{CALLAWAY PLANT UNIT 2 EMERGENCY RESPONSE PLAN} ANNEX

{AmerenUE}
Revision 0

Approved by _____ Date_____

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Table Of Contents

List of Tables

1.0 INTRODUCTION

This {Callaway Plant Unit 2} Emergency Plan Annex provides unit specific details for {Callaway Plant Unit 2}.

This includes a unit description (type of reactor, relationship to other units, special emergency equipment), shift staffing and Emergency Action Levels (EALs) to provide a full understanding and representation of the unit's emergency response capabilities. The Unit Annex is subject to the same review and audit requirements as the {Callaway Plant Unit 2} Emergency Plan.

1.1 UNIT DESCRIPTION

{Callaway Plant Unit 2} is an AREVA U.S. Evolutionary Power Reactor (EPR) is an evolutionary Pressurized Water Reactor (PWR) designed by Framatome ANP, Inc., a jointly-owned subsidiary of AREVA and Siemens. It is a four-loop plant with a rated thermal power of 4,590 MWt. The primary system design, loop configuration, and main components are similar to those of currently operating PWRs.

The U.S. EPR safety design features include four redundant trains of emergency core cooling, containment and Shield Building, and a core melt retention system for severe accident mitigation, which meet applicable regulatory and commercial requirements.

The safety design of the U.S. EPR is based primarily on deterministic analyses complemented by probabilistic analyses. The deterministic approach is based on the "defense-in-depth" concept that comprises four levels:

1. A combination of conservative design, quality assurance, and surveillance activities to prevent departures from normal operation

2. Detection of deviations from normal operation and protection devices and control systems to cope with them (This level of protection is provided to ensure the integrity of the fuel cladding and of the Reactor Coolant Pressure Boundary (RCPB) in order to prevent accidents.)

3. Engineered safety features and protective systems that are provided to mitigate accidents and consequently to prevent their evolution into severe accidents

4. Measures to preserve the integrity of the containment and enable control / mitigation of severe accidents

Low probability events with multiple failures and coincident occurrences up to the total loss of safety-grade systems are considered in addition to the deterministic design basis. Representative scenarios are defined for preventing both core melt and large releases in order to develop parameters for risk reduction features. A probabilistic approach is used to define these events and assess the specific measures available for their management. Consistent with international and U.S. probabilistic safety objectives, the frequency of core melt is less than 1E-5/reactor-year including all events and all reactor states.

Design provisions for the reduction of the residual risk, core melt mitigation, and the prevention of large releases are:

- Prevention of high pressure core melt by high reliability of decay heat removal systems, complemented by primary system Overpressure Protection (OPP)
- Primary system discharge into the containment in the event of a total loss of secondary side cooling
- Features for corium spreading and cooling
- Prevention of hydrogen detonation by reducing the hydrogen concentration in the containment at an early stage with catalytic hydrogen recombiners
- Control of the containment pressure increase by a dedicated Severe Accident Heat Removal System (SAHRS) consisting of a spray system with recirculation through the cooling structure of the melt retention device

External events such as an aircraft hazard, Explosion Pressure Wave (EPW), seismic events, missiles, tornado, and fire have been considered in the design of Safeguard Buildings and the hardening of the Shield Building.

1.1.1 OVERVIEW OF THE U.S. EPR DESIGN

The U.S. EPR is furnished with a four-loop, pressurized water, Reactor Coolant System (RCS) composed of a reactor vessel that contains the fuel assemblies, a pressurizer including control systems to maintain system pressure, one Reactor Coolant Pump (RCP) per loop, one SG per loop, associated piping, and related control and protection systems.

The RCS is contained within a concrete containment building. The containment building is enclosed by a Shield Building with an annular space between the two buildings. The post-tensioned concrete shell of the Containment Building is furnished with a steel liner and the Shield Building wall is reinforced concrete. The Containment and Shield Buildings comprise the Reactor Building. The Reactor Building is surrounded by four Safeguard Buildings and a Fuel Building. The internal structures and components within the Reactor Building, Fuel Building, and two Safeguard Buildings (including the plant Control Room) are protected against aircraft hazard and external explosions. The other two Safeguard Buildings are not protected against aircraft hazard or external explosions. However, they are separated by the Reactor Building, which restricts damage from these external events to a single safeguards building.

Redundant capacity safety systems for certain major safety systems are separated into four divisions. With four divisions, one division can be out-of-service for maintenance and one division can fail to operate, while the remaining two divisions are available to perform the necessary safety functions, even if one is ineffective due to the initiating event.

In the event of a loss of off-site power, each safeguard division is powered by a separate Emergency Diesel Generator (EDG). In addition to the four safety-related diesels that power various safeguards, two independent diesel generators are available to power essential equipment during a postulated Station Blackout (SBO) event—loss of off-site AC power with coincident failure of all four EDGs.

Water storage for safety injection is provided by the In-containment Refueling Water Storage Tank (IRWST). Also inside containment, below the Reactor Pressure Vessel (RPV), is a dedicated spreading area for molten core material following a postulated worst-case severe accident.

The fuel pool is located outside the Reactor Building in a dedicated building to simplify access for fuel handling during plant operation and handling of fuel casks. The Fuel Building is protected against aircraft hazard and external explosions. Fuel pool cooling is assured by two redundant, safety-related cooling trains.

2.0 ORGANIZATIONAL CONTROL OF EMERGENCIES

Section B of the {Callaway Plant Unit 2} Emergency Plan describes the unit's Emergency Response Organization (ERO). When the ERO is fully activated it will be staffed as described in the plan. This section of the Unit Annex describes the ERO staffing and their responsibilities to implement the emergency plan.

2.1 NORMAL STATION MANAGEMENT OVERVIEW

2.1.1 CORPORATE ORGANIZATION AND FUNCTIONS

{AmerenUE} is the owner and operator of {Callaway Plant Unit 2}. {AmerenUE} is responsible for siting, design, construction and operation of Unit 2 in accordance with its Quality Assurance Program. {The Senior Vice-President and Chief Nuclear Officer reports to the} President, {AmerenUE} {who, in turn,} reports to the Chief Executive Officer, {Ameren}.

A detailed description of the Organizational Structure of {AmerenUE} can be found in Section 13.1 of the FSAR.

2.2 NORMAL SHIFT STAFFING

The makeup of the normal shift is controlled by the unit's Technical Specifications and 10 CFR 50.54(m). Section B.1 of the {Callaway Plant Unit 2} Emergency Response Plan describes the normal responsibilities of shift personnel.

2.3 SHIFT EMERGENCY RESPONSE POSITIONAL RESPONSIBILITIES

Table 2.3-1 outlines Shift ERO positions required to meet minimum staffing and the major tasks assigned to each position

Table 2.3-1—Shift Emergency Response Organization

Functional Area	Major Tasks	Emergency Positions		Minimum Shift Size
1. Plant Operations and Assessment of Operational Aspects	Control Room Staff	{Operating Supervisor} Reactor Operator Equipment Operator {and Assistant Equipment Operators}	(CR) CR)	{2} 2 {4}
2. Emergency Direction and Control	Command and Control /Emergency Operations	{Shift Manager (Acting Emergency Coordinator)}	(CR)	1[(a)]
3. Notification & Communication	Emergency Communications	{Control Room Communicator}	(CR)	{(b)}
4. Radiological Accident Assessment and Support of Operational Accident Assessment	{Offsite Dose Projection}	{Health Physics Technical Support}		1
	Chemistry	Chemistry {Technician}		1
5. Plant System Engineering, Repair and Corrective Actions	Technical Support	Shift Technical Advisor (STA) [(b)]	(CR)	{(b)}
	Repair and Corrective Actions	{Instrument and Control Technician}		{2}
6. In-Plant Protective Actions	Radiation Protection	{Health Physics Operations}		{1}
7. Fire Fighting	—	Fire Brigade		(b)(c)

Table 2.3-1—Shift Emergency Response Organization

Functional Area	Major Tasks	Emergency Positions	Minimum Shift Size
8. First Aid and Rescue Operations	—	Plant Personnel	{b}
9. Site Access Control and Personnel Accountability	Security & Accountability	{Shift Security Supervisor} {Security Staff}	{1} (d)
		TOTAL:	{15}

(a) The {Shift Manager} shall function as the {Acting Emergency Coordinator} prior to TSC activation.
(b) {Position(s) filled by existing personnel on shift.}
(c) Per Station Fire Protection Plan
(d) Per Station Security Plan

3.0 CLASSIFICATION OF EMERGENCIES

Section D of the {Callaway Plant Unit 2} Emergency Plan describes the classification of emergencies into four levels of Emergency Class. They are the UNUSUAL EVENT, ALERT, SITE AREA EMERGENCY, and GENERAL EMERGENCY. These classification levels are entered by meeting the criteria of Emergency Action Levels (EALs) provided in this section of the U.S. EPR Annex.

3.1 EMERGENCY ACTION LEVELS (EALS)

An Emergency Action Level scheme based on Revision 5 of NEI 99-01 {dated 2/2008, "Methodology for Development of Emergency Action Levels," currently approved for use by NRC letter from Christopher G. Miller to NEI dated 2/22/08} is used for {Callaway Plant Unit 2}. Specific items not applicable to the U.S. EPR design are identified and alternate initiating conditions used as appropriate. Table 3-1, Emergency Action Level Initiating Conditions, provides a list of conditions considered for classification.

Emergency Action Level Threshold Values for each of the Initiating Conditions are provided in an EAL Technical Basis Document with appropriate basis and references.

An emergency is classified by assessing plant conditions and comparing abnormal conditions to Initiating Conditions and Threshold Values for each Emergency Action Level. Individuals responsible for the classification of events will refer to the Initiating Condition and Threshold Values in an Emergency Plan Implementing Procedure (EPIP). This EPIP contains Initiating Conditions, EAL Threshold Values, Mode Applicability Designators, appropriate EAL numbering system, and additional guidance necessary to classify events.

The EALs are set up in Recognition Categories. The first relates to Abnormal Radiological Conditions / Abnormal Radiological Effluent Releases. The second relates to Fission Product Barrier Degradation. The third relates to Hot Condition System Malfunctions. The fourth relates to Hazards and Other Conditions. The fifth related to Cold Shutdown System Malfunctions.

Emergency Action Levels are the measurable, observable detailed conditions that must be met in order to classify the event. Classification is not to be made without referencing, comparing and satisfying the Threshold Values specified in the Emergency Action Levels.

Mode Applicability provides the unit conditions when the Emergency Action Levels represent a threat. The Basis contains explanations and justification for including the Initiating Condition and Emergency Action Level.

A list of definitions is provided as part of this document for terms having specific meaning to the Emergency Action Levels. Site specific definitions are provided for terms with the intent to be used for a particular Initiating Condition/Threshold Value.

An EAL Technical Basis Document provides references to documents that were used to develop the EAL Threshold Values.

References to the {Recovery Manager or Emergency Coordinator} means the person in Command and Control as defined in the Emergency Plan. Classification of emergencies is a non-delegable responsibility of the {Emergency Coordinator}.

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

EALs are for unplanned events. A planned evolution involves 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. Planned evolutions to test, manipulate, repair and perform maintenance or modifications to systems and equipment that result in an EAL Threshold Value being met or exceeded are not subject to classification and activation requirements as long as the evolution proceeds as planned. However, these conditions may be subject to the reporting requirements of 10 CFR 50.72 and/or 10 CFR 50.73.

When two or more Emergency Action Levels are determined, declaration will be made on the highest classification level for the unit. {When both units are affected, the highest classification for the Plant will be used for notification purposes and specific units' classification levels will be noted}.

3.2 EMERGENCY ACTION LEVEL CATEGORIES

The EAL Scheme is broken into the following five major categories and numerous sub-categories as appropriate. Each major initiating condition described in Table 3-1, Emergency Action Level Initiating Conditions may be broken into additional sub conditions based on actual threshold values.

3.2.1 CATEGORY F – FISSION PRODUCT BARRIERS

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

1. Reactor Fuel Clad (FC): The zirconium tubes which house the ceramic uranium oxide pellets along with the end plugs which are welded into each end of the fuel rods comprise the Fuel Clad.

2. Reactor Coolant System (RC): The Reactor Vessel shell, vessel head, vessel nozzles and penetrations and all primary systems directly connected to the Reactor Vessel up to the first Containment isolation valve comprise the RCS.

3. Containment (CT): The vapor Containment structure and all isolation valves required to maintain Containment integrity under accident conditions comprise the Containment barrier.

The EALs in this category require evaluation of the Loss and Potential Loss thresholds listed in the fission product barrier matrix of Table 3-1. "Loss" and "Potential Loss" signify the relative damage and threat of damage to the barrier. "Loss" means the barrier no longer

assures containment of radioactive materials. "Potential Loss" means integrity of the barrier is threatened and could be lost if conditions continue to degrade.

The number of barriers that are lost or potentially lost and the following criteria determine the appropriate emergency classification level:

Unusual Event: Any loss or any potential loss of Containment

Alert: Any loss or any potential loss of either Fuel Clad or RCS

Site Area Emergency: Loss or potential loss of any two barriers

General Emergency: Loss of any two barriers and loss or potential loss of third barrier

The logic used for emergency classification based on fission product barrier monitoring should reflect the following considerations:

The ability to escalate the emergency classification as an event deteriorates must be maintained. For example, RCS leakage steadily increasing would represent an increasing risk to public health and safety.

Fission product barrier monitoring must be capable of addressing dynamic conditions. If reaching a loss or potential loss threshold is imminent (i.e., within 1 to 2 hours) while an event or multiple events occur, judgment dictates that the imminent situation deserves classification as if the thresholds were actually exceeded.

3.2.2 CATEGORY R – RADIOLOGICAL EFFLUENT / ABNORMAL RAD LEVELS

Many EALs are based on actual or potential degradation of fission product barriers because of the elevated potential for offsite radioactivity release. Degradation of fission product barriers, though, is not always apparent via non-radiological symptoms. Therefore, direct indication of elevated radiological effluents or area radiation levels are appropriate symptoms for emergency classification.

At lower levels, abnormal radioactivity releases may be indicative of a failure of containment systems or precursors to more significant releases. At higher release rates, offsite radiological conditions may result which require offsite protective actions.

Elevated area radiation levels in the plant may also be indicative of the failure of containment systems or preclude access to plant vital equipment necessary to ensure plant safety.

Events of this category pertain to the following subcategories:

1. Radiological Effluents

   Direct indication of effluent radiation monitoring systems provides a rapid assessment mechanism to determine releases in excess of classifiable limits. Projected offsite doses, actual offsite field measurements or measured release rates via sampling indicate doses or dose rates above classifiable limits.

2. Abnormal Radiation Levels

   Sustained general area radiation levels in excess of those indicating loss of control of radioactive materials or those levels that may preclude access to vital plant areas also warrant emergency classification.

3.2.3 CATEGORY H – HAZARDS

Hazards are non-plant, system-related events that can directly or indirectly affect plant operation, reactor plant safety or personnel safety.

The events of this category pertain to the following subcategories:

1. Security

   Unauthorized entry attempts into the Protected Area, bomb threats, sabotage attempts, and actual security compromises threatening loss of physical control of the plant.

2. Control Room Evacuation

   Events that are indicative of loss of Control Room habitability. If the Control Room must be evacuated, additional support for monitoring and controlling plant functions is necessary through the emergency response facilities.

3. Natural & Destructive Phenomena

   Natural events include earthquakes or tornados that have potential to cause plant structure or equipment damage of sufficient magnitude to threaten personnel or plant safety. This also includes non-naturally occurring events that can cause damage to plant facilities including vehicle crashes, missile impacts from turbine failure, etc.

4. Fire or Explosion

   Fires can pose significant hazards to personnel and reactor safety. Appropriate for classification are fires within the site Protected Area or which may affect operability of vital equipment.

5. Toxic / Flammable Gas

   This includes non-naturally occurring events that can cause damage to plant facilities including toxic or flammable gas leaks.

6. Judgment

   The EALs defined in other categories specify the predetermined symptoms or events that are indicative of emergency or potential emergency conditions and thus warrant classification. While these EALs have been developed to address the full spectrum of possible emergency conditions which may warrant classification and subsequent implementation of the Emergency Plan, a provision for classification of emergencies based on operator/management experience and judgment is still necessary. The EALs of this category provide the {Shift Manager}, {Emergency Coordinator} and/or

{Recovery Manager} the latitude to classify emergency conditions consistent with the established classification criteria based upon their judgment.

3.2.4 CATEGORY S – SYSTEM MALFUNCTION

Numerous system-related equipment failure events that warrant emergency classification have been identified in this category. They may pose actual or potential threats to plant safety.

The events of this category pertain to the following subcategories:

1. Loss of AC Power

   Loss of vital plant AC electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems that may be necessary to ensure fission product barrier integrity. This category includes total losses of vital plant power sources.

2. Loss of DC Power

   Loss of vital plant DC electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems that may be necessary to ensure fission product barrier integrity.

3. Failure of Protection System

   Events may be related to failure of the Protection System (PS) to initiate and complete reactor trips. In the plant licensing basis, postulated failures of the PS to complete a reactor trip comprise a specific set of analyzed events referred to as Anticipated Transient Without Scram (ATWS) events. For EAL classification however, ATWS is intended to mean any trip failure event that does not achieve reactor shutdown. If RPS actuation fails to assure reactor shutdown, positive control of reactivity is at risk and could cause a threat to Fuel Clad, RCS and Containment integrity.

4. Plant Monitoring

   Certain events that degrade plant operator ability to effectively assess plant conditions within the plant warrant emergency classification. Losses of annunciators are in this subcategory.

5. Technical Specification Limits

   System malfunctions may lead to loss of capability to accomplish heat removal from the reactor core and RCS.

   Only one EAL falls into this subcategory. It is related to the failure of the plant to be brought to the required plant operating condition required by technical specifications if a limiting condition for operation (LCO) is not met.

6. Communications

   Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification are included here.

7. RCS Leakage

   The Reactor Vessel provides a volume for the coolant that covers the reactor core. The Reactor Vessel and associated pressure piping (reactor coolant system) together provide a barrier to limit the release of radioactive material should the reactor Fuel Clad integrity fail.

   Excessive RCS leakage greater than Technical Specification limits are utilized to indicate potential pipe cracks that may propagate to an extent threatening Fuel Clad, RCS and Containment integrity.

9. Fuel Clad Degradation (Note: Fuel Clad Degradation is number 9; 8 is a RCS leakage in Category C).

   During normal operation, reactor coolant fission product activity is very low. Small concentrations of fission products in the coolant are primarily from the fission of tramp uranium in the Fuel Clad or minor perforations in the clad itself. Any significant increase from these base-line levels (2% - 5% clad failures) is indicative of fuel failures and is covered under the Fission Product Barriers category. However, lesser amounts of clad damage may result in coolant activity exceeding Technical Specification limits. These fission products will be circulated with the reactor coolant and can be detected by coolant sampling.

3.2.5 CATEGORY C – COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTION

Category C EALs are directly associated with cold shutdown or refueling system safety functions. Given the variability of plant configurations (e.g., systems out-of-service for maintenance, containment open, reduced AC power redundancy, time since shutdown) during these periods, the consequences of any given initiating event can vary greatly. For example, a loss of decay heat removal capability that occurs at the end of an extended outage has less significance than a similar loss occurring during the first week after shutdown. Compounding these events is the likelihood that instrumentation necessary for assessment may also be inoperable. The cold shutdown and refueling system malfunction EALs are based on performance capability to the extent possible with consideration given to RCS integrity, containment closure, and Fuel Clad integrity for the applicable operating modes (5 - Cold Shutdown; 6 – Refueling; D – Defueled).

The events of this category pertain to the following subcategories:

1. Loss of AC Power

   Loss of vital plant AC electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems that may be necessary to ensure fission product barrier integrity. This category includes total losses of vital plant power sources.

2. Loss of DC Power

   Loss of vital plant DC electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems that may be necessary to ensure fission product barrier integrity.

3. Failure of Protection System

   If PS actuation fails to assure positive control of reactivity it could cause a threat to Fuel Clad, RCS and Containment integrity.

6. Communications

   Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification.

7. and 8. RCS Leakage (Note: Categories 7 and 8 are both RCS Leakage in NEI guidance document.)

   The Reactor Vessel provides a volume for the coolant that covers the reactor core. The Reactor Vessel and associated pressure piping (reactor coolant system) together provide a barrier to limit the release of radioactive material should the reactor Fuel Clad integrity fail.

   Excessive RCS leakage greater than Technical Specification limits are utilized to indicate potential pipe cracks that may propagate to an extent threatening Fuel Clad, RCS and containment integrity. This EAL, for Cold Shutdown and Refueling, will be based on RCS leakage limits that are applicable during the operational modes unless other mode specific limits have been established.

10. Heat Sink

    Loss of the ability to remove decay heat could lead to fuel clad degradation.

3.3 MAINTENANCE OF EMERGENCY ACTION LEVELS

The details of EAL development are documented in an Emergency Action Level Technical Basis Document. Revision of the Technical Basis Document is controlled the same way as the {Callaway Plant Unit 2} Emergency Plan, requiring the same reviews including a review in accordance with 50.54(q).

FISSION PRODUCT BARRIER DEGRADATION

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
FG1 1 2 3 4 1. Loss of any two barriers and loss or potential loss of the third barrier.	**FS1** 1 2 3 4 1. Loss or potential loss of any two barriers.	**FA1** 1 2 3 4 1. Any loss or any potential loss of either fuel clad or RCS.	**FU1** 1 2 3 4 1. Any loss or any potential loss of containment.

{Add FC2 containment rad graph here (damage curve based on 300 µCi/gm DEI-131)}

{Add CT2 containment rad graph here (damage curve based on 20% fuel clad)}

	FC – Fuel Clad		RC – Reactor Coolant System		CT - Containment	
Sub-Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
2. Containment Radiation Monitoring	1. Containment radiation monitor ({JYK15 CR101}) > **{Graph FC2(L)1}.**	None	1. Containment radiation monitor ({JYK15 CR101}) > {**RC2(L)1**} **R/hr**.	None	None	1. Containment radiation monitor ({JYK15 CR101}) > {**Graph CT2(PL)1**}.
3. Core Temperature	1. {Calculated Clad Temperature in **Region 2 or higher**}**.**	1. {Calculated Clad Temperature in **Region 2**}.	None	None	None	1. a. Calculated Clad Temperature in **Region 4}**. **AND** b. Restoration procedures not effective within **15 minutes**. **OR** 2. a. Calculated Clad Temperature in **Region 3**}. **AND** b. RCS level ({JEF10 CL081}) < {**CT3(PL)2.b**}. **AND** c. Restoration procedures not effective within **15 minutes**.

Part 5: EP Annex

FISSION PRODUCT BARRIER DEGRADATION

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
FG1 1 2 3 4 1. Loss of any two barriers and Loss or Potential Loss of the third barrier.	**FS1** 1 2 3 4 1. Loss or Potential Loss of any two barriers.	**FA1** 1 2 3 4 1. Any Loss or any Potential Loss of either Fuel Clad or RCS.	**FU1** 1 2 3 4 1. Any Loss or any Potential Loss of Containment.

	FC – Fuel Clad		RC – Reactor Coolant System		CT - Containment	
Sub-Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
4. RPV Level	None	1. a. RCS level ({JEF10 CL081}) **< {FC4(PL)1.a}**. **AND** b. {Calculated Clad Temperature in Region 2 or higher}.	None	None	None	None
5. RCS Leak Rate	None	None	1. RCS leak rate greater than available makeup capacity as indicated by {Calculated Clad Temperature in **Region 2 or higher}.**	1. RCS leak rate requires operation of second charging pump to maintain pressurizer level.	None	None
6. SG Tube Leakage / Rupture	None	None	1. RUPTURED SG results in MHSI actuation.	None	1. RUPTURED SG is also FAULTED outside of containment. **OR** 2. a. Primary-to-Secondary leak rate > 10 gpm. **AND** b. UNISOLABLE steam release from affected SG to the environment.	None
7. RCS Activity	1. Coolant activity **> 300 µCi/gm** Dose Equivalent I-131.	None	None	None	None	None
8. Containment Pressure	None	None	None	None	1. A containment pressure rise followed by a rapid UNPLANNED drop in containment pressure. **OR** 2. Containment pressure or IRWST level response not consistent with LOCA conditions.	1. Containment pressure **> 62 psig** and rising. **OR** 2. Containment Hydrogen > 4%.
9. Containment Isolation Failure	None	None	None	None	1. a. Failure of **ALL** isolation valves in any one line to close. **AND** b. Direct downstream pathway to the environment exists after containment isolation signal.	None
10. E**C** 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 RSC 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.

Part 5: EP Annex

RADIOLOGICAL EFFLUENT/ABNORMAL RADIATION LEVELS

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

Radiological Effluents

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
RG1 1 2 3 4 5 6 D	**RS1** 1 2 3 4 5 6 D	**RA1** 1 2 3 4 5 6 D	**RU1** 1 2 3 4 5 6 D
Offsite dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 1000 mRem (10mSv) TEDE or 5000 mRem (50 mSv) Thyroid CDE for the actual or projected duration of the release using actual meteorology.	Offsite dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 100 mRem (1 mSv) TEDE or 500 mRem (5 mSv) Thyroid CDE for the actual or projected duration of the release using actual meteorology.	Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM limit for 15 minutes or longer.	Any release of gaseous or liquid radioactivity to the environment greater than 2 times the ODCM limit for 60 minutes or longer.
EALs:	**EALs:**	**EALs:**	**EALs:**
Note: If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values. Do not delay declaration awaiting dose assessment results.	**Note:** If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values. Do not delay declaration awaiting dose assessment results.	**Note:** 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:** 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.
1. Vent Stack Noble Gas ({KLK90 FR001}) > {RG1.1} µCi/hr for 15 minutes or longer. **OR** 2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of EITHER of the following: • > 1000 mRem TEDE • > 5000 mRem CDE Thyroid **OR** 3. Field survey results at or beyond the site boundary indicate EITHER of the following: • Gamma (closed window) dose rate > 1000 mR/hr for 60 minutes or longer. • Air sample analysis > 5000 mRem CDE Thyroid for one hour of inhalation.	1. Vent Stack Noble Gas ((KLK90 FR001}) > {RS1.1} µCi/hr for 15 minutes or longer. **OR** 2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of EITHER of the following: • > 100 mRem TEDE • > 500 mRem CDE Thyroid **OR** 3. Field survey results at or beyond the site boundary indicate EITHER of the following: • Gamma (closed window) dose rate > 100 mR/hr for 60 minutes or longer. • Air sample analysis > 500 mRem CDE Thyroid for one hour of inhalation.	1. Vent Stack Noble Gas ({KLK90 FR001}) > {RA1.1} µCi/hr for 15 minutes or longer. **OR** 2. ANY of the following effluent monitors > 200 times the ODCM limit established by a current radioactivity discharge permit for 15 minutes or longer: • Rad Waste Building Transfer Tank Discharge Line Activity Monitor ({KPK29 CR001/002}) • Discharge permit specified monitor **OR** 3. Confirmed sample analysis for gaseous or liquid releases > 200 times the ODCM limit for 15 minutes or longer.	1. Vent Stack Noble Gas ({KLK90 FR001}) > {RU1.1}µCi/hr for 60 minutes or longer. **OR** 2. ANY of the following effluent monitors > 2 times the ODCM limit established by a current radioactivity discharge permit for 60 minutes or longer: • Rad Waste Building Transfer Tank Discharge Line Activity Monitor ({KPK29 CR001/002}) • Discharge permit specified monitor **OR** 3. Confirmed sample analysis for gaseous or liquid releases > 2 times the ODCM limit for 60 minutes or longer.

Part 5: EP Annex

RADIOLOGICAL EFFLUENT/ABNORMAL RADIATION LEVELS

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Abnormal Radiation Levels			**RA2** 1 2 3 4 5 6 D 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. **EALs:** 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. **OR** 2. >1000 mR/hr on ANY of the following due to damage to irradiated fuel or loss of water level: • Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) • Fuel Building Spent Fuel Mast Bridge Dose Rate Monitor ({JYK28 CR002}) • Fuel Building Fuel Pool Dose Rate Monitor ({JYK28 CR001}) • Transfer Pit Dose Rate Monitor ({JYK23 CR001})	**RU2** 1 2 3 4 5 6 D UNPLANNED rise in plant radiation levels. **EALs:** 1. a. UNPLANNED water level drop in the reactor refueling cavity, spent fuel pool or fuel transfer canal as indicated by ANY of the following: • Reactor refueling cavity level ({FAK31 CL003 or CL004}) < {RU2.1.a(b1)} feet. • Spent fuel pool level ({FAL18 CL001}) < {RU2.1.a(b2)} feet. • Fuel transfer canal level ({FAL18 CL004 or CL005}) < {RU2.1.a(b3)} feet. • Report of visual observation. **AND** b. Area radiation monitor rise on ANY of the following: • Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) • Fuel Building Spent Fuel Mast Bridge Dose Rate Monitor ({JYK28 CR002}) • Fuel Building Fuel Pool Dose Rate Monitor ({JYK28 CR001}) • Transfer Pit Dose Rate Monitor ({JYK23 CR001}) **OR** 2. UNPLANNED area radiation monitor or radiation survey > 1000 times NORMAL LEVELS.
			RA3 1 2 3 4 5 6 D Rise in radiation levels within the facility that impedes operation of systems required to maintain plant safety functions. **EALs:** 1. Dose rate > 15 mR/hr in ANY of the following areas requiring continuous occupancy to maintain plant safety functions: • Control Room • Central Alarm Station	

Part 5: EP Annex

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Security	**HG1** 1 2 3 4 5 6 D HOSTILE ACTION resulting in loss of physical control of the facility. **EALs:** 1. A HOSTILE ACTION has occurred such that plant personnel are unable to operate equipment required to maintain safety functions. **OR** 2. A HOSTILE ACTION has caused failure of spent fuel cooling systems and IMMINENT fuel damage is likely.	**HS1** 1 2 3 4 5 6 D HOSTILE ACTION within the PROTECTED AREA. **EALs:** 1. A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervisor.	**HA1** 1 2 3 4 5 6 D HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat. **EALs:** 1. A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLLED AREA as reported by the Security Shift Supervisor. **OR** 2. A validated notification from the NRC of a LARGE AIRCRAFT attack threat within 30 minutes of the site.	**HU1** 1 2 3 4 5 6 D Confirmed SECURITY CONDITION or threat which indicates a potential degradation in the level of safety of the plant. **EALs:** 1. A SECURITY CONDITION that does not involve a HOSTILE ACTION as reported by the Security Shift Supervisor. **OR** 2. A credible site-specific security threat notification. **OR** 3. A validated notification from the NRC providing information of an aircraft threat.
CR Evacuation		**HS2** 1 2 3 4 5 6 D Control Room evacuation has been initiated and plant control cannot be established. **EALs:** 1. a. Control Room evacuation has been initiated. **AND** b. Control of the plant cannot be established within 15 minutes.	**HA2** 1 2 3 4 5 6 D Control Room evacuation has been initiated. **EALs:** 1. Control Room evacuation has been initiated.	

Part 5: EP Annex

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

Natural or Destructive Phenomena

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
	Table H-1: Safe Shutdown Vital Areas • Control Room • Safeguards Buildings • Containment • Nuclear Auxiliary Building • Emergency Power Generating Buildings • ESW Cooling Towers	**HA3** 1 2 3 4 5 6 D Natural or destructive phenomena affecting VITAL AREAS. **EALs:** 1. a. Seismic event > OBE as indicated by PICS seismic monitoring system. **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. **OR** 2. Tornado or high winds > {45 m/sec (100 mph)} resulting in EITHER of the following: • VISIBLE DAMAGE to ANY structures in Table H-1 areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems. **OR** 3. Internal flooding in Table H-1 areas resulting in EITHER of the following: • Electrical shock hazard that precludes access to operate or monitor safety equipment. • Control Room indication of degraded performance of those safety systems. **OR** 4. Turbine failure-generated PROJECTILES resulting in EITHER of the following: • VISIBLE DAMAGE to or penetration of ANY structures in Table H-1 areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems. **OR** 5. Vehicle crash resulting in EITHER of the following: • VISIBLE DAMAGE to ANY structures in Table H-1 areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems.	**HU3** 1 2 3 4 5 6 D Natural or destructive phenomena affecting the PROTECTED AREA. **EALs:** 1. a. Seismic event trigger as indicated by PICS seismic monitoring system. **AND** b. Earthquake confirmed by EITHER of the following: • Earthquake felt in plant • National Earthquake Center **OR** 2. a. Tornado within the PROTECTED AREA. **OR** b. High winds > {45 m/sec (100 mph)}. **OR** 3. Internal flooding in Table H-1 areas that has the potential to affect safety related equipment required by Technical Specifications for the current operating mode. **OR** 4. Turbine failure resulting in casing penetration or damage to turbine or generator seals.

Part 5: EP Annex

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Fire / Explosion		**Table H-1: Safe Shutdown Vital Areas** • Control Room • Safeguards Buildings • Containment • Nuclear Auxiliary Building • Emergency Power Generating Buildings • ESW Cooling Towers	**HA4** 1 2 3 4 5 6 D FIRE or EXPLOSION affecting the operability of plant safety systems required to establish or maintain safe shutdown. **EALs:** 1. FIRE or EXPLOSION resulting in EITHER of the following: • VISIBLE DAMAGE to ANY structures in Table H-1 areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems.	**HU4** 1 2 3 4 5 6 D FIRE within the PROTECTED AREA not extinguished within 15 minutes of detection or EXPLOSION within the PROTECTED AREA. **EALs:** 1. FIRE not extinguished within 15 minutes of Control Room notification or verification of a Control Room FIRE alarm in actual contact with or immediately adjacent to ANY of the Table H-1 areas. **OR** 2. EXPLOSION within the PROTECTED AREA.
Toxic Gas			**HA5** 1 2 3 4 5 6 D Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases, which jeopardize the ability to safely operate or shutdown the reactor. **Note:** If the equipment in the VITAL AREA was 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 to safely operate or shutdown the plant beyond that allowed by Technical Specifications at the time of the event. **EALs:** 1. Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases, which jeopardize the ability to safely operate or shutdown the reactor.	**HU5** 1 2 3 4 5 6 D Release of toxic, corrosive, asphyxiant or flammable gases deemed detrimental to NORMAL PLANT OPERATIONS. **EALs:** 1. Toxic, corrosive, asphyxiant or flammable gases in amounts that have or could adversely affect NORMAL PLANT OPERATIONS. **OR** 2. Report by local, county or state officials for evacuation or sheltering of site personnel based on an offsite event.
Judgment	**HG6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of General Emergency. **EALs:** 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 Protective Action Guideline exposure levels offsite for more than the immediate site area.	**HS6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of Site Area Emergency. **EALs:** 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 Protective Action Guideline exposure levels beyond the site boundary.	**HA6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of an Alert. **EALs:** 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 potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	**HU6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of an Unusual Event. **EALs:** 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 offsite response or monitoring are expected unless further degradation of safety systems occurs.

Part 5: EP Annex

SYSTEMS MALFUNCTIONS — HOT

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of AC	**SG1** 1 2 3 4 Prolonged loss of all offsite and all onsite AC power to emergency busses. **EALs:** 1. a. Loss of ALL offsite and ALL onsite AC power to 31, 32, 33 and 34 BDA busses. **AND** b. EITHER of the following: • Restoration of at least one emergency bus within 2 hours is not likely. • {Calculated Clad Temperature in Region 4}.	**SS1** 1 2 3 4 Loss of all offsite and all onsite AC power to emergency busses for 15 minutes or longer. **EALs:** 1. Loss of ALL offsite and ALL onsite AC power to 31, 32, 33 and 34 BDA busses for 15 minutes or longer.	**SA1** 1 2 3 4 AC power capability to emergency busses reduced to a single source for 15 minutes or longer such that any additional single failure would result in a loss of all AC power to the emergency busses. **EALs:** 1. a. AC power to 31, 32, 33 and 34 BDA busses is reduced to a single source for 15 minutes or longer. **AND** b. Any additional single failure will result in a loss of all AC power to 31, 32, 33 and 34 BDA busses.	**SU1** 1 2 3 4 Loss of all offsite AC power to emergency busses for 15 minutes or longer. **EALs:** 1. Loss of ALL offsite AC power to 31, 32, 33 and 34 BDA busses for 15 minutes or longer.
Loss of DC		**SS2** 1 2 3 4 Loss of vital DC power for 15 minutes or longer. **EALs:** 1. < 210 VDC on the vital 31, 32, 33 and 34 BUC busses for 15 minutes or longer.		
Failure of Protection Systems	**SG3** 1 2 Automatic trip and all manual actions failed to shutdown the reactor and indication of an extreme challenge to the ability to cool the core exists. **EALs:** 1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power > 5%. **AND** b. All manual actions failed to shutdown the reactor as indicated by reactor power > 5%. **AND** c. EITHER of the following have occurred: • {Calculated Clad Temperature in Region 3 or higher}. • Loss of all four trains of Emergency Feedwater.	**SS3** 1 2 Automatic trip failed to shutdown the reactor and manual actions taken from the reactor control console failed to shutdown the reactor. **EALs:** 1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power > 5%. **AND** b. Manual actions taken at the reactor control console failed to shutdown the reactor as indicated by reactor power > 5%.	**SA3** 1 2 Automatic trip failed to shutdown the reactor and the manual actions taken from the reactor control console are successful in shutting down the reactor. **EALs:** 1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power > 5%. **AND** b. Manual actions taken at the reactor control console successfully shutdown the reactor as indicated by reactor power < 5%.	**SU3** 3 4 Inadvertent criticality. **EALs:** 1. UNPLANNED sustained positive startup rate observed on nuclear instrumentation.

Part 5: EP Annex

SYSTEMS MALFUNCTIONS — HOT

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Plant Monitoring		**SS4** 1 2 3 4 Loss of all monitoring functions for 15 minutes or longer with a SIGNIFICANT TRANSIENT in progress. **EALs:** 1. a. Loss of SICS for 15 minutes or longer. **AND** b. Loss of PICS for 15 minutes or longer. **AND** c. ANY of the following SIGNIFICANT TRANSIENTS are in progress: • Automatic runback > 50% thermal power • Electrical load reject > 50% full load • Reactor trip • MHSI actuation	**SA4** 1 2 3 4 Loss of all monitoring functions for 15 minutes or longer. **EALs:** 1. a. Loss of SICS for 15 minutes or longer. **AND** b. Loss of PICS for 15 minutes or longer.	**SU4** 1 2 3 4 Degradation of monitoring functions for 15 minutes or longer. **EALs:** 1. Loss of SICS for 15 minutes or longer. **OR** 2. Loss of PICS for 15 minutes or longer.
T.S. Limits				**SU5** 1 2 3 4 Inability to reach required operating mode within Technical Specification limits. **EALs:** 1. Plant is not brought to required operating mode within Technical Specifications LCO action completion time.
Communications				**SU6** 1 2 3 4 Loss of all onsite or offsite communications capabilities. **EALs:** 1. Loss of ALL of the following onsite communication methods affecting the ability to perform routine operations: • {Radios} • {Plant Page} • {Internal Telephone Systems} **OR** 2. Loss of ALL of the following offsite communications methods affecting the ability to perform offsite notifications: • {SENTRY System} • NRC Emergency Notification System - ENS • NRC Health Physics Network - HPN • {External Telephone Systems}

Part 5: EP Annex

SYSTEMS MALFUNCTIONS — HOT

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
RCS Leakage				**SU7** 1 2 3 4 RCS leakage. **EALs:** 1. Unidentified or pressure boundary leakage > 10 gpm. **OR** 2. Identified leakage > 25 gpm.
Fuel Clad Degradation				**SU9** 1 2 3 4 Fuel clad degradation. **EALs:** 1. Gross Failed Fuel Monitor ({KUA66 CR001}) > {SU9.1} cpm. **OR** 2. Coolant sample activity > 1.0 µCi/gm dose equivalent I-131.

Part 5: EP Annex

SYSTEMS MALFUNCTIONS — COLD

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of AC			**CA1** 5 6 D Loss of all offsite and all onsite AC power to emergency busses for 15 minutes or longer. **EALs:** 1. Loss of ALL offsite and ALL onsite AC power to 31, 32, 33 and 34 BDA busses for 15 minutes or longer.	**CU1** 5 6 AC power capability to emergency busses reduced to a single source for 15 minutes or longer such that any additional single failure would result in a loss of all AC power to the emergency busses. **EALs:** 1. a. AC power to 31, 32, 33 and 34 BDA busses is reduced to a single source for 15 minutes or longer. **AND** b. Any additional single failure will result in a loss of all AC power to 31, 32, 33 and 34 BDA busses.
Loss of DC				**CU2** 5 6 Loss of required DC power for 15 minutes or longer. **EALs:** 1. < 210 VDC on the required 31, 32, 33 and 34 BUC busses for 15 minutes or longer.
Failure of Protection System				**CU3** 5 6 Inadvertent criticality. **EALs:** 1. UNPLANNED sustained positive startup rate observed on nuclear instrumentation.
Communications				**CU6** 5 6 D Loss of all onsite or offsite communications capabilities. **EALs:** 1. Loss of ALL of the following onsite communication methods affecting the ability to perform routine operations: • {Radios} • {Plant Page} • {Internal Telephone Systems} **OR** 2. Loss of ALL of the following offsite communications methods affecting the ability to perform offsite notifications: • {SENTRY System} • NRC Emergency Notification System - ENS • NRC Health Physics Network - HPN • {External Telephone Systems}

Part 5: EP Annex

SYSTEMS MALFUNCTIONS — COLD

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

RCS Leakage

GENERAL EMERGENCY

CG7 5 6

Loss of RPV inventory affecting fuel clad integrity with containment challenged.

EALs:

1. a. RPV level < {96.0 feet (29.3 meters)} (top of active fuel) for 30 minutes or longer.
   AND
   b. ANY Table C-1 containment challenge indications.

   OR

2. a. RPV level cannot be monitored with core uncovery indicated by ANY of the following for 30 minutes or longer:
   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) > {CG7.2.a(b1)} mR/hr.
   - Erratic source range monitor indication.
   - UNPLANNED level rise in IRWST.

   AND
   b. ANY Table C-1 containment challenge indications.

Table C-1: Containment Challenge Indications

- CONTAINMENT CLOSURE not established.
- Hydrogen concentration > 4% inside containment.
- UNPLANNED rise in containment pressure.

SITE AREA EMERGENCY

CS7 5 6

Loss of RPV inventory affecting core decay heat removal capability.

EALs:

1. a. CONTAINMENT CLOSURE not established.
   AND
   b. Loss of RPV inventory as indicated by RCS level ({JEF10 CL081}) < {CS7.1.b}.

   OR

2. a. CONTAINMENT CLOSURE established.
   AND
   b. RPV level < {96.0 feet (29.3 meters)} (top of active fuel).

   OR

3. a. RCS level cannot be monitored for 30 minutes or longer.
   AND
   b. Loss of RPV inventory as indicated by ANY of the following:
   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) > {CS7.3.b(b1)} mR/hr.
   - Erratic source range monitor indication.
   - UNPLANNED level rise in IRWST.

ALERT

CA7 5 6

Loss of RPV inventory.

EALs:

1. Loss of RPV inventory as indicated by RCS level ({JEF10 CL081}) < {CA7.1}.

   OR

2. a. RCS level cannot be monitored for 15 minutes or longer.
   AND
   b. Loss of RPV inventory as indicated by UNPLANNED level rise in IRWST.

UNUSUAL EVENT

CU7 5

RCS leakage.

EALs:

1. RCS leakage results in the inability to maintain or restore RCS level > Procedure Established Minimum Level for 15 minutes or longer.

CU8 6

UNPLANNED loss of RCS inventory.

EALs:

1. a. UNPLANNED RCS level drop below the RPV flange for 15 minutes or longer when the RCS level band is established above the RPV flange.

   OR

   b. UNPLANNED RCS level drop < Procedure Established Minimum Level for 15 minutes or longer when the RCS level band is established below the RPV flange.

   OR

2. a. RCS level cannot be monitored.
   AND
   b. Loss of RPV inventory as indicated by UNPLANNED level rise in IRWST.

Heat Sink

Table C-2: RCS Reheat Duration Thresholds

RCS	Cont Closure	Duration
Intact with Full Inventory	N/A	> 60 min*
Not Intact	Established	> 20 min*
OR	Not Established	
Reduced RCS Inventory		0 min

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

ALERT

CA10 5 6

Inability to maintain plant in cold shutdown.

EALs:

1. RCS temperature > 200° F for the specified duration on Table C-2.

   OR

2. RCS pressure rise > 10 psig due to a loss of RCS cooling (this EAL does not apply in solid plant conditions).

UNUSUAL EVENT

CU10 5 6

UNPLANNED loss of decay heat removal capability.

EALs:

1. RCS temperature > 200° F due to an UNPLANNED loss of decay heat removal capability.

   OR

2. Loss of ALL RCS temperature and RCS level indication for 15 minutes or longer.

Part 5: EP Annex

4.0 EMERGENCY RESPONSE FACILITIES AND EQUIPMENT

4.1 UNIT SPECIFIC EMERGENCY RESPONSE FACILITIES

4.1.1 CONTROL ROOM

Plant operations are directed from the Control Room. Nuclear Plant Instrumentation, Area and Process Radiation Monitoring System Instrumentation, Controls and Instrumentation for Reactor and Turbine Generator operation are provide here. The Control Room is located in Safeguards Building 2 - 53' Elevation. A description of the Control Room is contained in the Final Safety Analysis Report. Emergency equipment available to the Control Room is listed and maintained in accordance with Emergency Response Plan Implementation Procedures and/or Administrative Procedures.

4.1.2 TECHNICAL SUPPORT CENTER

{The TSC is the central point for direction of the emergency response on-site. The TSC provides the main communications link between the Plant and other Emergency Response Facilities. The TSC is staffed by designated technical, engineering, management, administrative, and NRC personnel. During emergencies, the TSC operates uninterrupted to provide plant management and technical support to Plant operations personnel. The TSC also relieves the Plant operators of peripheral duties not directly related to reactor system manipulations.

The TSC is located within the Protected Area, adjacent to the Unit 1 Service Building. It has adequate shielding and ventilation to ensure habitability during Design Basis Accidents. An emergency diesel generator allows facility operation during loss of off-site power.

The following functions are performed at the TSC:

- Management of on-site emergency response;
- Direction of on-site Radiation Protection activities;
- Direction of on-site emergency maintenance;
- Direction of site personnel accountability and security;
- Direction of site safety and hazards control;
- Performance of engineering and technical analyses for Control Room support;
- Assemblage of emergency repair/support personnel;
- Briefing, dispatching and direction of emergency repair personnel.

The TSC has the capability to support Plant management and technical personnel assigned there during an emergency. The TSC has access to important Plant parameters as required in Regulatory Guide 1.97, Rev. 2, via the Plant Computer System. Dedicated communications are available with the Control Room, EOF, and NRC. The TSC has the capability to transmit data and facsimiles.

The TSC has access to controlled copies of the necessary Plant records, operational specifications, procedures, Severe Accident Management Guidelines, as-built drawings, schematics, and diagrams essential for evaluation of the Plant under accident conditions. These include the NUREG-0696 specified documents.}

4.1.3 OPERATIONS SUPPORT CENTER

{The TSC is designed as a joint TSC/OSC}

4.1.4 ONSITE LABORATORIES

Chemistry laboratories located in the Nuclear Auxiliary Building are available for emergency response during an accident. The on-site laboratory sampling system is designed to provide gas and liquid samples of the containment atmosphere following an accident.

All modules, the sampling box and the local control cabinet are located in the Fuel Building. To ensure protection of the operating staff while taking a sample, in the sampling box, all modules and pipes that convey highly contaminated fluids are located behind a biological shield.

4.1.5 DECONTAMINATION FACILITIES

The personnel decontamination facility is located the Access Building and contains provisions for radiological decontamination of personnel, their wounds, supplies, instruments and equipment. This facility has extra clothing and decontaminants suitable for the type of contamination expected, including radio-iodine skin contamination.

4.1.6 FIRST AID

The First Aid station located in the Access Building facilitates medical treatment and initial assessment of radiation exposure and uptake.

4.2 ASSESSMENT RESOURCES

4.2.1 ONSITE METEOROLOGICAL MONITORING INSTRUMENTATION

{Callaway Plant Unit 2 shares meteorological instrumentation with Callaway Unit 1. Section H.5 of the Emergency Plan describes the Callaway Meteorological instrumentation.}

4.2.2 ONSITE RADIATION MONITORING EQUIPMENT

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

4.2.2.1 Radiation Monitoring Systems

4.2.2.1.1 Area Radiation Monitoring

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

4.2.2.1.2 Radiological Noble Gas Effluent Monitoring

The wide range gas monitors are installed on normal station effluent release points. These monitors have the capability to monitor noble gas activity in the range {of postulated accidents and in support of emergency response}. Each monitor system has a microprocessor that utilizes digital processing techniques to analyze data and control monitor functions. These monitors provide readout and alarm functions to the Main Control Room.

4.2.2.1.3 Radioiodine and Particulate Effluent Monitoring

The wide range gas monitor includes a sampling rack for collection of the Auxiliary Building Vent Stack particulate and radioiodine samples. Filter holders and valves are provided to allow grab sample collection for isotopic analyses in the unit's counting room. The sampling rack is shielded to minimize personnel exposure. The sampling media will be analyzed by a gamma ray spectrometer that utilizes a gamma spectrometer system.

4.2.2.1.4 High Range Containment Radiation Monitors

High range containment radiation monitors are installed for the U.S. EPR. The monitors will detect and measure the radiation level within the reactor containment during and following an accident. The monitors are in the range {of postulated accidents and in support of emergency response}.

4.2.2.1.5 In-plant Iodine Instrumentation

Effective monitoring of increasing iodine levels in buildings under accident conditions will include the use of portable instruments using silver zeolite as a sample media. It is expected that a sample can be obtained, purged, and analyzed for iodine content within a two-hour time frame.

4.2.2.1.6 Onsite Process Monitors

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

The unit's Emergency Operating Procedures assist personnel in recognizing inadequate core cooling using applicable instrumentation.

4.2.2.2 Onsite Fire Detection Instrumentation

The Plant Fire Alarm System (PFAS) is designed to meet the requirements of the applicable National Fire Protection Association (NFPA) Standards (e.g., NFPA 72, 13, 20, etc.). Detection is generally provided in areas containing safety related components/systems as recommended in Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants." The PFAS is furnished with electrically supervised circuits that monitor field input devices including smoke and heat detection, water supply and suppression supervisory devices and output devices such as suppression releasing and alarm notification devices. Instrumentation is provided in the Main Control Room and at the local fire control panels to

alert operators of the location of a detected fire, the release of a suppression system, or the annunciation of a trouble condition within a portion of the system.

In the event that a portion of the PFAS is inoperable, compensatory measures may be required for the affected areas.

Further details on the unit's Plant Fire Alarm system can be found in the unit's FSAR.

4.2.2.3 Unit Specific Station Parameter Monitoring System

A process and information system provides access to all process information needed to monitor the state of the plant in all plant states, including accident conditions. The system displays information on workstations providing selected data to anyone with authorization to access the data. The system displays are used for:

- Reviewing the accident sequence,
- Determining appropriate mitigating actions,
- Evaluating the extent of any damage, and
- Determining plant status during recovery operations.

The ERO shall use the information obtained from the system to monitor plant parameters and provide recommendations to the operators.

5.0 EMERGENCY MEASURES

5.1 UNIT ASSEMBLY AREAS

Unit assembly areas have been identified at the Access Building, Radiation Protection Lab area, the clean hallways on the ground level of the Radioactive Waste Processing Building, and the shop areas of the Switchgear Building. Evacuation of non-essential personnel is usually conducted immediately after accountability if a Site Area Emergency or General Emergency has been declared and conditions permit.

If it is determined that the prearranged Assembly Area is unfit for personnel, the {Shift Manager} or the {Emergency Coordinator} may designate an alternative Assembly Area and direct personnel using appropriate communication systems that are available.

5.2 UNIT EVACUATION ROUTES

Unit and Station Evacuation Routes will normally be via normal site egress routes. Alternate egress routes may be considered and are determined based on the event in progress and provided to evacuees over the unit's public address system.