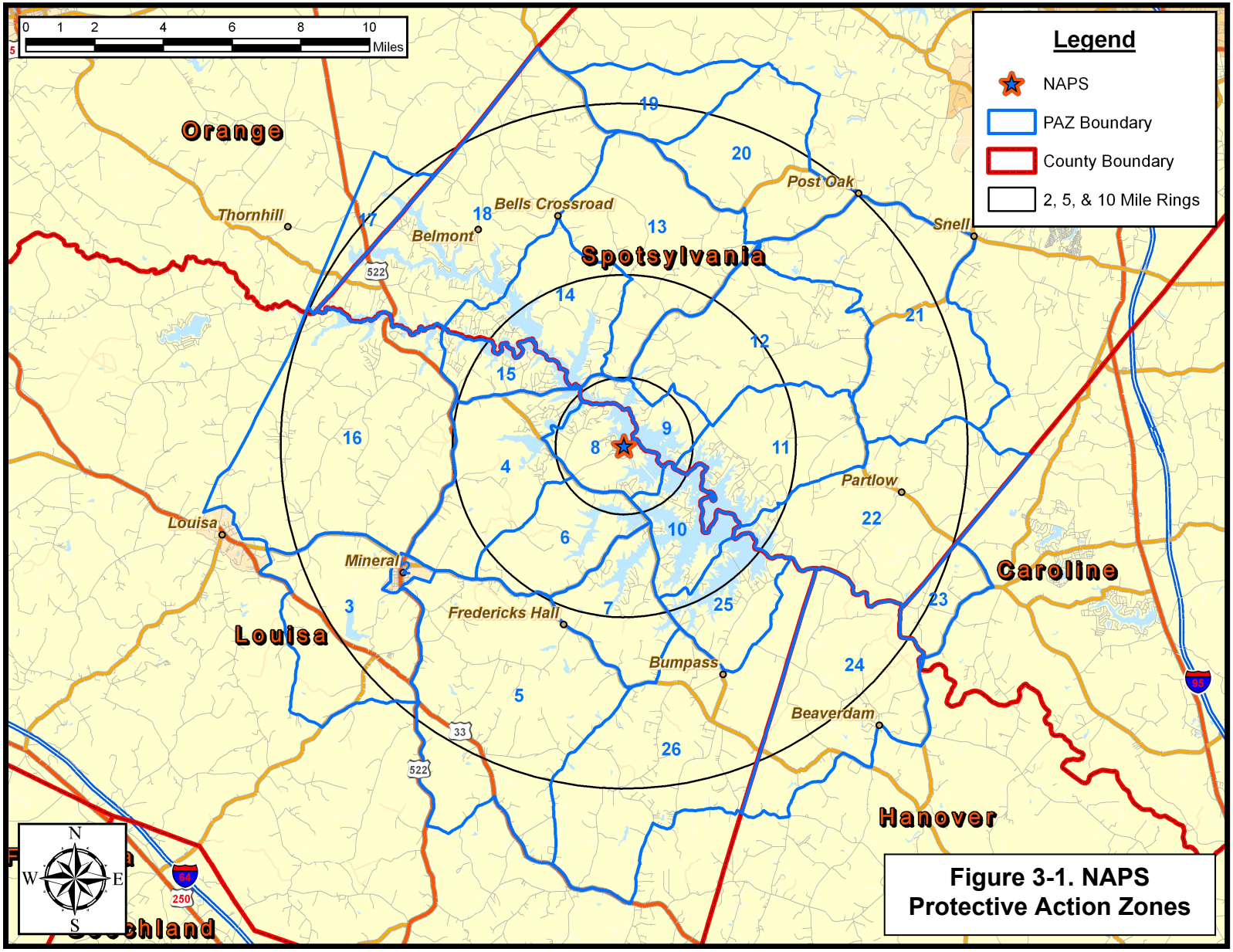

Figure 3-1. NAPS Protective Action Zones

Table 3-1. Permanent Resident Population and Vehicles by PAZ		
PAZ	**2008 POPULATION**	**2008 VEHICLES**
2	645	358
3	1,843	1,025
4	1,842	1,022
5	1,740	968
6	727	404
7	939	522
8	885	490
9	426	236
10	1,151	638
11	1,345	748
12	1,467	814
13	1,312	728
14	1,719	952
15	1,589	879
16	2,153	1,200
17	223	124
18	3,624	2,008
19	352	197
20	1,025	571
21	2,125	1,181
22	1,639	909
23	341	190
24	989	549
25	902	500
26	2,420	1,343
TOTAL:	**33,423**	**18,556**

Table 6-1. Decscription of Evacuation Regions																										
		Protective Action Zone (PAZ)																								
Region	Description	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
R01	2 mile ring					X		X	X	X																
R02	5-mile ring			X		X	X	X	X	X	X	X	X	X	X										X	
R03	Full EPZ	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Evacuate 2 mile ring and 5 miles downwind																										
	Wind Direction	Protective Action Zone (PAZ)																								
Region	Toward:	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
R04	N, NNE					X		X	X	X		X	X	X												
R05	NE					X		X	X	X	X	X	X													
R06	ENE, E					X		X	X	X	X	X														
R07	ESE, SE					X		X	X	X	X														X	
R08	SSE, S					X	X	X	X	X															X	
R09	SSW					X	X	X	X	X																
R10	SW			X		X	X	X	X	X																
R11	WSW			X		X		X	X	X																
R12	W			X		X		X	X	X					X											
R13	WNW, NW			X		X		X	X	X				X	X											
R14	NNW					X		X	X	X			X	X	X											
Evacuate 5 mile ring and downwind to EPZ boundary																										
	Wind Direction	Protective Action Zone (PAZ)																								
Region	Toward:	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
R15	N			X		X	X	X	X	X	X	X	X	X	X			X	X	X					X	
R16	NNE			X		X	X	X	X	X	X	X	X	X	X			X	X	X	X				X	
R17	NE			X		X	X	X	X	X	X	X	X	X	X				X	X	X				X	
R18	ENE			X		X	X	X	X	X	X	X	X	X	X					X	X	X			X	
R19	E			X		X	X	X	X	X	X	X	X	X	X						X	X	X		X	
R20	ESE			X		X	X	X	X	X	X	X	X	X	X						X	X	X	X	X	X
R21	SE			X		X	X	X	X	X	X	X	X	X	X							X	X	X	X	X
R22	SSE, S			X	X	X	X	X	X	X	X	X	X	X	X									X	X	X
R23	SSW	X	X	X	X	X	X	X	X	X	X	X	X	X	X										X	X
R24	SW, WSW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	
R25	W	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X							X	
R26	WNW, NW			X		X	X	X	X	X	X	X	X	X	X	X	X	X							X	
R27	NNW			X		X	X	X	X	X	X	X	X	X	X		X	X	X						X	

Table 6-2. Evacuation Scenario Definitions					
Scenario	**Season**	**Day of Week**	**Time of Day**	**Weather**	**Special**
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Midweek	Midday	Snow	None
9	Winter	Weekend	Midday	Good	None
10	Winter	Weekend	Midday	Rain	None
11	Winter	Weekend	Midday	Snow	None
12	Winter	Midweek, Weekend	Evening	Good	None
13	Summer	Midweek	Midday	Good	New Plant Construction
14	Summer	Midweek	Midday	Good	New Plant Construction + Refueling

Table 7-1C. Time To Clear The Indicated Area of 95 Percent of the Affected Population

	Summer		Summer		Summer		Winter			Winter			Winter		Summer	Summer
	Midweek		Weekend		Midweek Weekend		Midweek			Weekend			Midweek Weekend		Midweek	Midweek
Scenario:	(1)	(2)	(3)	(4)	(5)	Scenario:	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Scenario:	(13)	(14)
Region Wind Toward:	Midday		Midday		Evening	Region Wind Toward:	Midday			Midday			Evening	Region Wind Toward:	Midday	Midday
	Good Weather	Rain	Good Weather	Rain	Good Weather		Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather		New Plant Construction	New Plant Construction + Refueling
Entire 2-Mile Region, 5-Mile Region, and EPZ																
R01 2-mile ring	3:20	3:20	2:40	2:40	2:50	R01 2-mile ring	3:20	3:20	3:50	2:40	2:40	3:20	2:50	R01 2-mile ring	3:15	3:20
R02 5-mile ring	3:20	3:20	2:40	2:40	2:50	R02 5-mile ring	3:20	3:20	4:00	2:40	2:40	3:20	2:50	R02 5-mile ring	3:35	3:40
R03 Entire EPZ	3:30	3:30	3:20	3:30	3:00	R03 Entire EPZ	3:30	3:40	4:10	2:50	3:00	3:40	3:00	R03 Entire EPZ	3:50	3:55
2-Mile Ring and Downwind to 5 Miles																
R04 N,NNE	3:10	3:10	2:20	2:20	2:40	R04 N,NNE	3:20	3:20	3:50	2:30	2:30	3:10	2:40	R04 N,NNE	3:10	3:20
R05 NE	3:20	3:20	2:30	2:30	2:40	R05 NE	3:20	3:20	3:50	2:40	2:40	3:20	2:50	R05 NE	3:20	3:20
R06 ENE,E	3:20	3:20	2:40	2:40	2:50	R06 ENE,E	3:30	3:30	4:00	2:40	2:40	3:20	2:50	R06 ENE,E	3:20	3:20
R07 ESE,SE	3:20	3:20	2:40	2:40	2:50	R07 ESE,SE	3:20	3:20	4:00	2:50	2:50	3:20	2:50	R07 ESE,SE	3:20	3:25
R08 SSE,S	3:10	3:10	2:40	2:40	2:50	R08 SSE,S	3:20	3:20	4:00	2:50	2:50	3:30	2:50	R08 SSE,S	3:25	3:35
R09 SSW	3:20	3:20	2:40	2:40	2:50	R09 SSW	3:20	3:20	3:50	2:40	2:50	3:20	2:50	R09 SSW	3:20	3:25
R10 SW	3:20	3:20	2:40	2:40	2:50	R10 SW	3:20	3:20	4:00	2:50	2:50	3:30	2:50	R10 SW	3:25	3:35
R11 WSW	3:20	3:20	2:40	2:40	2:50	R11 WSW	3:20	3:20	4:00	2:40	2:40	3:30	2:50	R11 WSW	3:20	3:30
R12 W	3:20	3:20	2:30	2:30	2:50	R12 W	3:20	3:20	4:00	2:40	2:40	3:20	2:40	R12 W	3:25	3:35
R13 WNW,NW	3:10	3:20	2:30	2:30	2:40	R13 WNW,NW	3:20	3:20	3:50	2:40	2:40	3:20	2:50	R13 WNW,NW	3:30	3:35
R14 NNW	3:10	3:10	2:30	2:30	2:40	R14 NNW	3:20	3:20	3:50	2:40	2:40	3:20	2:50	R14 NNW	3:20	3:25
5-Mile Ring and Downwind to EPZ Boundary																
R15 N	3:20	3:20	3:20	3:30	2:50	R15 N	3:30	3:30	4:00	2:50	2:50	3:30	2:50	R15 N	3:35	3:45
R16 NNE	3:30	3:30	3:20	3:30	2:50	R16 NNE	3:30	3:30	4:00	2:50	3:00	3:30	3:00	R16 NNE	3:40	3:45
R17 NE	3:30	3:30	3:00	3:10	2:50	R17 NE	3:30	3:30	4:00	2:50	3:00	3:30	3:00	R17 NE	3:40	3:45
R18 ENE	3:30	3:30	3:00	3:10	2:50	R18 ENE	3:30	3:30	4:00	2:50	3:00	3:30	2:50	R18 ENE	3:40	3:45
R19 E	3:20	3:30	2:50	3:00	2:50	R19 E	3:30	3:30	4:00	2:50	2:50	3:30	2:50	R19 E	3:40	3:45
R20 ESE	3:30	3:30	2:50	3:00	3:00	R20 ESE	3:30	3:30	4:00	2:50	2:50	3:30	3:00	R20 ESE	3:45	3:50
R21 SE	3:30	3:30	2:40	2:50	2:50	R21 SE	3:30	3:30	4:00	2:50	2:50	3:30	3:00	R21 SE	3:45	3:50
R22 SSE,S	3:20	3:30	2:40	2:50	2:50	R22 SSE,S	3:30	3:30	4:00	2:50	2:50	3:30	2:50	R22 SSE,S	3:50	3:50
R23 SSW	3:20	3:20	2:40	2:50	2:50	R23 SSW	3:30	3:30	4:00	2:50	2:50	3:30	2:50	R23 SSW	3:50	3:50
R24 SW,WSW	3:20	3:20	3:00	3:00	2:50	R24 SW,WSW	3:30	3:30	4:00	2:50	2:50	3:30	2:50	R24 SW,WSW	3:45	3:50
R25 W	3:20	3:20	3:20	3:30	2:50	R25 W	3:30	3:30	4:00	2:50	3:00	3:30	2:50	R25 W	3:40	3:50
R26 WNW,NW	3:20	3:20	3:20	3:30	2:50	R26 WNW,NW	3:30	3:30	4:00	2:50	3:00	3:30	2:50	R26 WNW,NW	3:40	3:45
R27 NNW	3:20	3:20	3:20	3:20	2:50	R27 NNW	3:30	3:30	4:00	2:50	2:50	3:30	2:50	R27 NNW	3:35	3:45

Table 7-1D. Time To Clear The Indicated Area of 100 Percent of the Affected Population

	Summer		Summer		Summer		Winter			Winter			Winter		Summer	Summer
	Midweek		Weekend		Midweek Weekend		Midweek			Weekend			Midweek Weekend		Midweek	Midweek
Scenario:	(1)	(2)	(3)	(4)	(5)	Scenario:	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Scenario:	(13)	(14)
Region Wind Toward:	Midday		Midday		Evening	Region Wind Toward:	Midday			Midday			Evening	Region Wind Toward:	Midday	Midday
	Good Weather	Rain	Good Weather	Rain	Good Weather		Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather		New Plant Construction	New Plant Construction + Refueling
Entire 2-Mile Region, 5-Mile Region, and EPZ																
R01 2-mile ring	5:00	5:00	4:00	4:00	4:00	R01 2-mile ring	5:00	5:00	6:00	4:00	4:00	5:00	4:00	R01 2-mile ring	5:00	5:00
R02 5-mile ring	5:00	5:00	4:40	4:40	4:30	R02 5-mile ring	5:00	5:00	6:00	4:40	4:40	5:10	4:30	R02 5-mile ring	5:00	5:00
R03 Entire EPZ	5:10	5:10	4:50	4:50	4:50	R03 Entire EPZ	5:10	5:10	6:10	4:50	4:50	5:20	4:50	R03 Entire EPZ	5:10	5:10
2-Mile Ring and Downwind to 5 Miles																
R04 N,NNE	5:00	5:00	4:00	4:00	4:00	R04 N,NNE	5:00	5:00	6:00	4:00	4:00	5:00	4:00	R04 N,NNE	5:00	5:00
R05 NE	5:00	5:00	4:00	4:00	4:00	R05 NE	5:00	5:00	6:00	4:00	4:00	5:00	4:00	R05 NE	5:00	5:00
R06 ENE,E	5:00	5:00	4:00	4:00	4:00	R06 ENE,E	5:00	5:00	6:00	4:00	4:00	5:00	4:00	R06 ENE,E	5:00	5:00
R07 ESE,SE	5:00	5:10	4:00	4:10	4:00	R07 ESE,SE	5:00	5:00	6:00	4:00	4:00	5:00	4:00	R07 ESE,SE	5:00	5:00
R08 SSE,S	5:00	5:00	4:00	4:10	4:00	R08 SSE,S	5:00	5:00	6:00	4:00	4:00	5:10	4:00	R08 SSE,S	5:00	5:00
R09 SSW	5:00	5:00	4:00	4:10	4:00	R09 SSW	5:00	5:00	6:00	4:00	4:00	5:00	4:00	R09 SSW	5:00	5:00
R10 SW	5:00	5:00	4:00	4:10	4:00	R10 SW	5:00	5:00	6:00	4:00	4:10	5:00	4:00	R10 SW	5:00	5:00
R11 WSW	5:00	5:00	4:00	4:00	4:00	R11 WSW	5:00	5:00	6:00	4:00	4:00	5:00	4:00	R11 WSW	5:00	5:00
R12 W	5:00	5:00	4:00	4:00	4:10	R12 W	5:00	5:00	6:00	4:00	4:00	5:00	4:10	R12 W	5:00	5:00
R13 WNW,NW	5:00	5:00	4:40	4:40	4:40	R13 WNW,NW	5:00	5:00	6:00	4:40	4:40	5:00	4:40	R13 WNW,NW	5:00	5:00
R14 NNW	5:00	5:00	4:40	4:40	4:40	R14 NNW	5:00	5:00	6:00	4:40	4:40	5:00	4:40	R14 NNW	5:00	5:00
5-Mile Ring and Downwind to EPZ Boundary																
R15 N	5:00	5:10	4:50	4:50	4:50	R15 N	5:00	5:10	6:10	4:50	4:50	5:10	4:50	R15 N	5:00	5:00
R16 NNE	5:10	5:10	4:50	4:50	4:50	R16 NNE	5:10	5:10	6:10	4:50	4:50	5:20	4:50	R16 NNE	5:10	5:10
R17 NE	5:10	5:10	4:50	4:50	4:50	R17 NE	5:10	5:10	6:10	4:50	5:00	5:20	4:50	R17 NE	5:10	5:10
R18 ENE	5:10	5:10	4:40	4:50	4:50	R18 ENE	5:10	5:10	6:10	4:50	5:00	5:20	4:50	R18 ENE	5:10	5:10
R19 E	5:10	5:10	4:50	4:50	4:50	R19 E	5:10	5:10	6:10	4:50	4:50	5:10	4:50	R19 E	5:10	5:10
R20 ESE	5:10	5:10	4:50	4:50	4:50	R20 ESE	5:10	5:10	6:10	4:50	4:50	5:20	4:50	R20 ESE	5:10	5:10
R21 SE	5:10	5:10	4:50	4:50	4:50	R21 SE	5:10	5:10	6:10	4:50	4:50	5:20	4:50	R21 SE	5:10	5:10
R22 SSE,S	5:10	5:10	4:50	4:50	4:50	R22 SSE,S	5:10	5:10	6:10	4:50	4:50	5:20	4:50	R22 SSE,S	5:10	5:10
R23 SSW	5:10	5:10	4:50	4:50	4:50	R23 SSW	5:10	5:10	6:10	4:50	4:50	5:10	4:50	R23 SSW	5:10	5:10
R24 SW,WSW	5:10	5:10	4:50	4:50	4:50	R24 SW,WSW	5:10	5:10	6:10	4:50	4:50	5:10	4:50	R24 SW,WSW	5:10	5:10
R25 W	5:10	5:10	4:50	4:50	4:50	R25 W	5:10	5:10	6:10	4:50	4:50	5:10	4:50	R25 W	5:10	5:10
R26 WNW,NW	5:00	5:10	4:40	4:40	4:50	R26 WNW,NW	5:00	5:10	6:10	4:40	4:40	5:10	4:50	R26 WNW,NW	5:10	5:10
R27 NNW	5:00	5:10	4:40	4:40	4:50	R27 NNW	5:00	5:00	6:10	4:50	4:50	5:10	4:40	R27 NNW	5:00	5:00

Table 8-4A. School Evacuation Time Estimates - Good Weather								
School	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Boundary (mi.)	Travel Time to EPZ Bndry (min)*	ETE (hr:min)	Dist. EPZ Bndry to EAC (mi.)	Travel Time EPZ Bndry to EAC (min)**	ETE to EAC (hr:min)
Louisa County Schools								
Thomas Jefferson Elementary School	90	5	1.53	3	**1:40**	9.89	15	**1:55**
Jouett Elementary School	90	5	4.23	8	**1:45**	17.10	26	**2:10**
Louisa County High School	90	5	3.55	7	**1:45**	8.08	13	**1:55**
Louisa County Middle School	90	5	3.30	6	**1:45**	8.07	13	**1:55**
Mineral Christian Preschool (DAYCARE)	90	5	3.49	6	**1:45**	9.02	14	**1:55**
Spotsylvania County Schools								
Berkeley Elementary School	90	5	2.06	4	**1:40**	7.97	12	**1:55**
Livingston Elementary School	90	5	9.29	16	**1:55**	7.21	11	**2:05**
Post Oak Middle School	90	5	4.21	8	**1:45**	7.26	11	**1:55**
Spotsylvania High School	90	5	3.19	6	**1:45**	7.98	12	**1:55**
				Average for EPZ:	**1:45**		**Average:**	**2:00**

*Average speed within EPZ output by PC-DYNEV = 35.0 mph.
**Average speed outside EPZ (assumed) = 40.0 mph.

Table 8-6A. Transit Dependent Evacuation Time Estimates - Good Weather												
	Single Wave					Second Wave						
Route Number	Mobilization (min.)	Route Length (mi.)	Route Travel Time (min.)*	Pickup Time (min.)	ETE (hr:min)	Mobilization (min.)	Unload (min.)	Driver Rest (min.)	Return time to EPZ (min.)	Route Travel Time (min.)**	Pickup Time (min.)	ETE (hr:min)
1	120	22.1	46	30	3:20	120	5	10	20	38	30	3:45
2A	120	22.8	47	30	3:20	120	5	10	20	40	30	3:45
2B	120	27.9	58	30	3:30	120	5	10	20	49	30	3:55
2C	120	31.9	66	30	3:40	120	5	10	20	55	30	4:00
3A	120	21.8	45	30	3:15	120	5	10	20	38	30	3:45
3B	120	16.4	34	30	3:05	120	5	10	20	29	30	3:35
4	120	17.1	35	30	3:05	120	5	10	20	30	30	3:35
5	120	22.0	46	30	3:20	120	5	10	20	38	30	3:45
Average for EPZ:					**3:20**	**Average for EPZ:**						**3:45**

*Average speed within EPZ output by PC-DYNEV at 2:00 = 29.0 mph.
** Average speed within EPZ output by PC-DYNEV at 2:35 = 34.5 mph.

Appendix 5–Implementing Procedures – Topical List

Emergency plan implementing procedures address a range of actions needed to implement the contents of this emergency plan. The emergency plan implementing procedures address, at a minimum, the following topics, including parenthetical references to the affected sections of this plan:

- Emergency Classification (II.D)
- Notifications Associated with Emergency Conditions (II.E, II.L.1)
- Emergency Communications (II.F)
- Protective Action Recommendations (II.J.7, II.J.10)
- Activation of the Emergency Response Organization (I.B)
- Site Assembly, Accountability, and Evacuation (II.J.4, II.J.5)
- Core Damage Assessment (II.I)
- Radiation Protection Under Emergency Conditions (II.K)
- Plume Tracking and Assessment of Offsite Radiological Conditions (II.I)
- Respiratory Protection and Distribution of Radioprotective Drugs (II.J.6)
- Personnel Monitoring (II.K.2, II.K.3)
- Decontamination (II.K.5, II.K.7)
- Obtaining and Analyzing High Activity Samples Under Emergency Conditions (II.I)
- Emergency Media Relations (II.G)
- Recovery and Reentry (II.M)

Additional plant procedures address various activities that are required to support the ongoing maintenance of emergency preparedness. These supporting procedures are not included within the body of the emergency plan implementing procedures. These supporting procedures address, at a minimum, the following topics, including parenthetical references to the affected sections of this plan:

- Emergency Equipment Inventory and Operational Tests (II.H.10)
- Conduct of Emergency Drills and Exercises (II.N)
- Testing of Emergency Communications Systems (II.N, II.F)
- Emergency Plan Training (II.G.5, II.O, II.P.1)
- Maintaining Emergency Preparedness (II.P)

Appendix 6–Emergency Equipment and Supplies

Dominion maintains inventories of emergency equipment and supplies for use by emergency response personnel in the ERFs and by Dominion's offsite field monitoring teams. The actual inventories are based on the activities that occur in, or are dispatched from, the affected facility. Actual inventories are established in inventory lists in accordance with plant procedures. Emergency kit inventories typically include the following:

- Radiation survey instrument(s)
- Surface contamination control and survey supplies
- Air sampling equipment and sampling media
- Scaler(s) or other appropriate radio-analytical counting instrument(s)
- Protective clothing
- Contamination control and decontamination supplies
- Respiratory protection equipment
- Radiological control posting and warning supplies
- Personnel monitoring equipment (record and instantaneous reading dosimeters)
- Radioiodine blocking agent
- Emergency lighting equipment
- Appropriate maps
- Computer equipment
- Plans, procedures, and drawings
- Communications equipment
- Administrative and recordkeeping supplies
- Batteries and other expendable supplies
- First aid supplies (e.g., bandages, stretchers, splints, topical ointments)

Appendix 7–Certification Letter

COMMONWEALTH of VIRGINIA

Department of Emergency Management

MICHAEL M. CLINE
State Coordinator

JACK E. KING
Chief Deputy Coordinator

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Deputy Coordinator

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June 11, 2010

MEMORANDUM

TO: Mrs. Leslie N. Hartz
Vice President, Nuclear Support Services
Dominion Resources Services, Inc.

FROM: Signatory Agencies in Support of the Original North Anna Power Station Emergency Operations Plan, dated July 1974

SUBJECT: Combined License Application for a new nuclear generating unit at the North Anna Power Station

The below-signed state agencies and localities have reviewed the emergency plan supporting the revised Combined License Application for a new nuclear generating unit at the North Anna Power Station. This memorandum updates correspondence filed with Dominion Resources Services, Inc., dated during the period of August-September 2007. The organizations severally certify its commitment that:

- Proposed emergency plans are practicable;
- Virginia Department of Emergency Management is committed to participating in further development of the plans, including any required field demonstrations; and
- Virginia Department of Emergency Management is committed to executing their responsibilities under the plans in the event of an emergency.

Furthermore, the organizations concur with the proposed emergency classification system, initiating conditions, and emergency action levels described in the Combined License Application Emergency Plan and evacuation time estimates.

It is with joint understanding that the specific nature of arrangements in support of emergency preparedness for operation of the proposed new nuclear unit will be clearly established in a properly executed and binding letter of agreement that will be included in the North Anna Unit 3 Combined License Application Emergency Plan if and when Dominion Energy proceeds with construction and operation of this nuclear facility.

We, the below signed, look forward to continuing our partnership in these efforts:

Karen Remley, M.D.
State Health Commissioner
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Nancy.glasheen@vdh.virginia.gov

Date: 6/11/10

Michael M. Cline
State Coordinator, Virginia Department of Emergency Management
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Date: 11 Jun 10

On Behalf of Col. Flaherty. Captain Steven L. Chumley

Colonel W. S. (Steve) Flaherty
Superintendent, Virginia Department of State Police
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DIV. 1 COMMANDER

Date: 6/11/10

~~Robert W. Duncan~~ Dabney W. Watts

Director, Virginia Department of Game and Inland Fisheries, Law Enforcement Division
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Date: 06-11-2010

V.P. Support Services

John F. Duval
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Date: 6-11-10

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Date: 6/15/10

Appendix 8–Cross-Reference to Regulations, Guidance, and State and Local Plans

Note: To a limited extent, certain details of the Commonwealth and risk jurisdiction plans may be specific to Unit 3. Such details will be developed at a later date consistent with the commitments outlined in the certification letter provided in Appendix 7 of this plan.

Requirement	Corresponding COL Emergency Plan Provision
10 CFR 50.47(b)(1)	II.A, II.B, II.C
10 CFR 50.47(b)(2)	II.A, II.B, II.C, II.E, II.F
10 CFR 50.47(b)(3)	II.A, II.B, II.C, II.H
10 CFR 50.47(b)(4)	II.D, App. 1
10 CFR 50.47(b)(5)	II.E, II.F, II.J
10 CFR 50.47(b)(6)	II.E, II.F, II.J
10 CFR 50.47(b)(7)	II.G
10 CFR 50.47(b)(8)	II.H
10 CFR 50.47(b)(9)	II.H, II.I
10 CFR 50.47(b)(10)	II.J, II.K
10 CFR 50.47(b)(11)	II.J, II.K
10 CFR 50.47(b)(12)	II.L
10 CFR 50.47(b)(13)	II.M
10 CFR 50.47(b)(14)	II.N
10 CFR 50.47(b)(15)	II.O
10 CFR 50.47(b)(16)	II.P
10 CFR 50.72(a)(3)	II.E.1
10 CFR 50.72(a)(4)	II.F.1.f
10 CFR 50.72(c)(3)	II.E.4
10 CFR 50 App E.IV	COL Emergency Plan, including App. 4 and Evacuation Time Estimate
10 CFR 50 App E.IV.A	II.A, II.B, II.C, II.E, II.F, II.J, II.K, II.L
10 CFR 50 App E.IV.B	II.D, II.H, II.I, App. 1
10 CFR 50 App E.IV.C	II.A, II.D, II.E. II.F, App. 1
10 CFR 50 App E.IV.D	II.A, II.E, II.F, II.G, App. 3
10 CFR 50 App E.IV.E	II.B, II.F, II.H, II.I, II.L, II.N, App. 2, App. 6
10 CFR 50 App E.IV.F	II.N, II.O

Requirement	Corresponding COL Emergency Plan Provision
10 CFR 50 App E.IV.G	II.P
10 CFR 50 App E.IV.H	II.M

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
A.1.a	Plan §II.A.1.a	Plan §VII, App. 3	Plan §VII	Plan §VII	Plan §VII	Plan §VII	Plan §VII
A.1.b	Plan §II.A.1.b	Plan §VIII, App. 3	Plan §VIII	Plan §VIII	Plan §V.II	Plan §V.II	Plan §VIII
A.1.c	Plan §II.A.1.c	App. 3	Plan Att. 12 & 13	Plan Att. 12 & 13	Plan Att. 12 & 13	Plan Att. 12 & 13	Plan Att. 12 & 13
A.1.d	Plan §II.A.1.d	Plan §VII.C	Plan §VII.A	Plan §VII.A	Plan §VII.A	Plan §VII.A	Plan §VII.A
A.1.e	Plan §II.A.1.e	App. 10 §II.A	Plan §§VII.A, IX.A., IX.B, ESF #5	Plan §§VII.A, IX.A., IX.B, ESF #5	Plan §VII.A, App. 5	Plan §VII.A, App. 5	Plan §§VII.A, IX.A., IX.B, ESF #5
A.2.a		App. 2 Tab A	Plan Att. 13	Plan Att. 13	Plan Att. 13	Plan Att. 13	Plan Att. 13
A.2.b		Plan §I	Plan §I.A	Plan §I.A	Plan §I	Plan §I	Plan §I.A
A.3	Plan §II.A.3	Plan Att. 1	Plan Att. 14	Plan Att. 14	Plan Att. 14	Plan Att. 14	Plan Att. 14
A.4	Plan §II.A.4	App. 1 §C	Plan §VII	Plan §VII	Plan §V.II	Plan §V.II	Plan §VII
B.1	Plan §II.B.1						
B.2	Plan §II.B.2						
B.3	Plan §II.B.3						
B.4	Plan §II.B.4						
B.5	Plan §II.B.5						
B.6	Plan §II.B.6						
B.7	Plan §II.B.7						
B.7	Plan §II.B.7						
B.7	Plan §II.B.7						

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
B.7	Plan §II.B.7						
B.7	Plan §II.B.7						
B.8	Plan §II.B.8						
B.9	Plan §II.B.9						
C.1.a	Plan §II.C.1.a	App. 2 §1.E					
C.1.b	Plan §II.C.1.b	App. 2 §II					
C.1.c	Plan §II.C.1.c	App. 2 Tab B	Plan §IX.A	Plan §IX.A	Plan §IX.A	Plan §IX.A	Plan §IX.A
C.2.a		Plan §VII.D, App. 1 §D.3, App. 2 §I.A.2	not applicable	not applicable	not applicable	not applicable	not applicable
C.2.b	Plan §II.C.2.b						
C.3	Plan §II.C.3	App. 6 §II.C.3					
C.4.	Plan §II.C.4, App. 7	App. 6	Plan Att. 14	Plan Att. 14	Published separately	Published separately	Plan Att. 14
D.1	Plan §II.D.1, App. 1						
D.2	Plan §II.D.2, App. 1						
D.3		App. 5	Plan §VIII.A	Plan §VIII.A	Plan §VIII.A	Plan §VIII.A	Plan §VIII.A
D.4		Plan §VIII.B, App. 5	Plan §VIII.E	Plan §VIII.E	Plan §VIII.E	Plan §VIII.E	Plan §VIII.E

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
E.1	Plan §II.E.1	App. 4	Plan §VIII.C, ESF #2 & #5	Plan §VIII.C, ESF #2 & #5	Plan §VIII.C, App. 1 & 5	Plan §VIII.C, App. 1 & 5	Plan §VIII.C, ESF #2 & #5
E.2	Plan §II.E.2	Plan §VIII.C, App. 1 Tab A, App. 4	Plan §VIII.C, ESF #2 & #5	Plan §VIII.C, ESF #2 & #5	Plan §VIII.C, App. 1 & 5	Plan §VIII.C, App. 1 & 5	Plan §VIII.C, ESF #2 & #5
E.3	Plan §II.E.3						
E.4	Plan §II.E.4						
E.4.a	Plan §II.E.4						
E.4.b	Plan §II.E.4						
E.4.c	Plan §II.E.4						
E.4.d	Plan §II.E.4						
E.4.e	Plan §II.E.4						
E.4.f	Plan §II.E.4						
E.4.g	Plan §II.E.4						
E.4.h	Plan §II.E.4						
E.4.i	Plan §II.E.4						
E.4.j	Plan §II.E.4						
E.4.k	Plan §II.E.4						
E.4.l	Plan §II.E.4						
E.4.m	Plan §II.E.4						
E.4.n	Plan §II.E.4						

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
E.5		Plan §IX.C, App. 9, Annex M Tab A & B	Plan §§VIII.D & IX.C, ESF #2 & #5	Plan §§VIII.D & IX.C, ESF #2 & #5	Plan §VIII.D, App. 2 & 5	Plan §VIII.D, App. 2 & 5	Plan §§VIII.D & IX.C, ESF #2 & #5
E.6	Plan §II.E.6	Plan §IX.C, App. 4 §II.B	Plan §§VIII.D & IX.C, ESF #2	Plan §§VIII.D & IX.C, ESF #2	Plan §VIII.D, App. 2 & 5	Plan §VIII.D, App. 2 & 5	Plan §§VIII.D & IX.C, ESF #2
E.7	Plan §II.E.7	Annex M Tab A Att. 1	Plan §IX.C, ESF #2	Plan §IX.C, ESF #2	Plan §IX.C, App. 2	Plan §IX.C, App. 2	Plan §IX.C, ESF #2
F.1.a	Plan §II.F.1.a	App. 10 §II	Plan §IX.B	Plan §IX.B	Plan §VII, App. 5	Plan §VII, App. 5	Plan §IX.B
F.1.b	Plan §II.F.1.b	App. 10 §IV.H	Plan §IX.B, ESF #5	Plan §IX.B, ESF #5	Plan §IX.B.	Plan §IX.B.	Plan §IX.B, ESF #5
F.1.c	Plan §II.F.1.c	App. 10 §IV.I	See COVRERP	See COVRERP	See COVRERP	See COVRERP	See COVRERP
F.1.d	Plan §II.F.1.d	App. 10 §II	Plan §IX.B	Plan §IX.B	Plan §IX.B	Plan §IX.B	Plan §IX.B
F.1.e	Plan §II.F.1.e	App. 10 §II	Plan §VIII.C	Plan §VIII.C	Plan §VIII.C, App. 5	Plan §VIII.C, App. 5	Plan §VIII.C
F.1.f	Plan §II.F.1.						
F.2	Plan §II.F.2	App. 10 §III.E	Plan §IX.B	Plan §IX.B	Plan §IX.B	Plan §IX.B	Plan §IX.B
F.3	Plan §II.F.3	App. 10, App. 13 §II.C.1	Plan §IX.B	Plan §IX.B	Plan §IX.B	Plan §IX.B	Plan §IX.B
G.1	Plan §II.G.1	App. 10 §II.A.1	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1
G.2	Plan §II.G.2	App. 9 §II.A	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1
G.3.a	Plan §II.G.3.a	App. 9 §III.A	Plan §IX.C.2	Plan §IX.C.2	Plan §IX.C.2	Plan §IX.C.2	Plan §IX.C.2
G.3.b	Plan §II.G.3.b						

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
G.4.a	Plan §II.G.4.a	App. 9 §III	Plan §IX.C.2, ESF #5	Plan §IX.C.2, ESF #5	Plan §IX.C.2, App. 2	Plan §IX.C.2, App. 2	Plan §IX.C.2, ESF #5
G.4.b	Plan §II.G.4.b	App. 9 §III.A	ESF #5	ESF #5	Plan §IX.C.2, App. 2	Plan §IX.C.2, App. 2	ESF #5
G.4.c	Plan §II.G.4.c	App. 9 §III	Plan §IX.C.2, ESF #5	Plan §IX.C.2, ESF #5	Plan §IX.C.2, App. 2	Plan §IX.C.2, App. 2	Plan §IX.C.2, ESF #5
G.5	Plan §II.G.5	App. 9, Annex M	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1	Plan §IX.C.1
H.1	Plan §II.H.1						
H.2	Plan §II.H.2						
H.3		Plan §VII, App. 1, App. 4	Plan §IX.A, App. 1	Plan §IX.A, App. 1	Plan §IX.A, App. 2	Plan §IX.A, App. 2	Plan §IX.A, App. 1
H.4	Plan §II.H.4	App. 1 §C	Plan §IX.A, ESF #5	Plan §IX.A, ESF #5	Plan §IX.A, App. 1 & 5	Plan §IX.A, App. 1 & 5	Plan §IX.A, ESF #5
H.5	Plan §II.H.5						
H.5.a	Plan §II.H.5.a						
H.5.b	Plan §II.H.5.b						
H.5.c	Plan §II.H.5.c						
H.5.d	Plan §II.H.5.d						
H.6.a	Plan §II.H.6.a						
H.6.b	Plan §II.H.6.b						
H.6.c	Plan §II.H.6.c						

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
H.7	Plan §II.H.7, App. 6	App. 7 §III & Tab E	Plan §VII.B	Plan §VII.B	Plan §VIII.B, App. 6	Plan §VIII.B, App. 6	Plan §VII.B
H.8	Plan §II.H.8, App. 2						
H.9	Plan §II.H.9, App. 2						
H.10	Plan §II.H.10, App. 6	App. 7 §III.A.1 & Tab E	Plan §VII.A.1	Plan §VII.A.1	Plan §VII.A.1	Plan §VII.A.1	Plan §VII.A.1
H.11	Plan §II.H.11, App. 6	App. 7	ESF #6 & #7 & #8	ESF #6 & #7 & #8	App. 3 & 6	App. 3 & 6	ESF #6 & #7 & #8
H.12	Plan §II.H.12	App. 6 §II.C	Plan §VIII.B, ESF #10	Plan §VIII.B, ESF #10	Plan §VIII.B, App. 6	Plan §VIII.B, App. 6	Plan §VIII.B, ESF #10
I.1	Plan §II.I.1						
I.2	Plan §II.I.2						
I.3.a	Plan §II.I.3.a						
I.3.b	Plan §II.I.3.b						
I.4	Plan §II.I.4						
I.5	Plan §II.I.5						
I.6	Plan §II.I.6						
I.7	Plan §II.I.7, App. 6	App. 6 §II.C	Plan §VIII.B, ESF #10	Plan §VIII.B, ESF #10	Plan §VIII.B, App. 6	Plan §VIII.B, App. 6	Plan §VIII.B, ESF #10
I.8	Plan §II.I.8	App. 6 §II.C, App. 7 §II.B	ESF #10	ESF #10	App. 6	App. 6	ESF #10

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
I.9	Plan §II.I.9	App. 6 §II.C.3.b					
I.10	Plan §II.I.10, App. 2	Bureau of Radiological Health SOP					
I.11		App. 6 §II.C.3					
J.1.a	Plan §II.J.1						
J.1.b	Plan §II.J.1						
J.1.c	Plan §II.J.1						
J.1.d	Plan §II.J.1						
J.2	Plan §II.J.2	App. 5 Tab A, App. 5 Tab B Att. 6	Not applicable in Caroline County.	Not applicable in Hanover County.	Not applicable in Louisa County	Not applicable in Orange County	Not applicable in Spotsylvania County.
J.3	Plan §II.J.3						
J.4	Plan §II.J.4						
J.5	Plan §II.J.5						
J.6.a	Plan §II.J.6.a						
J.6.b	Plan §II.J.6.b						
J.6.c	Plan §II.J.6.c						
J.7	Plan §II.J.7, App. 2						
J.8	Plan §II.J.8, App. 4						

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
J.9		App. 6 §II.C	Plan §§V.D & VIII.F	Plan §§V.D & VIII.F	Plan §§V.D & VIII.F	Plan §§V.D & VIII.F	Plan §§V.D & VIII.F
J.10.a	Plan §II.J.10.a	App. 5 Tab B Att. 6	Plan Att. 10 & 11, ESF #6 & #10	Plan Att. 10 & 11, ESF #6 & #10	Plan Att. 10, App. 4 & 6	Plan Att. 10, App. 4 & 6	Plan Att. 10 & 11, ESF #6 & #10
J.10.b	Plan §II.J.10.b	App. 5 Tab B Att. 6	Plan Att. 6-9	Plan Att. 6-9	Plan Att. 9 & 10	Plan Att. 9 & 10	Plan Att. 6-9
J.10.c	Plan §II.J.10.c, App. 3	App. 4 §II.B	Plan §VIII.D, ESF #2	Plan §VIII.D, ESF #2	Plan §VIII.D, App. 4	Plan §VIII.D, App. 4	Plan §VIII.D, ESF #2
J.10.d		App. 4 §II.B.3, App. 5	Plan §§V.D & VII.A.4, ESF #6 & 10	Plan §§V.D & VII.A.4, ESF #6 & 10	Plan §§V.D & VII.A.4, App. 4	Plan §§V.D & VII.A.4, App. 4	Plan §§V.D & VII.A.4, ESF #6 & 10
J.10.e		App. 8	Plan §V.D, ESF #6 & 10	Plan §V.D, ESF #6 & 10	Plan §V.D, App. 3, App. 6	Plan §V.D, App. 3, App. 6	Plan §V.D, ESF #6 & 10
J.10.f		App. 8	not applicable	not applicable	not applicable	not applicable	not applicable
J.10.g		App. 5	Plan §V.D, ESF #13	Plan §V.D, ESF #13	Plan §V.D, App. 3	Plan §V.D, App. 3	Plan §V.D, ESF #13
J.10.h		App. 5, App. 11	Plan §V.D, ESF #6	Plan §V.D, ESF #6	Plan §V.D, App. 3	Plan §V.D, App. 3	Plan §V.D, ESF #6
J.10.i		App. 5 Tab B Att. 6	Plan Att. 5 & 10	Plan Att. 5 & 10	Plan Att. 5 & 10	Plan Att. 5 & 10	Plan Att. 5 & 10
J.10.j		Annex A Tab C	Plan §§V.D & VII.A.2, ESF #13	Plan §§V.D & VII.A.2, ESF #13	Plan §§V.D & VII.A.2, App. 4	Plan §§V.D & VII.A.2, App. 4	Plan §§V.D & VII.A.2, ESF #13
J.10.k		App. 12 §III.A	Plan §VII, ESF #13	Plan §VII, ESF #13	Plan §V.D, App. 4	Plan §V.D, App. 4	Plan §VII, ESF #13

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
J.10.l		App. 5 Tab B Att. 6	Plan Att. 5 & 10	Plan Att. 5 & 10	Plan Att. 11	Plan Att. 11	Plan Att. 5 & 10
J.10.m	Plan §II.J.10.m	App. 7					
J.11		App. 7 (Also see Maryland Plan)					
J.12		App. 11	Plan §V.D, ESF #6	Plan §V.D, ESF #6	Plan §V.D, App. 3	Plan §V.D, App. 3	Plan §V.D, ESF #6
K.1	Plan §II.K.1						
K.1	Plan §II.K.1						
K.1	Plan §II.K.1						
K.1	Plan §II.K.1						
K.1	Plan §II.K.1						
K.1	Plan §II.K.1						
K.1	Plan §II.K.1						
K.2	Plan §II.K.2						
K.3.a	Plan §II.K.3.a	App. 7 §II & III	Plan §§VIII.B & VIII.F, ESF #10	Plan §§VIII.B & VIII.F, ESF #10	Plan §§VIII.B & VIII.F, App. 6	Plan §§VIII.B & VIII.F, App. 6	Plan §§VIII.B & VIII.F, ESF #10
K.3.b	Plan §II.K.3.b	App. 7 Tabs C & G	Plan §VIII.F, ESF #10	Plan §VIII.F, ESF #10	Plan §VIII.F, App. 6	Plan §VIII.F, App. 6	Plan §VIII.F, ESF #10
K.4		App. 7	Plan §VIII.F, ESF #10	Plan §VIII.F, ESF #10	Plan §VIII.F, App. 6	Plan §VIII.F, App. 6	Plan §VIII.F, ESF #10

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
K.5.a	Plan §II.K.5.a	App. 7 §II.B.3	ESF #6	ESF #6	App. 3 & 6	App. 3 & 6	ESF #6
K.5.b	Plan §II.K.5.b	App. 7 Tab D, App. 11	ESF #6 & #10	ESF #6 & #10	App. 3 & 9	App. 3 & 9	ESF #6 & #10
K.6.a	Plan §II.K.6.a						
K.6.b	Plan §II.K.6.b						
K.6.c	Plan §II.K.6.c						
K.7	Plan §II.K.7						
L.1	Plan §II.L.1	Annex H Tab A	ESF #6	ESF #6	App. 3 & 8 & 9	App. 3 & 8 & 9	ESF #6
L.2	Plan §II.L.2						
L.3		Annex H Tab A					
L.4	Plan §II.L.4	Annex H Tab C	ESF #6	ESF #6	App. 3 & 8	App. 3 & 8	ESF #6
M.1	Plan §II.M.1	App. 11	ESF #5	ESF #5	App. 1 & 6	App. 1 & 6	ESF #5
M.2	Plan §II.M.2						
M.3	Plan §II.M.3	App. 11					
M.4	Plan §II.M.4	App. 11					
N.1.a	Plan §II.N.1.a	App. 13	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
N.1.b	Plan §II.N.1.b	App. 13 §II	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
N.2.a	Plan §II.N.2.a	App. 13 §II.C.1	Plan §XII.B.1	Plan §XII.B.1	Plan §XII.B.1	Plan §XII.B.1	Plan §XII.B.1
N.2.b	Plan §II.N.2.b						
N.2.c	Plan §II.N.2.c	App. 13 §II.C.2	not applicable, see COVRERP	not applicable, see COVRERP	not applicable, see COVRERP	not applicable, see COVRERP	not applicable, see COVRERP

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
N.2.d	Plan §II.N.2.d	App. 13 §II.C.3	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
N.2.e(1)	Plan §II.N.2.e	App. 13 §II.C.4					
N.2.e(2)	Plan §II.N.2.e						
N.3.a	Plan §II.N.3.a	App. 13 §II.D.1	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
N.3.b	Plan §II.N.3.b	App. 13 §II.D.2	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
N.3.c	Plan §II.N.3.c	App. 13 §II.D.3	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
N.3.d	Plan §II.N.3.d	App. 13 §II.D.4	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
N.3.e	Plan §II.N.3.e	App. 13 §II.D.5	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
N.3.f	Plan §II.N.3.f	App. 13 §II.D	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
N.4	Plan §II.N.4	App. 13 §II.A.4	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
N.5	Plan §II.N.5	App. 13 §II.A.4	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
O.1	Plan §II.O.1	App. 13 §II.E	Plan §XII.A	Plan §XII.A	Plan §XII.A	Plan §XII.A	Plan §XII.A
O.1.a	Plan §II.O.1.a						
O.1.b		App. 13 §II.E.1	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
O.2	Plan §II.O.2						

NUREG-0654 Eval. Criterion	COL EPlan	Commonwealth of Virginia	Caroline County	Hanover County	Louisa County	Orange County	Spotsylvania County
O.3	Plan §II.O.3						
O.4.a	Plan §II.O.4.a	App. 13 §II.E	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
O.4.b	Plan §II.O.4.b	App. 13 §II.E.2	See COVRERP	See COVRERP	See COVRERP	See COVRERP	See COVRERP
O.4.c	Plan §II.O.4.c	App. 13 §II.E.6	See COVRERP	See COVRERP	See COVRERP	See COVRERP	See COVRERP
O.4.d	Plan §II.O.4.d	App. 13 §II.E.3	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
O.4.e	Plan §II.O.4.e						
O.4.f	Plan §II.O.4.f	App. 13 §II.E.3	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
O.4.g	Plan §II.O.4.g		Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
O.4.h	Plan §II.O.4.h	App. 13 §II.E.3	Plan §XII	Plan §XII	Plan §XII	Plan §XII	Plan §XII
O.4.i	Plan §II.O.4.i						
O.4.j	Plan §II.O.4.j	App. 13 §II.E.4	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
O.5	Plan §II.O.5	App. 13 §§II.E.1 & 6	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP	Plan §XII, see COVRERP
P.1	Plan §II.P.1	App. 13 §§II.E.1 & 6	Plan §§VII.A & XII.A	Plan §§VII.A & XII.A	Plan §§VII.A & XII.A	Plan §§VII.A & XII.A	Plan §§VII.A & XII.A
P.2	Plan §II.P.2	Plan §VII.B, App. 2	Plan §VII	Plan §VII	Plan §VII	Plan §VII	Plan §VII
P.3	Plan §II.P.3	Plan §X.C	Plan §VII	Plan §VII	Plan §VII	Plan §VII	Plan §VII
P.4	Plan §II.P.4	Plan §X.C.1	Plan §§VII & XI	Plan §§VII & XI	Plan §§VII & XI	Plan §§VII & XI	Plan §§VII & XI
P.5	Plan §II.P.5	Plan §X.C, App. 2	Plan §§VII & XI	Plan §§VII & XI	Plan §§VII & XI	Plan §§VII & XI	Plan §§VII & XI

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P.6	Plan §II.P.6	Plan Att. 1	Plan §I	Plan §I	Plan §I	Plan §I	Plan §I
P.7	Plan §II.P.7, App. 5	Plan Att. (un-numbered)	Plan §XIV	Plan §XIV	Plan §XIV	Plan §XIV	Plan §XIV
P.8	Plan §II.P.8, App. 8	Plan pages i through ix	Plan pages i through xvii	Plan pages i through xvii	Plan pages i through xvii	Plan pages i through xvii	Plan pages i through xvii
P.9	Plan §II.P.9						
P.10	Plan §II.P.10	Plan §IX.B	Plan §X	Plan §X	Plan §X	Plan §X	Plan §X