Vogtle Units 3 and 4

NEI 07-01

Emergency Action Levels

Technical Basis

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INTRODUCTION

Nuclear utilities must respond to a formal set of threshold conditions that require plant 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. Emergency classes are defined in 10 CFR 50. Levels of response and the conditions leading to those responses are defined in a 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.

NEI 07-01, Methodology for Development of Emergency Action Levels Advanced Passive Light Water Reactors, is based on the EAL work accomplished through the NUMARC/NESP 007, NEI 99-01 Revision 4 and Revision 5 development process. The history of the development is contained in 99-01 Revision 4 and continues in Revision 5 of the 99-01 document.

The NEI EAL Task Force identified eight characteristics that were to be incorporated into model EALs. Experience to date has shown these considerations to be valid. These were:

(1) Consistency (i.e., the EALs would lead to similar decisions under similar circumstances at different 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) Thoroughness in addressing, and disposing of, the issues of completeness and accuracy raised regarding NUREG-0654, Appendix 1;
(6) Technical completeness and appropriateness for each classification level;
(7) A logical progression in classification for combinations of multiple events;
(8) Objective, observable values.

Based on the information gathered and reviewed, the Task Force has developed generic EAL guidance. Because of the wide variety of presentation methods (formats) used at different utilities, the Task Force believes that specifying guidance as to what each IC and EAL should address, and including sufficient basis information for each EAL will best assure uniformity of approach. The information is presented by Recognition Category:

- R - Abnormal Rad Levels/Radiological Effluent
- C - Cold Shutdown./ Refueling System Malfunction
- F - Fission Product Barrier Degradation
- H - Hazards or Other Conditions Affecting Plant Safety
- S - System Malfunction

Each of the EAL guides in Recognition Categories is structured in the following way:

- Recognition Category - As described above.
- Emergency Class - NOUE, Alert, Site Area Emergency or General Emergency.
- Initiating Condition - Symptom- or Event-Based, Generic Identification and Title.
- Operating Mode Applicability - Power Operation, Hot Standby, Safe Shutdown, Cold Shutdown, Refueling, Defueled, All, or Not Applicable.
- Emergency Action Level(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 class, such as for Loss of All AC Power.

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 Guidance has the primary threshold for NOUE as operation outside the safety envelope for the plant as defined by plant technical specifications, including LCOs and Action Statement Times. In addition, certain precursors of more serious events such as earthquakes are included in NOUE EALs. This provides a clear demarcation between the lowest emergency class and "non-emergency" notifications specified by 10 CFR 50.72.

ACRONYMS

AC	Alternating Current
ADS	Automatic Depressurization System
AP1000	Advanced Passive 1000 Mw PWR (Westinghouse)
ATWS	Anticipated Transient Without Scram
CDE	Committed Dose Equivalent
CET	Core Exit Thermocouple
CFR	Code of Federal Regulations
Ci	Curie
CMT/CNMT	Containment
CSF	Critical Safety Function
CSFST	Critical Safety Function Status Tree
CVCS	Chemical and Volume Control System
DAS	Diverse Actuation System
DC	Direct Current
DG	Diesel Generator
EAL	Emergency Action Level
ECL	Emergency Classification Level
ED	Emergency Director
EFS	Communication System
EOF	Emergency Operations Facility
EOP	Emergency Operating Procedure
EPA	Environmental Protection Agency
EPG	Emergency Procedure Guideline
EPIP	Emergency Plan Implementing Procedure
EPRI	Electric Power Research Institute
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FSAR	Final Safety Analysis Report
GE	General Emergency
IC	Initiating Condition
IDLH	Immediately Dangerous to Life and Health
IRWST	In Containment Refueling Water Storage Tank
Keff	Effective Neutron Multiplication Factor
LCO	Limiting Condition of Operation
LER	Licensee Event Report
LFL	Lower Flammability Limit
LOCA	Loss of Coolant Accident
LWR	Light Water Reactor
MCR	Main Control Room
MSL	Main Steam Line
MSIV	Main Steam Isolation Valve
mR	milliRem
Mw	Megawatt
NEI	Nuclear Energy Institute
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NORAD	North American Aerospace 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
PA	Protected Area
PAG	Protective Action Guide
PIP	Plant Investment Protection
PLS	Plant Control System
PMS	Plant Monitoring and Control System
POAH	Point of Adding Heat
PRA/PSA	Probabilistic Risk Assessment / Probabilistic Safety Assessment
PWR	Pressurized Water Reactor
psig	Pounds per Square Inch Gauge
R	Rem
RCS	Reactor Coolant System
RMS	Radiation Monitoring System
RNS	Normal Residual Heat Removal System
RPS	Reactor Protection System
RPV	Reactor Pressure Vessel
SG	Steam Generator
SPDS	Safety Parameter Display System
SRO	Senior Reactor Operator
SSE	Safe Shutdown Earthquake
TEDE	Total Effective Dose Equivalent
TBD	To Be Determined
TOAF	Top of Active Fuel
TSC	Technical Support Center
TVS	Closed Circuit Television System (AP1000)
WE	Westinghouse Electric
WOG	Westinghouse Owners Group

1.0 METHODOLOGY FOR DEVELOPMENT OF EMERGENCY ACTION LEVELS

1.1 Background

NEI 07-01, Methodology for Development of Emergency Action Levels Advanced Passive Light Water Reactors, is based on the EAL work accomplished through the NUMARC/NESP 007, NEI 99-01 Revision 4 and Revision 5 development process. The history of the development is contained in 99-01 Revision 4 and continues in Revision 5 of the 99-01 document.

In 2006 the nuclear power revival of new plants with the advanced passive designs was being planned. The NEI EAL Task Force developed NEI 07-01 to address only the Westinghouse AP1000 and the General Electric ESBWR designs and is the basis for this Vogtle 3 and 4 EAL Technical Basis Document.

2.0 CHANGES INCORPORATED WITH NEI 07-01

Future changes will be identified in this section for future revisions.

3.0 DEVELOPMENT OF BASIS FOR GENERIC APPROACH

The generic guidance provided in this document 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 reactor plant and its operators. There are existing reporting requirements (EPA, OSHA) under which utilities operate. 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 document.

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

3.1 Definitions Used in Developing EAL Methodology

Based on the above review of regulations, review of common utility usage of terms, discussions among Task Force members, and existing published information, the following definitions apply to the generic EAL methodology:

EMERGENCY CLASS: One of a minimum set of names or titles, established by the Nuclear Regulatory Commission (NRC), for grouping off-normal nuclear power plant conditions according to (1) their relative radiological seriousness, and (2) the time-sensitive onsite and off-site radiological emergency preparedness actions necessary to respond to such conditions. The existing radiological emergency classes, in ascending order of seriousness, are called:

- Notification of Unusual Event
- Alert
- Site Area Emergency
- General Emergency

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

Discussion:

In NUREG-0654, the NRC introduced, but does not define, the term "initiating condition." Since the term is commonly used in nuclear power plant emergency planning, the definition above has been developed and combines both regulatory intent and the greatest degree of common usage among utilities.

Defined in this manner, an IC is an emergency condition which sets it apart from the broad class of conditions that may or may not have the potential to escalate into a radiological emergency. It can be a continuous, measurable function that is outside technical specifications, such as elevated RCS temperature or falling reactor coolant level (a symptom). It also encompasses occurrences such as FIRE (an event) or reactor coolant pipe failure (an event or a barrier breach).

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

Discussion:

The term "emergency action level" has been defined by example in the regulations, as noted in the above discussion concerning regulatory background. The term had not, however, been defined operationally in a manner to address all contingencies.
There are times when an EAL will be a threshold point on a measurable continuous function, such as a primary system coolant leak that has exceeded technical specifications for a specific plant.

At other times, the EAL and the IC will coincide, both identified by a discrete event that places the plant in a particular emergency class. For example, "Train Derailment Onsite" is an example of an "NOUE" IC in NUREG-0654 that also can be an event-based EAL.

3.2 Perspective

The purpose of this effort is to define a methodology for EAL development that will better assure a consistent emergency classification commensurate with the level of risk. The approach must be easily understood and applied by the individuals responsible for onsite and offsite emergency preparedness and response. In order to achieve consistent application, this recommended methodology must be accepted at all levels of application (e.g., licensed operators, health physics personnel, facility managers, offsite emergency agencies, NRC and FEMA response organizations, etc.).

Commercial nuclear facilities are faced with a range of public service and public acceptance pressures. It is of utmost importance that emergency regulations be based on as accurate an assessment of the risk as possible. There are evident risks to health and safety in understating the potential hazard from an event. However, there are both risks and costs to alerting the public to an emergency that exceeds the true threat. This is true at all levels, but particularly if evacuation is recommended.

3.3 Recognition Categories

ICs and EALs can be grouped in one of several schemes. This generic classification scheme incorporates 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. When one or more of these indicators begin to show off-normal readings, reactor operators are trained to identify the probable causes and potential consequences of these "symptoms" and take corrective action. The level of seriousness indicated by these symptoms depends on the degree to which they have exceeded technical specifications, 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. 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 barriers used to assure containment of radioactive materials contained within a nuclear power plant. For radioactive materials that are contained within the reactor core, these barriers are: fuel cladding, reactor coolant system 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 Emergency Operating Procedures (EOPs) Critical Safety Function (CSF) Status Tree Monitoring for the AP1000. Challenge to one or more barriers generally is initially identified through instrument readings and periodic sampling. The fission product barrier matrix

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 reactor coolant system 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 Safe 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 technical specifications. It is under these circumstances that the operations staff has the most direct information of the plant's systems, displayed in the main 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., reactor coolant system pressure boundary may be open) and fewer of the safety systems required for power operation are required to be fully operational.

It is important to note that in some operating modes there may not be definitive and unambiguous indicators of containment integrity available to Control Room personnel. For this reason, barrier-based EALs should not place undue reliance on assessments of containment integrity in all operating modes. Generally, Technical Specifications relax maintaining containment integrity requirements in cold shutdown and refueling 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.

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 can 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., as described in NUREG-0654 Appendix 1, 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 Design Differences

Although the same basic concerns with barrier integrity and the major safety problems of nuclear power plants are similar, design differences will have a substantial effect on EALs. In these cases, EAL guidelines unique to AP1000 and ESBWR are specified. These passive design plants incorporate the requirements contained in EPRI Advanced Light Water Reactor (ALWR) Requirements Document. Accordingly, many of the plant safety features for both designs are functionally equivalent.

3.5 Required Characteristics

Eight characteristics that should be incorporated into model EALs are identified below:

(1) Consistency (i.e., the EALs would lead to similar decisions under similar circumstances at different 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) Thoroughness in addressing, and disposing of, the issues of completeness and accuracy raised regarding NUREG-0654 Appendix 1;
(6) Technical completeness for each classification level;
(7) A logical progression in classification for multiple events; and
(8) Objective, observable values.

The EAL development methodology pays careful attention to these eight characteristics to assure that all are addressed in the proposed EALs. The most pervasive and complex of the eight is the first—"consistency." The common denominator that is most appropriate for measuring consistency among ICs and EALs is relative risk. The approach taken in the development of these EALs is based on risk assessment to set the boundaries of the emergency classes and assure that all EALs that trigger that emergency class are in the same range of relative risk. Precursor conditions of more serious emergencies also represent a potential risk to the public and must be appropriately classified.

3.6 Emergency Class Descriptions

There are three considerations related to emergency classes. These are:

(1) The potential impact on radiological safety, either as now known 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) plume exposure levels. In addition, the "Discussion" sections below include offsite dose consequence considerations which were not included in NUREG-0654 Appendix 1.

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 offsite 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 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.

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 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 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.

SITE AREA EMERGENCY (SAE): 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 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.

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 offsite emergency response agency concerns as to timely declaration of a General Emergency.

GENERAL EMERGENCY (GE): 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 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.

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 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 postulated to occur at high population density sites. 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.

3.7 Emergency Class Thresholds

The most common bases for establishing these boundaries are the technical specifications, bounding conditions and setpoints for each plant that have been developed in the design basis calculations and the Safety Analysis Report (SAR).

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 class. For example, the main steam line radiation monitor may detect high radiation that triggers an alarm. That radiation level also may be the setpoint that closes the main steam isolation valves (MSIV) and initiates the reactor trip. This same radiation level threshold, depending on plant-specific parameters, also may be the appropriate EAL for a direct entry into an emergency class.

In addition to the continuously measurable indicators, such as coolant temperature, coolant levels, leak rates, containment pressure, etc., the SAR provides indications of the consequences associated with design basis events. Examples would include steam pipe breaks, MSIV malfunctions, and other anticipated events that, upon occurrence, place the plant immediately into an emergency class.

Another approach for defining these boundaries is the use of a plant-specific probabilistic safety assessment (PSA - also known as probabilistic risk analysis, PRA). PRAs have been completed for the designs as part of the licensing process. PRAs can be used as a good first approximation of the 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 since 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.

3.8 Emergency Action Levels

ICs/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, 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.

Classifications are based on evaluation of each Unit. All classifications are to be based upon VALID indications, reports or conditions. Indications, reports or conditions are considered VALID when they are verified by (1) an instrument channel check, or (2) indications on related or redundant indications, or (3) by direct observation by plant personnel, such that doubt related to the indication's operability, the condition's existence, or the report's accuracy is removed. Implicit in this 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 can be determined. There are two basic approaches to determining these EALs. 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 will be the threshold reading that most closely corresponds to the emergency class description using the best available information.

The Emergency Director 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 Director, an IMMINENT situation is at hand, the classification should be made as if the threshold has been exceeded.

For discrete (discontinuous) events, the approach will have to be somewhat different. Typically, in this category are internal and external hazards such as FIRE or earthquake. The purpose for including hazards in EALs is to assure that station personnel and offsite 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 status for events approaching or exceeding design

basis limits such as Operating Basis Earthquake, 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 Critical Safety Functions (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.

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.

Portions of the IC and EAL Bases are specifically designated as information necessary for the development of the site specific thresholds of the EALs. 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 need not be included in the technical basis document supporting the EALs. In some cases, the information developed from the developer information may be appropriate to include in the technical basis document. In addition, the appendices are developer information in their entirety.

3.9 Treatment of Multiple Events and Emergency Class Upgrading

Although the majority of the EALs provide very specific thresholds, the Emergency Director must remain alert to events or conditions that lead to the conclusion that exceeding the EAL threshold is IMMINENT. If, in the judgment of the Emergency Director, 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 classes (as the early classification may provide for more effective implementation of protective measures), it is nonetheless applicable to all emergency classes.

3.10 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, Rev. 1, Section 3 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.

3.11 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 can be made, the declaration shall be based on the mode that existed at the time the event occurred.

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

3.11.1 AP1000 Operating Modes

Power Operations (1):	Reactor Power greater than 5%, Keff greater than or equal to 0.99
Startup (2):	Reactor Power less than or equal to 5%, Keff greater than or equal to 0.99
Hot Standby (3):	RCS greater than 420 °F, Keff less than 0.99
Safe Shutdown (4):	RCS less than or equal to 420°F, but greater than 200°F , Keff less than 0.99
Cold Shutdown (5):	RCS less than or equal to 200 °F, Keff less than 0.99
Refueling (6):	One or more vessel head closure bolts less than fully tensioned
Defueled (None)	All reactor fuel removed from reactor pressure vessel.

4.0 HUMAN FACTORS CONSIDERATIONS

Some factors that should be considered in determining the method of presentation of EALs:

- Who is the audience (user) for this information? A senior utility executive would likely want information presented differently than a licensed operator. Offsite agencies and the NRC may have entirely different information needs.
- The conditions under which the information must be read, understood, and acted upon. Since the subject matter here is *emergency* actions, it is highly likely that the user of the EALs will be under high stress during the conditions where they are required to be used, particularly under conditions corresponding to Site Area Emergency and General Emergency.
- What is the user's perception as to the importance of the EALs compared to other actions and decisions that may be needed at the same time? To allow a licensed operator to discharge his responsibilities for dealing with the situation and also provide prompt notification to outside agencies, the emergency classification and notification process must be rapid and concise.
- Is the EAL consistent with the user's knowledge of what constitutes an *emergency* situation?
- How much help does the user receive in deciding which EAL and emergency class is involved? An Emergency Director with a staffed TSC and EOF has many more resources immediately at his disposal than the licensed operator (typically, the Shift Supervisor) who has to make the initial decisions and take first actions.

Based on review of a number of plants' EALs and associated information, interviews with utility personnel, and a review of drill experience some recommendations follow.

4.1 Symptom-based, Event-based, Or Barrier-based EALs

Reviews of the emergency class descriptions provided elsewhere in this document shows that NOUEs and Alerts deal primarily with sequences that are precursors to more serious emergencies or that may have taken a plant outside of its intended operating envelope, but currently pose no danger to the public. Observable indications in these classes can be events (e.g. natural phenomena), symptoms (e.g., high temperature, low water level), or barrier-related (e.g., challenge to fission product barrier). As one escalates to Site Area Emergency and General Emergency, potential radiological impact to people (both onsite and offsite) rise. However, at this point the root cause event(s) leading to the emergency class escalation matter far less than the increased (potential for) radiological releases. Thus, EALs for these emergency classes should be primarily symptom- and barrier-based. It should be noted again, as stated in Section 3.4, that barrier monitoring is a subset of symptom monitoring, i.e., what readings (symptoms) indicate a challenge to a fission product barrier.

5.0 GENERIC EAL GUIDANCE

This section provides generic EAL guidance based on the information gathered and reviewed by the Task Force. Because of the wide variety of presentation methods used at different utilities, this document specifies guidance as to what each IC and EAL should address, and including sufficient basis information for each will best assure uniformity of approach. This approach is analogous to reactor vendors' owners groups developing generic emergency procedure guidelines which are converted by each utility into plant-specific emergency operating procedures. Each utility is reminded, however, to review the "Human Factors Considerations" section of this document as part of implementation of the attached Generic EAL Guidance.

5.1 Generic Arrangement

The information is presented by Recognition Categories:

- A - Abnormal Rad Levels / Radiological Effluent
- C - Cold Shutdown./ Refueling System Malfunction
- F - Fission Product Barrier Degradation
- H - HAZARDS or OTHER Conditions Affecting Plant Safety
- S - System Malfunction

EALs for permanently defueled plants and Independent Spent Fuel Storage Installations are contained in NEI 99-01, current revision and are not addressed in this document.

The Initiating Conditions for each of the above Recognition Categories is in the order of NOUE, Alert, Site Area Emergency, and General Emergency. For all Recognition Categories, an Initiating Condition matrix versus Emergency Class is first shown. For Recognition Category F, the barrier-based EALs are presented in Tables F-1 and F-2 for ESBWR and AP1000 respectively.

With the exception of Recognition Category F, each of the EAL guides in Recognition Categories is structured in the following way:

- **Recognition Category** - As described above.
- **Emergency Class** - NOUE, Alert, Site Area Emergency or General Emergency.
- **Initiating Condition** – Symptom- or Event-Based, Generic Identification and Title.
- **Operating Mode Applicability** - These modes are defined in each licensee's technical specifications. The mode classifications and terminology appropriate to the specific facility should be used.
- **Emergency Action Level(s)** – these EALs are conditions and indications that were considered to meet the criteria of the IC.
- **Basis** – provides information that explains the IC and EALs. The bases are written to assist the personnel implementing the generic guidance into site-specific procedures. Some bases provide information intended to assist with establishing site-specific instrumentation values. Appendices A and C provide detailed guidance on implementing their corresponding Recognition Categories.

For Recognition Category F, basis information is presented in a format consistent with Tables 5-F-1, 2 and 3. The presentation method shown for Fission Product Barrier Function Matrix was chosen to clearly show the synergism among the EALs and to support more accurate dynamic assessments.

5.2 Generic Bases

The generic guidance has the primary threshold for NOUEs as operation outside the safety envelope for the plant as defined by plant technical specifications, including LCOs and Action Statement Times. In addition,

certain precursors of more serious events are included in NOUE IC/EALs. This provides a clear demarcation between the lowest emergency class 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 (i.e., tornadoes, hurricanes, FIRE in plant VITAL AREAs) or require additional help directly (Control Room evacuation) and thus increased monitoring of the plant is warranted. 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 will already result in the staffing of the TSC for assistance and additional monitoring. Thus, direct escalation to the Site Area Emergency is unnecessary. Other Alerts, that have been specified, correspond to conditions which are consistent with the emergency class 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 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.

5.3 Site Specific Implementation

The guidance presented here is not intended to be applied to plants as-is. However, the benefits of aligning with the guidance as closely as possible may be realized in; improved interface with the NRC, improved interface with other utilities, better positioning to adopt future enhancements such as FAQs. The generic guidance is intended to provide the logic for developing site-specific IC/EALs using site-specific IC/EAL presentation methods. Each utility will need to implement the IC/EALs using site-specific needs with regard to instrumentation, nomenclature, plant arrangement, and method of presentation, etc. When plant design prevents use of ICs/EALs prescribed in NEI 07-01, other indications that address the subject condition should be implemented. Such revision is expected and encouraged provided that the intent of the generic guidance is retained. Deviations from the intent may be acceptable, but will need to be justified during regulatory review. Items associated with presentation, e.g., format, sequencing of IC/EALs, IC numbering, recognition categories are at the option of the utility. RIS 2003-18 and its supplements 1 and 2 clarify the expectations for alignment with the guidance document and the associated regulatory review requirements.

The generic guidance includes both ICs and EALs. It is the intent of this guidance that both be included in the site-specific implementation. Each serves a specific purpose. The IC is intended to be the fundamental criteria for the declaration, whereas, the EALs are intended to represent unambiguous conditions that may 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 Director, the intent of the IC may be met. While the generic guidance does include Emergency Director judgment ICs, the additional detail in the individual ICs will facilitate classifications over the broad guidance of the ED judgment ICs.

State and local requirements have not been reflected in the generic guidance and should be considered on a case-by-case basis with appropriate state and local emergency response organizations.

Although not a requirement, utilities should consider either preparing a basis document or including basis information with the IC/EALs. The bases provided for each IC/EAL will provide a starting point for developing these site-specific bases. This information may assist the Emergency Director in making

classifications, particularly those involving judgment or multiple events. The basis information may be useful in training, for explaining event classifications to offsite officials, and would facilitate 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 procedure. Definitions of these terms are provided below.

AFFECTING SAFE SHUTDOWN: Event in progress has adversely affected functions that are necessary to bring the plant to and maintain it in the applicable SAFE or COLD SHUTDOWN condition. Plant condition applicability is determined by Technical Specification LCOs in effect.

> Example 1: Event causes damage that results in entry into an LCO that requires the plant to be placed in SAFE SHUTDOWN. SAFE SHUTDOWN is achievable, but COLD SHUTDOWN is not. This event <u>is not</u> "AFFECTING SAFE SHUTDOWN."
> Example 2: Event causes damage that results in entry into an LCO that requires the plant to be placed in COLD SHUTDOWN. SAFE SHUTDOWN is achievable, but COLD SHUTDOWN is not. This event <u>is</u> "AFFECTING SAFE SHUTDOWN."

BOMB: Refers to an explosive device suspected of having sufficient force to damage plant systems or structures.

CIVIL DISTURBANCE: A group of one or more persons violently protesting station operations or activities at the site.

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

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

FAULTED: In a steam generator, the existence of secondary side leakage that results in an uncontrolled drop in steam generator pressure or the steam generator 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 Nuclear Power Plant or its personnel that includes the use of violent force to destroy equipment, take HOSTAGES, and/or intimidates 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 Nuclear Power Plant. Non-terrorism-based EALs should be used to address such activities, (i.e., violent acts between individuals in the OWNER CONTROLLED AREA).

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.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH): An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would interfere with an individual's ability to escape from a dangerous atmosphere.

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.

LOWER FLAMMABILITY LIMIT (LFL): The minimum concentration of a combustible substance that is capable of propagating a flame through a homogenous mixture of the combustible and a gaseous oxidizer.

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 or emergency operating procedures, or deviation from normal security or radiological controls posture, is a departure from NORMAL PLANT OPERATIONS.

POINT OF ADDING HEAT: A Unit specific reactor power level at which sufficient energy is being added to the reactor coolant from the reactor to result in a bulk coolant temperature increase. [This value may vary slightly based on plant core loading and time of life. For purposes of identifying the Unit specific reactor power level, a typical value may be chosen to prevent having to recalculate this setpoint. Sites may choose to operationally have their staff identify that the reactor is at the POAH and not develop a specific power level equivalent to the POAH.]

PROJECTILE: An object directed toward a Nuclear Power Plant that could have an effect sufficient to cause concern for its continued operability, reliability, or safety of personnel.

PROTECTED AREA: The area which normally encompasses all controlled areas within the security PROTECTED AREA fence.

RUPTURED: In a steam generator, existence of primary-to-secondary leakage of a magnitude sufficient to require or cause a reactor trip and automatic depressurization.

SIGNIFICANT TRANSIENT: An UNPLANNED event involving one or more of the following: (1) automatic turbine runback greater than 25% thermal reactor power, (2) electrical load rejection greater than 25% full electrical load, (3) Reactor Trip, (4) Safety Injection Actuation, or (5) thermal power oscillations greater than10%.

STRIKE ACTION: A work stoppage within the PROTECTED AREA by a body of workers to enforce compliance with demands made on (site-specific). The STRIKE ACTION must threaten to interrupt NORMAL PLANT OPERATIONS.

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, or (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 affected structure, system, or component. Example damage includes: deformation due to heat or impact,

denting, penetration, rupture, cracking, paint blistering. Surface blemishes (e.g., paint chipping, scratches) should not be included.

VITAL AREA: Any area, normally within the PROTECTED AREA, which 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 (site-specific).

Table 5-A-1

Recognition Category R

Abnormal Rad Levels / Radiological Effluent

INITIATING CONDITION MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOUE
RG1 Offsite 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. *Op. Modes: All*	**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. *Op. Modes: All*	**RA1** Any Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Offsite Dose Calculation Manual for 15 Minutes or Longer. *Op. Modes: All*	**RU1** Any Release of Gaseous or Liquid Radio-activity to the Environment that Exceeds Two Times the Offsite Dose Calculation Manual for 60 Minutes or Longer. *Op. Modes: All*
		RA2 Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel. *Op. Modes: All*	**RU2** UNPLANNED Rise in Plant Radiation. *Op. Modes: All*
		RA3 Release of Radioactive Material or Rise in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown *Op. Modes: All*	

RU1

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

Any Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Offsite Dose Calculation Manual for 60 Minutes or Longer

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the release duration has exceeded, or will likely exceed, the applicable time. 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. VALID reading on any effluent monitor that exceeds two times the alarm setpoint established by a current radioactivity discharge permit for 60 minutes or longer.

Plant Vent	VFS-RICA-103	[TBD]
Turbine Island Vent	TDS-JE-RE001	[TBD]
Gaseous Radwaste Discharge	WGS-RICA-017	[TBD]
Liquid Radwaste discharge	WLS-RIA-229	[TBD]
Wastewater Discharge	WWS-JE-RE021	[TBD]

2. VALID reading on one or more of the following radiation monitors that exceeds the reading shown for 60 minutes or longer:

Steam Generator Blowdown	BDS-RE-010	[TBD]
	BDS-RE-011	[TBD]
Main Steam Line	SGS-RIA-026, RIA-027	[TBD]
Service Water Blowdown	SWS-RIA-008	[TBD]
Containment Air Filtration Exhaust	VFS-MA-02A, MA-02B	[TBD]

3. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of two times [site-specific ODCM - TBD] with a release duration of 60 minutes or longer,.

Basis:

This IC addresses a potential or actual 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. Nuclear power plants incorporate features intended to control the release of radioactive effluents to the environment. Further, there are administrative controls 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 ODCM multiples are specified in ICs RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an offsite 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 (e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.) on the applicable permit. The Emergency Director should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes. Also, if an ongoing release is detected and the starting time for that release is unknown, the Emergency Director should, in the absence of data to the contrary, assume that the release has exceeded 60 minutes.

Threshold #1 addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed two times the Technical Specification limit and releases are not terminated within 60 minutes.

Threshold #2 is intended for effluent monitoring on non-routine release pathways for which a discharge permit would not normally be prepared.

Threshold #3 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.

References:

VFS-M3C-101
WGS-M3C-101
WLS-M3C-101
WWS-M3C-100
BDS-M3C-101
SGS-M3C-101
SWS-M3C-101
RMS-J7-001

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

UNPLANNED Rise in Plant Radiation

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2)

1. a. VALID uncontrolled water level drop in the refueling pathway with all irradiated fuel assemblies remaining covered by water as indicated by:

   - Spent Fuel Pool Low-Low Alarm 22.75 ft. on SFS-LICA-19A/B/C
   - Visual observation

   AND

   b. VALID rise in area radiation reading indicated by::

   - Fuel Handling Area Exhaust Radiation Monitor VAS-RE 001
   - Containment High Range PXS-RICA-160, 161, 162, 163
   - Refueling Bridge Portable Monitor [site specific - TBD]

2. VALID Area Radiation Monitor readings rise by a factor of 1000 over normal* levels.

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

Basis:

This IC addresses elevated radiation levels as a result of water level lowering but above the RPV flange or events that have resulted, or may result, in unexpected rise in radiation dose rates within plant buildings. These radiation levels represent a loss of control over radioactive material and may represent a potential degradation in the level of safety of the plant.

Classification as a NOUE is warranted as a precursor to a more serious event.

While a radiation monitor could detect a rise 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 refueling events where the water level drops below the RPV flange classification would be via CU2. This event escalates to an Alert per IC 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 Matrix for events in operating modes 1-4.

Threshold #2 addresses elevated in-plant radiation levels encountered during operation of plant processes that represent a degradation in the control of radioactive material, and represent a potential degradation in the level of safety of the plant. This EAL excludes in-plant radiation levels that may result from use of radiographic sources. 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 IC AA3 if the increase in dose rates impedes personnel access necessary for safe operation.

References:

SFS-M3C-101
RCS-M3C-101
VAS-M3C-101
PXS-M3C-101
RMS-J7-001

Initiating Condition -- ALERT

Any Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Offsite Dose Calculation Manual for 15 Minutes or Longer

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the release duration has exceeded, or will likely exceed, the applicable time. 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. VALID reading on any effluent monitor that exceeds 200 times the alarm setpoint established by a current radioactivity discharge permit for 15 minutes or longer.

Plant Vent	VFS-RICA-103	[TBD]
Turbine Island Vent	TDS-JE-RE001	[TBD]
Gaseous Radwaste Discharge	WGS-RICA-017	[TBD]
Liquid Radwaste discharge	WLS-RIA-229	[TBD]
Wastewater Discharge	WWS-JE-RE021	[TBD]

2. VALID reading on one or more of the following radiation monitors that exceeds the reading shown for 15 minutes or longer:

Steam Generator Blowdown	BDS-RE-011	[TBD]
	BDS-RE-010	[TBD]
Main Steam Line	SGS-RIA-026, RIA-027	[TBD]
Service Water Blowdown	SWS-RIA-008	[TBD]
Containment Air Filtration Exhaust	VFS-MA-02A, MA-02B	[TBD]

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:

This IC addresses a potential or actual 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 occurrence of extended, uncontrolled radioactive releases to the environment is indicative of a degradation in the features and/or controls established to prevent unintentional releases, or control and monitor intentional releases.

The ODCM multiples are specified in ICs RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an offsite 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.

This EAL includes any release for which a radioactivity discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.) on the applicable permit. The Emergency Director should not wait until 15 minutes has elapsed, but should declare

the event as soon as it is determined that the release duration has or will likely exceed 15 minutes. Also, if an ongoing release is detected and the starting time for that release is unknown, the Emergency Director should, in the absence of data to the contrary, assume that the release has exceeded 15 minutes.

Threshold #1 addresses radioactivity releases that for whatever reason cause effluent radiation monitor readings that exceed two hundred times the alarm setpoint established by the radioactivity discharge permit. This alarm setpoint may be associated with a planned batch release, or a continuous release path.

Threshold #2 addresses effluent or accident radiation monitors on non-routine release pathways (i.e., for which a discharge permit would not normally be prepared).

Threshold #3 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.

Threshold s #1 and #2 directly correlate with the IC since annual average meteorology is used.

References:

VFS-M3C-101
WGS-M3C-101
WLS-M3C-101
WWS-M3C-100
BDS-M3C-101
SGS-M3C-101
SWS-M3C-101
RMS-J7-001

RA2

Initiating Condition -- ALERT

Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2)

1. A VALID alarm or elevated reading on one or more of the following radiation monitors due to irradiated fuel uncovery or damage:

Fuel Handling Area Exhaust Radiation Monitor	VAS-RE 001
Containment High Range	PXS-RICA-160, 161, 162, 163
Refueling Bridge Portable Monitor	[site specific - TBD]

2. A water level drop in the reactor refueling pathway resulting in irradiated fuel becoming uncovered as indicated by:

Spent Fuel Pool Low-Low Alarm [TBD] ft	PP-SFS-LICA-19A/B/C
Visual observation	

Basis:

This IC addresses specific events that have resulted, or may result, in unexpected rise 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 degradation in the level of safety of the plant.

Threshold #1 addresses radiation monitor indications of fuel uncovery and/or fuel damage. Elevated readings on ventilation monitors may be indication of a radioactivity release from the fuel, confirming that damage has occurred. Raised background at the monitor due to water level lowering may mask raised ventilation exhaust airborne activity and needs to be considered. Application of this threshold requires understanding of the actual radiological conditions present in the vicinity of the monitor.

Threshold #2 indications include instrumentation and personnel (e.g., refueling crew) reports.

Escalation, if appropriate, would occur via IC RS1 or RG1 or Emergency Director judgment.

References:

SFS-M3C-101
VAS-M3C-101
PXS-M3C-101
RMS-J7-001

RA3

Initiating Condition -- ALERT

Release of Radioactive Material or Rise in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown

Operating Mode Applicability: All

Emergency Action Levels:

1. VALID dose rate greater than 15 mR/hr in the following areas requiring continuous occupancy to maintain plant safety functions:

Main Control Room Area Monitor	RMS-JE-RE010
Technical Support Center Area Monitor	RMS-JE-RE016
Central Alarm Station	RMS-JE-RE009

Basis:

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

Areas requiring continuous occupancy include the Control Room, Technical Support Center (if staffed) and the Central Alarm Station.

References:

RMS-J7-001

Initiating Condition -- SITE AREA EMERGENCY

Offsite 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.

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

Note: *If dose assessment results are available at the time of declaration, the classification should be based on dose assessment instead of radiation monitor values. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated / completed in order to determine if the classification should be subsequently escalated.*

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the release duration has exceeded, or will likely exceed, the applicable time.*

1. VALID reading on one or more of the following radiation monitors that exceeds or is expected to exceed the reading shown for 15 minutes or longer:

Plant Vent (Mid Range Gas)	VFS-RIA-104A	[Setpoint TBD]
Plant Vent (High Range Gas)	VFS-RIA-104B	[Setpoint TBD]
Gaseous Radwaste discharge	WGS-RICA-017	[Setpoint TBD]

2. Dose assessment using actual meteorology indicates doses greater than 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the site boundary.

3. Field survey results indicate closed window dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate thyroid CDE of 500 mrem for one hour of inhalation, at or beyond the site boundary.

Basis:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed a small fraction of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

The Emergency Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes.

The monitor list in EAL #1 should include monitors on all potential release pathways.

References:

VFS-M3C-101
WGS-M3C-101
RMS-J7-001

RG1

Initiating Condition -- GENERAL EMERGENCY

Offsite 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.

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

Note: *If dose assessment results are available at the time of declaration, the classification should be based on dose assessment instead of radiation monitor values. Do not delay declaration awaiting dose assessment results.*

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the release duration has exceeded, or will likely exceed, the applicable time.*

1. VALID reading on one or more of the following radiation monitors that exceeds or expected to exceed the reading shown for 15 minutes or longer:

Plant Vent (Mid Range Gas)	VFS-RIA-104A	[Setpoint TBD]
Plant Vent (High Range Gas)	VFS-RIA-104B	[Setpoint TBD]
Gaseous Radwaste discharge	WGS-RICA-017	[Setpoint TBD]

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 exceeding 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate thyroid CDE of 5000 mrem for one hour of inhalation, at or beyond site boundary.

Basis:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed the EPA Protective Action Guides (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.

The Emergency Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes. The monitor list in EAL #1 includes monitors on all potential release pathways.

References:

VFS-M3C-101
WGS-M3C-101
RMS-J7-001

Recognition Category C
Cold Shutdown/Refueling System Malfunction
INITIATING CONDITION MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOUE
CG1 Loss of RPV Inventory Affecting Fuel Clad Integrity with Containment Challenged. *Op. Modes: Cold Shutdown, Refueling*	**CS1** Loss of RPV Inventory Affecting Core Decay Heat Removal Capability. *Op. Modes: Cold Shutdown*	**CA1** Loss of RCS/RPV Inventory. *Op. Modes: Cold Shutdown, Refueling*	
			CU2 UNPLANNED Loss of RCS/RPV Inventory *Op. Mode: Refueling*
			CU3 All Safety Related DC Batteries Not Being Charged for Greater Than 30 Minutes Due to Loss of Power to PIP Busses. *Op. Modes: Cold Shutdown, Refueling, Defueled*
		CA4 Inability to Maintain Plant in Cold Shutdown. *Op. Modes: Cold Shutdown, Refueling*	**CU4** UNPLANNED Loss of Decay Heat Removal Capability. *OP. Modes: Cold Shutdown, Refueling*
			CU6 UNPLANNED Loss of All On-site or Off-site Communications Capabilities. *Op. Modes: Cold Shutdown, Refueling, Defueled*
			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*

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU2

Initiating Condition -- **NOTIFICATION OF UNUSUAL EVENT**

UNPLANNED Loss of RCS Inventory.

Operating Mode Applicability: Refueling

Emergency Action Levels: (1 or 2)

1. UNPLANNED RCS level drop below the top of the RPV flange either visually or as indicated by RCS Hot Leg level at 9.7% and lowering as indicated on RCS-LT-160A or -160B for 15 minutes or longer.

2. RCS level cannot be monitored with a loss of RCS inventory as indicated by:
   - Visual observations inside containment
   - Unexplained rise in Containment sump level on WLS-LICR-034, WLS-LICR-035, OR WLS-LICR-036.

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. Refueling evolutions that decrease RCS water level below the RPV flange are carefully planned and procedurally controlled. An UNPLANNED event that results in water level decreasing below the RPV 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 level via either IC CA1 (Loss of RCS/RPV Inventory with Irradiated Fuel in the RPV) or CA4 (Inability to Maintain Plant in Cold Shutdown with Irradiated Fuel in the RPV).

References:

RCS-M3C-101
WLS-M3C-101
WLS-M3-001
RCS-M3-001
PXS-M3-001

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU3

Initiating Condition -- **NOTIFICATION OF UNUSUAL EVENT**

All Safety Related DC Batteries Not Being Charged for Greater Than 30 Minutes Due to Loss of Power to PIP Busses.

Operating Mode Applicability: Cold Shutdown
Refueling
Defueled

Example Emergency Action Level:

AP1000

1. Loss of all AC power capability to Busses ECS-ES-1 and ECS-ES-2 busses for greater than 30 minutes or longer.

Basis:

The off-site AC power system supplies power for the unit in cold shutdown, refueling, and defueled conditions. Both the normal off-site and standby on-site AC power systems are non-Class 1E with no Technical Specification requirements. All safety-related functions associated with the unit in cold shutdown and refueling are provided by the safety-related on-site Class 1E DC power systems.

The loss of normal off-site AC power and standby on-site AC power systems de-energizes the RNS pumps. However, the on-site safety-related Class 1E DC power systems are rated for 24 hours and 72 hours of service based on the most-limiting post-accident electrical load requirements for powering the passive, safety-related systems, and thus remain available for a significant time following a loss of all off-site AC power and on-site AC power. Therefore, the progression of events after a loss of RNS cooling at mid-loop caused by a loss of AC power results in a heatup to saturation, a boiling off of coolant to the IRWST, reduction of hot leg level, and actuation of passive IRWST injection. This restores RCS water inventory using only the passive cooling systems and the on-site safety-related Class 1E DC power systems.

Loss of DC power potentially compromises all safety related plant systems requiring electric power.

Escalation to an Alert, if appropriate, is by Abnormal Radiation Levels / Radiological Effluent, or Emergency Director Judgment ICs. Thirty minutes was selected as a threshold to exclude transient or momentary power losses, and is appropriate because of the passive cooling systems and the on-site safety-related Class 1E DC power systems.
References:

APP-ECS-E8-001
APP-RCS-M3-001
APP-PXS-M3-001
APP-RNS-M3-001
APP-ZOS-E8-001
Technical Specification 3.9.7

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU4

Initiating Condition -- **NOTIFICATION OF UNUSUAL EVENT**

UNPLANNED Loss of Decay Heat Removal Capability.

Operating Mode Applicability:	Cold Shutdown Refueling
Emergency Action Levels:	(1 or 2)

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.*

1. An event results in RCS temperature exceeding 200 F on RCS-TI-135A or -135B

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

Basis:

This IC is included as a NOUE because it may be 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. Monitoring RCS temperature and RPV level so that escalation to the alert level via CA4 or CA1 will occur if required.

Decay heat removal is normally performed by the non-safety related RNS pumps and heat exchangers. The progression of events after a loss of RNS cooling at mid-loop results in a heatup to saturation, a boiling off of coolant to the IRWST, reduction of hot leg level, and actuation of passive IRWST injection. This restores RCS water inventory using only the safety-related passive cooling systems. However, if an unplanned event causes the both normal decay heat removal and the passive cooling systems to be lost, then RCS temperature can exceed 200ºF. In addition, even though RNS may be operating and initial RCS/RPV inventory is available, a loss of all RCS temperature and RPV level indication prevents the operator from ensuring adequate RNS decay heat removal is occurring.

Any reduction of RCS inventory to the predetermined setpoint will result in an Alert based on CA1 or CA4.

References:

APP-RCS-M3-001
APP-PXS-M3-001
APP-RNS-M3-001
APP-GW-GL-022
Tech Spec 3.4.7
Tech Spec 3.5

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU6

Initiating Condition -- **NOTIFICATION OF UNUSUAL EVENT**

UNPLANNED Loss of All Onsite or Offsite Communications Capabilities.

Operating Mode Applicability:	Cold Shutdown Refueling Defueled
Emergency Action Levels:	(1 or 2)

1. Loss of all of the following on-site communications capability affecting the ability to perform routine operations:

   - EFS
   - TVS
   - [Site specific – TBD]

2. Loss of all of the following off-site communication methods affecting the ability to perform offsite notifications:

   (site-specific list of communications methods)

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 problems with offsite authorities. The loss of offsite communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

The availability of one method of ordinary offsite communications is sufficient to inform state and local authorities of plant conditions.

EFS and TVS are comprised of the following:
- Wireless Telephone System
- Telephone-Page System
- Sound Powered System
- Security Communication System
- Closed Circuit Television System

References:

EFS-E8-001
TVS-J7-001

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU7

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

UNPLANNED Loss of Required DC Power for 15 Minutes or Longer.

Operating Mode Applicability: Cold Shutdown
Refueling

Emergency Action Level:

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.*

1. a. Loss of Required UPS System Power based on [voltage indications TBD] for ALL of the following AC instrumentation and control busses:

   - Division A 24-Hour Bus IDSA-EA-1
   - Division B 24-Hour Bus IDSB-EA-1
   - Division B 72-Hour Bus IDSB-EA-3
   - Division C 24-Hour Bus IDSC-EA-1
   - Division C 72-Hour Bus IDSC-EA-3
   - Division D 24-Hour Bus IDSD-EA-1

   AND

   b. Failure to restore power to at least one required bus in less than 15 minutes from the time of loss.

Basis:

The purpose of this IC and its associated EALs is to recognize a loss of the Class 1E DC which provides electrical power for safety related and vital control and monitoring instrumentation loads. It also provides power for safe shutdown when all the onsite and offsite AC power sources are lost and cannot be recovered for 72 hours.

UNPLANNED is included in this IC to preclude the declaration of an emergency as a result of planned maintenance activities.

Bus voltage of [TBD] VDC is the minimum bus voltage necessary for the operation of safety-related instrumentation and controls. This voltage value incorporates a margin of significantly longer than the allowed 15 minutes of operation before the onset of inability to operate those loads.

References:

IDS-E8-001

CU8

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

Inadvertent Criticality.

Operating Mode Applicability: Cold Shutdown
Refueling

Emergency Action Levels:

1. An UNPLANNED sustained positive startup rate.

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.

Escalation would be by Emergency Director Judgment.

Reference:

PMS-J4-020
PMS-J1-003

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA1

Initiating Condition -- **ALERT**

Loss of RCS/RPV Inventory.

Operating Mode Applicability: Cold Shutdown
Refueling

Emergency Action Levels: (1 or 2)

1. a. Pressurizer level at 12% and lowering on RCS-LT-200

   OR

   b. RCS Hot Leg level is at 9.7% and lowering as indicated on RCS-LT-160A OR -160B

2. RCS level cannot be monitored for greater than 30 minutes with a loss of RCS/RPV inventory as indicated by unexplained rise in Containment sump level on WLS-LICR-034, WLS-LICR-035, OR WLS-LICR-036.

Basis:

These Thresholds 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 RPV level lowering and potential core uncovery. This condition will result in a minimum classification of Alert. The inability to restore and maintain level after reaching this setpoint would therefore be indicative of a failure of the RCS barrier.

The RCS PZR level and Hot Leg level setpoints were chosen to indicate that actions must be taken to prevent reaching a level that would cause a loss of RNS cooling. The inability to restore and maintain level after reaching this setpoint would therefore be indicative of a failure of the RCS barrier. The pressurizer level setpoint is 12%, which is the pressurizer level low-2 setpoint. This provides CMT actuation for Core Heat Removal. The hot leg level setpoint is 9.7%, which is the hot leg level low-2 setpoint. This activates ADS 4 and IRWST injection for Core Heat Removal.

If all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes.

The 30-minute duration for the loss of level indication was chosen to allow CA1 to be an effective precursor to CS1. This provides time to increase makeup and isolate leakage prior to core uncovery. Whether or not the actions in progress will be effective should be apparent within 30 minutes.

If RPV level continues to decrease then escalation to Site Area will be via CS1 (Loss of RPV Inventory Affecting Core Decay Heat Removal Capability).

References:

RCS-M3 -101
WLS-M3C-101
WLS-M3-001
RCS-M3-001
PXS-M3-001

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA4

Initiating Condition -- ALERT

Inability to Maintain Plant in Cold Shutdown.

Operating Mode Applicability: Cold Shutdown
Refueling

Emergency Action Levels: (EAL 1 or 2 or 3)

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.*

1. An UNPLANNED event results in RCS Temperature greater than 200 ºF as indicated on RCS-TI-135A OR -135B for greater than the specified duration on table.

Table: RCS Reheat Duration Thresholds		
RCS	**Containment Closure**	**Duration**
Intact	N/A	60 minutes*
Open	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 does not apply in Solid Plant conditions.)

Basis:

For Threshold 1, the RCS Reheat Duration Threshold table addresses complete loss of functions required for core cooling for greater than 60 minutes during refueling and cold shutdown modes when RCS integrity is established. The 60 minute time frame should allow sufficient time to restore cooling without there being a substantial degradation in plant safety.

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. The allowed 20 minute time frame was included to allow operator action to restore the heat removal function, if possible.

Finally, complete loss of functions required for core cooling during refueling and cold shutdown modes when neither CONTAINMENT CLOSURE nor RCS integrity are established. 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 note (*) 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 Threshold 2, the 10 psi pressure increase covers 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 Control Board instrumentation that is equal to or greater than 10 psi.

Escalation to Site Area would be via CS1 should boiling result in significant RPV level loss leading to core uncovery.

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

The Emergency Director must remain alert to events or conditions that lead to the conclusion that exceeding the EAL threshold is IMMINENT. If, in the judgment of the Emergency Director, an IMMINENT situation is at hand, the classification should be made as if the threshold has been exceeded.

References:

RCS-M3C-101
RCS-M3-001
PXS-M3-001
RNS-M3-001

Initiating Condition -- **SITE AREA EMERGENCY**

Loss of RPV Inventory Affecting Core Decay Heat Removal Capability.

Operating Mode Applicability: Cold Shutdown
Refueling

Emergency Action Levels: (1 or 2)

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.*

1. WITH CONTAINMENT CLOSURE NOT established:

   RPV level less than Lo-2 (3 inches above the inside surface of the bottom of the Hot Leg) on RCS LT-160A or -160B

   OR

2. With CONTAINMENT CLOSURE established

   RCS LT-160A or LT-160B Offscale low

   OR

3. RPV level cannot be monitored for 60 minutes or longer with a loss of RPV inventory as indicated by:
   - Containment radiation monitor reading GREATER THAN [TBD] rad/hr on PXS-JE-RE-160, -161, -162, OR -163
   - Unexplained containment sump level rise on WLS-LICR-034, WLS-LICR-035, OR WLS-LICR-036
   - Erratic Source Range Monitor Indication

Basis:

Under the conditions specified by this IC, continued decrease in RPV level is indicative of a loss of inventory control. Inventory loss may be due to an RPV breach, pressure boundary leakage, or continued boiling in the RPV.

For 1, the lowest observable level is used.

The 60-minute duration allows sufficient time for actions to be performed to recover needed cooling equipment and is considered to be conservative. An effluent release is not expected with closure established.

Declaration of a Site Area Emergency is warranted under the conditions specified by the IC. Escalation to a General Emergency is via CG1 (Loss of RPV Inventory Affecting Fuel Clad Integrity with Containment Challenged with Irradiated Fuel in the RPV) or radiological effluent IC RG1 (Offsite Dose Resulting from an Actual or IMMINENT Release of Gaseous Radioactivity Exceeds 1000 mR TEDE or 5000 mR Thyroid CDE for the Actual or Projected Duration of the Release Using Actual Meteorology).

References:

APP-RCS-M3C-101
Tech Specs 3.4.12, 3.4.13, 3.5.3,
3.5.5 and 3.5.7

Initiating Condition -- **GENERAL EMERGENCY**

Loss of RPV Inventory Affecting Fuel Clad Integrity with Containment Challenged.

Operating Mode Applicability: Cold Shutdown
Refueling

Emergency Action Level:

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.*

1. a. CONTAINMENT challenged as indicated by one or more of the following:
   - CONTAINMENT CLOSURE not established
   - Explosive mixture inside containment
   - Pressure above [TBD] psig value

   AND

   b. Core uncovery 30 minutes or longer as indicated by **EITHER**:
   - RCS LT-160A or LT-160B Offscale low.

   OR

   - CANNOT be monitored with indication of core uncovery by ANY of the following:
     - PXS-JE-RE160, -161, -162, -163 radiation monitor reading greater than [TBD] (Hi2 setpoint).
     - Core Exit Thermocouple temperature equal to or greater than [700°F] on [TBD].
     - Erratic Source Range Monitor Indication
     - Unexplained containment sump level rise on WLS-LICR-034, WLS-LICR-035, OR WLS-LICR-036

Basis:

These conditions represent the inability to restore and maintain RPV level to above the top of active fuel. Fuel damage is probable if RPV level cannot be restored, as available decay heat will cause boiling, further reducing the RPV level.

These conditions 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*, NUREG-1449, *Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States*, and, NUMARC 91-06, *Guidelines for Industry Actions to Assess Shutdown Management.* Analysis in the above references indicates that core damage may occur within an hour following continued core uncovery therefore, conservatively, 30 minutes was chosen.

For both cold shutdown and refueling modes sump and tank level rise 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 RPV lowers, the dose rate above the core will increase. The dose rate due to this core shine should result in up-scaled radiation monitor indication and possible alarm. Additionally, post-TMI studies indicated that the installed nuclear instrumentation will operate erratically when the core is uncovered and that this should be used as a tool for making such determinations.

The GE is declared on the occurrence of the loss or IMMINENT loss of function of all three barriers. Based on the above discussion, RCS barrier failure resulting in core uncovery for 30 minutes or more may cause fuel clad failure. 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.

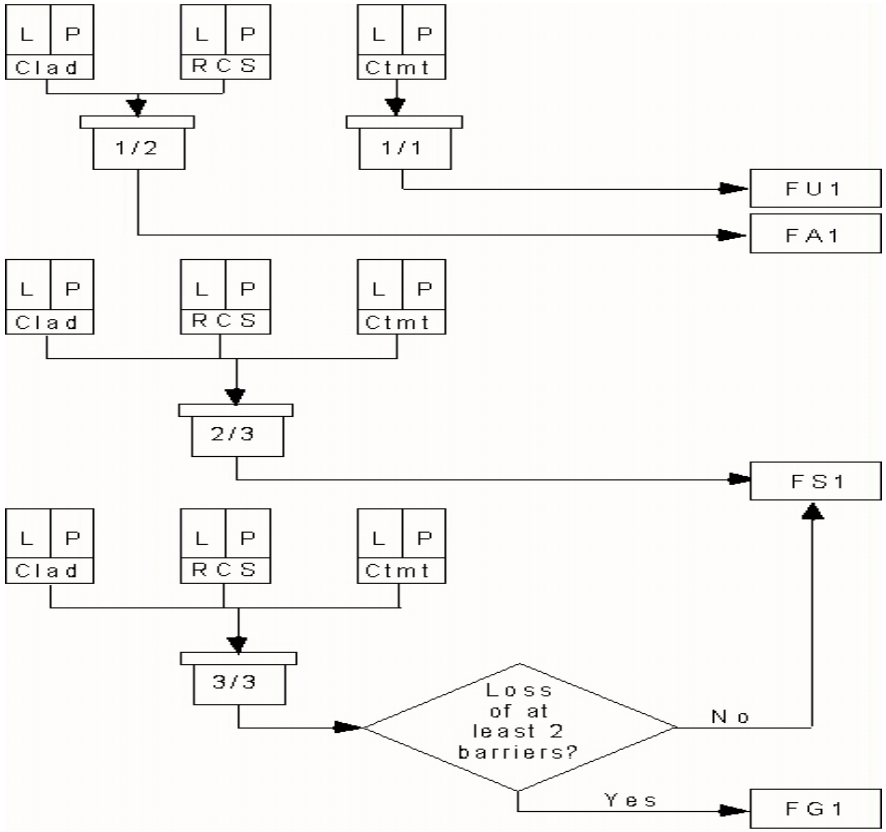
If CONTAINMENT CLOSURE is re-established prior to exceeding the temperature or level thresholds of the RCS Barrier and Fuel Clad Barrier EALs, escalation to GE would not occur.

References:

APP-PXS-M3C-101
APP-PXS-M3-001
Tech Specs 3.4.12, 3.4.13, 3.5.3,
3.5.5, 3.5.7 and 3.5.8

Table 5-F-1
Recognition Category F
Fission Product Barrier Degradation
INITIATING CONDITION MATRIX
See Table 5-F-2 for EALs

NOUE	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
FU1 ANY Loss or ANY Potential Loss of Containment *Op. Modes: Power Operation, Hot Standby, Startup, Safe Shutdown*	**FA1** ANY Loss or ANY Potential Loss of EITHER Fuel Clad OR RCS *Op. Modes: Power Operation, Hot Standby, Startup, Safe Shutdown*	**FS1** Loss or Potential Loss of ANY Two Barriers *Op. Modes: Power Operation, Hot Standby, Startup, Safe Shutdown*	**FG1** Loss of ANY Two Barriers AND Loss or Potential Loss of Third Barrier *Op. Modes: Power Operation, Hot Standby, Startup, Safe Shutdown*



Note: The logic flow diagram is for use by developers and is not required for site specific implementation.

NOTES

1. The logic used for these initiating conditions reflects the following considerations:

   - The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier (See Sections 3.4 and 3.8). NOUE ICs associated with RCS and Fuel Clad Barriers are addressed under System Malfunction ICs.

   - At the Site Area Emergency level, there must be some ability to dynamically assess how far present conditions are from the threshold for a General Emergency. 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 Director would have more assurance that there was no immediate need to escalate to a General Emergency.

   - The ability to escalate to higher emergency classes 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 Technical Specification 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 Technical Specifications.

TABLE 5-F-2

PWR Emergency Action Level
Fission Product Barrier Reference 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.

UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
ANY loss or ANY Potential Loss of Containment	ANY loss or ANY Potential Loss of EITHER Fuel Clad or RCS	Loss or Potential Loss of ANY two Barriers	Loss of ANY two Barriers AND Loss or Potential Loss of Third Barrier

Fuel Clad Barrier Example EALS		**RCS Barrier Example EALS**		**Containment Barrier Example EALS**	
LOSS	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**
1. Critical Safety Function Status		**1. Critical Safety Function Status**		**1. Critical Safety Function Status**	
Core-Cooling Red Entry Conditions Met	Core Cooling-Orange Entry Conditions Met OR Heat Sink-Red Entry Conditions Met	Not Applicable	RCS Integrity-Red Entry Conditions Met OR Heat Sink-Red Entry Conditions Met	Not Applicable	Containment-Red Entry Conditions Met
OR		OR		OR	
2. Primary Coolant Activity Level		**2. RCS Leak Rate**		**2. Containment Pressure**	
Dose Equivalent 300 µCi/gm I-131 OR 280 µCi/gm XE-133] as indicated on [TBD]	Not Applicable	RCS leak rate greater than available makeup capacity as indicated by RCS subcooling less than 30 degrees on [TBD]	RCS leak rate greater than 135 gpm on [TBD] with Letdown isolated	A containment pressure rise followed by a rapid unexplained drop in containment pressure. **OR** Containment pressure or sump level response not consistent with LOCA or MSL break conditions	59 psig and rising on PCS-PI-012, 013 or 014 **OR** 4% H_2 on VLS-AE001, 002 or 003 **OR** Containment Pressure Hi/Hi Alarm on PCS-P005, 006 or 007 AND PCS does NOT actuate.
OR		OR		OR	
3. Core Exit Thermocouple Readings		**3. Not Applicable**		**3. Core Exit Themocouple Reading**	
Greater than 1200°F degrees F	Greater than 700 degrees F	Not applicable	Not applicable	Not applicable	Core exit thermocouples in excess of 1200 degrees AND Restoration procedures not effective within 15 minutes AND Stage 4 ADS actuated.
OR		OR		OR	

TABLE 5-F-2

PWR Emergency Action Level
Fission Product Barrier Reference 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.

UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
ANY loss or ANY Potential Loss of Containment	ANY loss or ANY Potential Loss of EITHER Fuel Clad or RCS	Loss or Potential Loss of ANY two Barriers	Loss of ANY two Barriers AND Loss or Potential Loss of Third Barrier

Fuel Clad Barrier Example EALS		**RCS Barrier Example EALS**		**Containment Barrier Example EALS**	
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	RCS Hot Leg Level LESS than [9.7%] on RCS-LT-160A or RCS-LT-160B. **OR** Inventory CSF – Yellow Entry Conditions met	Ruptured S/G results in a CMT/PRHR Actuation	Not Applicable	RUPTURED S/G is also FAULTED outside of containment **OR** Primary-to-Secondary leakrate greater than 10 gpm with UNISOLABLE steam release from affected S/G to the environment	Not applicable
OR		**OR**		**OR**	
5. Not Applicable		**5. Not Applicable**		**5. CNMT Isolation Failure or Bypass**	
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Failure of all valves in any one line to close AND direct downstream pathway to the environment exists after CTMT isolation signal	Not Applicable
OR		**OR**		**OR**	
6. Containment Radiation Monitoring		**6. Containment Radiation Monitoring**		**6. Containment Radiation Monitoring**	
Containment radiation monitor reading greater than [TBD] rad/hr on PXS-JE-RE-160, -161, -162, OR -163	Not Applicable	Containment radiation monitor reading greater than 2 rad/hr on PXS-JE-RE-160, -161, -162, OR -163	Not Applicable	Not Applicable	Containment radiation monitor reading GREATER THAN [TBD] rad/hr on PXS-JE-RE-160, -161, -162, OR -163
OR		**OR**		**OR**	
7 Other (Site-Specific) Indications		**7. Other (Site-Specific) Indications**		**7. Other (site-specific) Indications**	
(Site specific) as applicable	(Site specific) as applicable	(Site-specific) as applicable	(Site-specific) as applicable	(Site specific) as applicable	(Site specific) as applicable
OR		**OR**		**OR**	
8. Emergency Director Judgment		**8. Emergency Director Judgment**		**8. Emergency Director Judgment**	
Any condition in the judgment of the Emergency Director that indicates Loss or Potential Loss of the Fuel Clad Barrier		Any condition in the judgment of the Emergency Director that indicate Loss or Potential Loss of the RCS Barrier		Any condition in the judgment of the Emergency Director that indicates Loss or Potential Loss of the Containment barrier	

Basis Information For Table 5-F-4
PWR Emergency Action Level
Fission Product Barrier Reference Table

FUEL CLAD BARRIER THRESHOLDS: (1 or 2 or 3 or 4 or 5 or 6 or 7 or 8)

1. Critical Safety Function Status

   These Thresholds serve as precursors to a loss of fuel clad. Core cooling orange path indicates subcooling has been lost and that some clad damage may occur. Core cooling red path indicated significant superheating and core uncovery and is considered to indicate a loss of the fuel clad. Heat Sink RED when heat sink is required indicates the steam generator heat sink function is under extreme challenge and provides the potential for loss of the fuel clad. Meeting the entry conditions satisfies these thresholds.

2. Primary Coolant Activity Level

   This is a site specific value corresponding to 300 μCi/gm I-131 equivalent or 280 μCi/gm Xe-133. This amount of radioactivity indicates significant clad damage and the fuel barrier is considered lost.

   There is no equivalent Potential Loss for this item.

3. Core Exit Thermocouple Readings

   The core exit thermocouples (CETs) provide an adequate measure of core temperatures to estimate temperatures at which potential cladding damage and core over temperature may be occurring. CETs with readings greater than 700 °F indicate the onset of inadequate core cooling. Continued operation in this state can lead to a core damage sequence if Emergency Operating Procedures are not effective in restoring core cooling.

   CETs with readings above 1200 °F indicate significant clad heating and the loss of the fuel clad barrier. Core exit thermocouples are included in addition to the Critical Safety Functions to include conditions when the status trees may not be in use.

4. Reactor Vessel Water Level

   There is no Loss Threshold corresponding to this item.

   The potential loss corresponds to a level 3 inches above the bottom of the Hot Leg. This is defined by the CSFSTs as an Inventory YELLOW path. Meeting the entry conditions satisfies this threshold.

   The value for the Potential Loss Threshold corresponds to the 3 inches above the bottom of the Hot Leg. This Potential Loss Threshold is defined by the Inventory YELLOW path.

5. Not Applicable

6. Containment Radiation Monitoring

   The reading of 100 rad/hr on PXS-JE-RE160, RE161, RE162 or RE163 is a value which indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the containment. Use of a confirmed radiation monitoring reading can lead to an earlier Alert classification. A reactivity excursion or mechanical damage may cause fuel damage that is first detected by radiation monitors.

   Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within Technical Specifications and are therefore indicative of fuel damage.

   There is no Potential Loss Threshold associated with this item.

7. Other (Site-Specific) Indications – Not Applicable

8. Emergency Director Judgment

   The Emergency Director can declare an Alert based on the judgment that conditions exist which indicate the Loss or Potential Loss of the Fuel Cladding barrier. This can take any other factors into consideration including the inability to monitor the barrier.

RCS BARRIER THRESHOLDS: (1 or 2 or 3 or 4 or 5 or 6 or 7 or 8)

1. Critical Safety Function Status

   There is no Loss Threshold associated with this item.

   These Thresholds serve as precursors to a loss of fuel clad. Heat Sink RED when heat sink is required indicates the steam generator heat sink function is under extreme challenge and provides the potential for loss of the fuel clad. An Integrity RED path indicates an extreme challenge to the safety function and a potential loss of the RCS barrier. Meeting the entry conditions satisfies these thresholds.

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 reactor coolant system by the Chemical and Volume Control System (CVS). Where leakage is greater than available inventory control a loss of subcooling can occur. Isolating letdown is a standard abnormal operating procedure action and may prevent unnecessary classifications when a non-RCS leakage path such as a CVS leak exists. The intent of this condition is met if attempts to isolate Letdown are NOT successful.

3. Not Applicable

4. Steam Generator Tube Rupture (SGTR)

   A SGTR is based on the inability to maintain normal liquid inventory within the RCS by normal operation of the CVS system. The loss of the RCS barrier is based on leakage large enough to cause CMT/PRHR actuation.

   There is no Potential Loss Threshold for this condition.

5. Not Applicable

6. Containment Radiation Monitoring

   The reading of 100 rad/hr on PXS-JE-RE160, RE161, RE162 or RE163 is a value which indicates the release of reactor coolant to the containment. Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within Technical Specifications and are therefore indicative of fuel damage.

   There is no Potential Loss Threshold associated with this item.

7. Other (Site-Specific) Indications – Not Applicable

8. Emergency Director Judgment

   The Emergency Director can declare an Alert based on the judgment that conditions exist which indicate the Loss or Potential Loss of the RCS Barrier. This can take any other factors into consideration including the inability to monitor the barrier.

CONTAINMENT BARRIER THRESHOLDS: (1 or 2 or 3 or 4 or 5 or 6 or 7 or 8)

1. Critical Safety Function Status

   There is no Loss Threshold associated with this item.

   A Containment 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. Meeting the entry condition satisfies this threshold.

2. Containment Pressure

Rapid unexplained loss of pressure following an initial pressure rise indicates a loss of containment integrity. Containment pressure should increase as a result of mass and energy release into the containment. In addition, containment pressure or sump level response not consistent with design basis accident conditions can also be an indicator of 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.

Containment Pressure at 45 psig (design pressure) and the existence of an explosive mixture of hydrogen means there is potential for damage to containment. Containment pressure at 6.2 psig or greater indicates the pressure has reached the PCS actuation setpoint. Should the PCS system not actuate at this point, this condition would represent a Potential Loss of Containment. This represents a challenge to containment that requires operation of the containment isolation and pressure suppression systems.

3. Core Exit Thermocouples (CETs)

   The Core Cooling RED path represents an imminent core melt sequence, which if not corrected, could lead to RPV failure and an increased potential for containment failure. It is appropriate to allow 15 minutes for functional restoration procedures to address the core melt sequence. Whether or not the procedures will be effective should be apparent in 15 minutes. In addition, if the CETs continue to be at or greater than 1200°F for 15 minutes after the ADS Valves have actuated, the conditions in this Potential Loss Threshold represent IMMINENT core melt sequences which, if not corrected, could lead to vessel failure and increased potential for containment failure. If the Emergency Operating Procedures have been ineffective in restoring reactor vessel level above the RCS and Fuel Clad barriers, there is not a success path and a core melt sequence is in progress.

4. SG Secondary Side Release With Primary To Secondary Leakage

   Steam generator tube leakage can represent the bypass of containment and the loss of the RCS barrier. This recognizes the non-isolable release path directly to the environment. The first Loss Threshold addresses the condition in which a RUPTURED steam generator is also FAULTED.

   The second loss Threshold addresses SG tube leaks that exceed 10 gpm in conjunction with a UNISOLABLE release path to the environment.

5. Containment Isolation Failure or Bypass

   The failure of the isolation of a containment penetration allows a direct path to the environment and represents failure of the Containment barrier. The Containment barrier must be considered breached if isolation fails.

6. Containment Radiation Monitoring

   There is no Loss Threshold associated with this item.

   The 100 rad/hr reading 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 General Emergency declaration is warranted.

7. Other (Site-Specific) Indications – Not Applicable

8. Emergency Director Judgment

   The Emergency Director can declare an Alert based on the judgment that conditions exist which indicate the Loss or Potential Loss of the Containment Barrier. This can take any other factors into

consideration including the inability to monitor the barrier. The Containment Barrier should not be declared lost or potentially lost based on exceeding Technical Specification 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 Technical Specifications.

TABLE 5-H-1

Recognition Category H

HAZARDS or OTHER Conditions Affecting Plant Safety

INITIATING CONDITION MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOUE
		HA1 Natural or Destructive Phenomena Affecting the Plant VITAL AREA. *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 PROTECTED AREA Boundary Not Extinguished In Less Than 15 Minutes of Detection OR EXPLOSION within the Protected Area Boundary *Op. Modes: All*
		HA3 Access To a VITAL AREA Is Prohibited Due To Release of Toxic, Corrosive, Asphyxiant or Flammable Gases Which Jeopardizes Operation of Systems 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*
	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*	
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 Existing Which in the Judgment of the Emergency Director Warrant Declaration of General Emergency. *Op. Modes: All*	**HS3** Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of Site Area Emergency. *Op. Modes: All*	**HA6** Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert. *Op. Modes: All*	**HU5** Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a NOUE. *Op. Modes: All*

HU1

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

Natural or Destructive Phenomena Affecting the PROTECTED AREA.

Operating Mode Applicability: All

Emergency Action Level: (1 or 2 or 3 or 4)

1. Seismic event identified by any 2 of the following:
   - Earthquake felt in plant.
   - Seismic event confirmed by [site-specific indication or method TBD].
   - National Earthquake Center.

2. Tornado striking within PROTECTED AREA boundary or high wind gust greater than ([TBD] mph AP1000 JE-MES-[TBD]) (ESBWR – [TBD]).

3. Turbine failure resulting in casing penetration or damage to turbine or generator seals.

4. Sustained hurricane force winds greater than 74 mph forecast to be at the plant site in the next four hours in accordance with [procedure TBD], Severe Weather Checklist.

Basis:

These Thresholds are categorized on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators.

Threshold#1:[*will be developed on site-specific basis.*] 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 or deny that an earthquake has occurred in the area of the plant.

Threshold#2 is based on the assumption that a tornado striking (touching down) or high winds within the PROTECTED AREA may have potentially damaged plant structures containing functions or systems required for safe shutdown of the plant. If such damage is confirmed visually or by other in-plant indications, the event may be escalated to Alert.

Threshold #3 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. 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. Escalation of the emergency classification is based on potential damage done by projectiles generated by the failure. These events would be classified by the radiological ICs or Fission Product Barrier ICs.

Threshold #4 addresses the site-specific phenomena of the hurricane based on the severe weather mitigation procedure. This Threshold Value can also be precursors of more serious events.

References:

APP-SJS-J7-001
APP-RCS-M3-001
APP-CNS-M3-001

HU2

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

FIRE Within the PROTECTED AREA Boundary Not Extinguished Within 15 Minutes of Detection OR EXPLOSION within the PROTECTED AREA Boundary.

Operating Mode Applicability: All

Emergency Action Level:

1. FIRE not extinguished in less than 15 minutes of Control Room notification or receipt of a Control Room FIRE alarm in any of the following areas:

   - Containment
   - Shield Building
   - Aux Building
   - Annex Building
   - Turbine Building
   - Radwaste Building

2. EXPLOSION within the Protected Area boundary

Basis:

The purpose of Threshold #1 is to address the magnitude and extent of FIREs that may be potentially significant precursors to damage to safety systems. As used here, *Detection* is visual observation and report by plant personnel or sensor alarm indication. The 15 minute time period begins with a credible notification that a FIRE is occurring, or indication of a VALID fire detection system alarm. Validation of a fire detection system alarm includes actions that can be taken with the Control Room or other nearby site-specific location to ensure that the alarm is not spurious. A validated 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.

The intent of this 15 minute duration is to size the FIRE and to discriminate against small FIREs that are readily extinguished. Fires inside the protected area, located near equipment, that last greater than 15 minutes can result in a challenge to the site fire brigade. This represents a degradation in plant operational status.

For Threshold #2 only those EXPLOSIONS of sufficient force to damage permanent structures or equipment within the PROTECTED AREA should be considered. The Emergency director also needs to consider any security aspects of the EXPLOSION, if applicable.

Escalation to a higher emergency class is by IC HA4, "FIRE Affecting the Operability of Plant Safety Systems Required for the Current Operating Mode".

References:
FPS-M3-001
CNS-M3-001
Technical Specification 5.4

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 Levels: (1 or 2)

1. Toxic, corrosive, asphyxiant or flammable gases in amounts that have or 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 IC is based on the existence of uncontrolled releases of toxic or flammable gas that may enter the site boundary and affect NORMAL PLANT OPERATIONS.

During the initial stages of a potential gas release, actions that are taken as precautions (such as pre-cautionary evacuation of a room or area while conditions are assessed) do not constitute an adverse affect on NORMAL PLANT OPERATIONS.

The fact that SCBA may be worn does not eliminate the need to declare the event.

It is intended that releases of toxic, corrosive, asphyxiant or flammable gases are of sufficient quantity, and the release point of such gases is such that NORMAL PLANT OPERATIONS would be affected.

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 Threshold is via HA3, which involves a quantified a release of toxic or flammable gas affecting access to VITAL AREAs.

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

Example Emergency Action Levels:

1. A SECURITY CONDITION that does NOT constitute a HOSTILE ACTION as reported by the (site-specific) security shift supervision.

2. A credible site specific security threat notification.

3. A validated notification from NRC providing information of an aircraft threat.

Basis:

Reference is made to (site-specific) security shift supervision 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 plant Safeguards Contingency Plan.

Threshold #1 is based on (site-specific) Site Security Plans. Security events which do not represent a potential degradation in the level of safety of the plant, are reported under 10 CFR 73.71 or in some cases under 10 CFR 50.72. Security events assessed as HOSTILE ACTIONS are classifiable under HA4, HS4 and HG1.

This threshold is based on site specific security plans. Site specific Safeguards Contingency Plans are based on guidance provided by NEI 03-12.

Threshold #2 is to ensure that appropriate notifications for the security threat are made in a timely manner. This includes information of a credible threat.

Threshold #3 is to ensure that notifications for the security threat are made in a timely manner and that Off-site Response Organizations and plant personnel are at a state of heightened awareness regarding the credible threat. Only the plant to which the specific threat is made need declare the Notification of Unusual Event.

A higher initial classification could be made based upon the nature and timing of the threat and potential consequences.

HAZARDS OR OTHER CONDITIONS
AFFECTING PLANT SAFETY

HU5

Initiating Condition – NOTIFICATION OF UNUSUAL EVENT

Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a NOUE.

Operating Mode Applicability: All

Emergency Action Level:

1. Other conditions exist which in the judgment of the Emergency Director indicate that 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 offsite 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 Director to fall under the NOUE emergency class.

HA1

Initiating Condition -- ALERT

Natural or Destructive Phenomena Affecting the Plant VITAL AREAS.

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3 or 4 or 5)

1. Seismic event greater than Operating Basis Earthquake (OBE) [0.10g] as indicated by the time history analyzer initiation of the Control Room alarm.
   AND
   Confirmed by **EITHER**:
   - Earthquake felt in plant
   - National Earthquake Center

2. Tornado striking or high winds greater than [TBD] 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 systems.
   - Containment Building
   - Shield Building
   - Aux Building

3. Vehicle crash within PROTECTED AREA boundary and resulting in VISIBLE DAMAGE to any structure containing safety systems or component or Control Room indication of degraded performance of those safety systems:
   - Containment
   - Shield Building
   - Aux Building

4. Internal flooding in areas of the plant that creates an industrial safety hazards (e.g., electric shock) that precludes access necessary to operate or monitor safety equipment.

5. Sustained hurricane winds greater than 74 mph onsite resulting in VISIBLE DAMAGE to plant structures within the PROTECTED AREA boundary containing equipment necessary for safe shutdown, or has caused damage as evidenced by control room indication of degraded performance of those systems.

Basis:

These thresholds 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 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. Escalation to higher classifications occur on the basis of System Malfunctions.

Threshold 1 is based on the FSAR design basis. Seismic events of this magnitude can result in a plant VITAL AREA being subjected to forces beyond design limits, and thus damage may be assumed to have occurred to plant safety systems.

Threshold 2 is based on the FSAR design basis. Wind loads of this magnitude can cause damage to safety functions.

Threshold 3 addresses crashes of vehicle types large enough to cause significant damage to safety structure, system, or component containing functions and systems required for safe shutdown of the plant.

Threshold 4 addresses the effect of internal flooding that has created industrial safety hazards (e.g., electrical shock) that preclude necessary access to operate or monitor safety equipment.

Threshold 5 covers site-specific phenomena of a hurricane. The Threshold Value is based on damage attributable to the wind.

References:

APP-SJS-J7-001
APP-RCS-M3-001
APP-CNS-M3-001

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:

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
   - Shield Building
   - Aux Building

Basis:

The reference to damage of systems is used to identify the magnitude of the FIRE / EXPLOSION and to discriminate against minor FIREs / EXPLOSIONs. The reference to safety systems is included to discriminate against FIREs / 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 / EXPLOSION was large enough to cause damage to these systems.

The inclusion of a "VISIBLE DAMAGE" should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this Threshold to assess the actual magnitude of the damage. The occurrence of the EXPLOSION with reports of evidence of damage is sufficient for declaration. The Emergency Director also needs to consider any security aspects of the EXPLOSIONs.

Escalation to a higher emergency class, if appropriate, will be based on System Malfunction, Fission Product Barrier Degradation, Abnormal Rad Levels / Radiological Effluent, or Emergency Director Judgment ICs.

References:

APP-RCS-M3-001
APP-CNS-M3-001
APP-FPS-M3-001
APP-GW-GJP-305

HA3

Initiating Condition -- ALERT

Access to a VITAL AREA Is Prohibited Due To Release of Toxic, Corrosive, Asphyxiant or Flammable Gases Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or Safely Shutdown the Reactor.

Operating Mode Applicability: All

Emergency Action Levels:

1. Access to a VITAL AREA is prohibited due to report or detection of toxic, corrosive, asphyxiant, or flammable gases which jeopardizes operation of systems required to maintain safe operations or safely shutdown the reactor.

Basis:

Gases in a Plant Vital Area can affect the ability to safely operate or safely shutdown the reactor.

Escalation to a higher emergency class, if appropriate, will be based on System Malfunction, Fission Product Barrier Degradation, Abnormal Rad Levels / Radioactive Effluent, or Emergency Director Judgment ICs.

The fact that self contained breathing apparatus (SCBA) may be worn does not eliminate the need to declare the event

An Asphyxiant is a gas capable of reducing the level of oxygen in the body to dangerous levels. Most commonly, asphyxiants work by merely displacing air in an enclosed environment. This reduces the concentration of oxygen below the normal level of around 19%, which can lead to breathing difficulties, unconsciousness or even death.

This Threshold addresses concentrations at which gases can ignite/support combustion. 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.

HA4

Initiating Condition - ALERT

HOSTILE ACTION Within the OWNER CONTROLLED AREA or Airborne Attack Threat.

Operating Mode Applicability: All

Example Emergency Action Level: (1 or 2)

1. A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLED AREA as reported by the (site specific security shift supervision).

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).

Threshold #1 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.

Threshold #2 addresses the immediacy of an expected threat arrival or impact on the site within a relatively short time.

The intent of this Threshold 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. 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 Alert.

The NRC Headquarters Operations Officer (HOO) 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.

HA5

Initiating Condition -- ALERT

Control Room Evacuation Has Been Initiated.

Operating Mode Applicability: All

Emergency Action Level:

1. GW-GJP-306, Evacuation of Control Room, requires Control Room evacuation.

Basis:

With the Control Room evacuated, additional support, monitoring and direction through the Technical Support Center and/or other emergency response facilities is necessary. Inability to establish plant control from outside the Control Room will escalate this event to a Site Area Emergency.

References:

APP-GW-GJP-306

HA6

Initiating Condition -- ALERT

Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert.

Operating Mode Applicability: All

Emergency Action Level:

1. Other conditions exist which in the judgment of the Emergency Director indicate that events are in process 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.

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 Director to fall under the Alert emergency class.

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:

1. Control room evacuation has been initiated.

   AND

   Control of the plant cannot be established per GW-GJP-306 in less than [TBD] minutes.

Basis:

Expeditious transfer of safety systems has not occurred but fission product barrier damage may not yet be indicated. The intent of this IC is to capture those events where control of the plant cannot be reestablished in a timely manner. [*Site-specific time for transfer based on analysis or assessments as to how quickly control must be reestablished without core uncovering and/or core damage. This time should not exceed [TBD] minutes without additional justification.*] The Emergency Director 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. The functions of concern are reactivity control, RCS inventory, and secondary heat removal.

Escalation of this event, if appropriate, would be by Fission Product Barrier Degradation, Abnormal Rad Levels/Radiological Effluent, or Emergency Director Judgment ICs.

References:

APP-GW-GJP-306

HS3

Initiating Condition – SITE AREA EMERGENCY

Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of Site Area Emergency.

Operating Mode Applicability: All

Emergency Action Level:

1. Other conditions exist which in the judgment of the Emergency Director indicate that 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 ACTION that results in intentional damage or malicious acts; (1) toward site personnel or equipment that could lead to the likely failure of or; (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the site boundary.

Basis:

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 Director to fall under the emergency class description for Site Area Emergency.

HS4

Initiating Condition – - SITE AREA EMERGENCY

HOSTILE ACTION Within the PROTECTED AREA.

Operating Mode Applicability: All

Example Emergency Action Level:

1. A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the (site security shift supervision).

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 OWNER CONTROLLED AREA 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..

Escalation of this emergency classification level, if appropriate, would be based on actual plant status after impact or progression of attack.

HG1

Initiating Condition – GENERAL EMERGENCY

HOSTILE ACTION Resulting in Loss Of Physical Control of the Facility.

Operating Mode Applicability: All

Emergency Action Level: (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 for a freshly off-loaded reactor core in pool.

Basis:

This IC 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. If control of the plant equipment necessary to maintain safety functions can be transferred to another location, then the above initiating condition is not met.

This EAL also addresses failure of spent fuel cooling systems as a result of HOSTILE ACTION if IMMINENT fuel damage is likely. "Freshly" is defined by site-specific requirements.

HG2

Initiating Condition – GENERAL EMERGENCY

Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of General Emergency.

Operating Mode Applicability: All

Emergency Action Level:

1. Other conditions exist which in the judgment of the Emergency Director indicate that 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 loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Basis:

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 Director to fall under the General Emergency class.

Recognition Category S
System Malfunction
INITIATING CONDITION MATRIX

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOUE
SG1 All Safety Related DC Batteries Not Being Charged for Greater Than 72 Hours Due to Loss of Power to PIP Busses. *Op. Modes: Power Operation, Startup, Hot Standby, Safe/Stable Shutdown*	**SS1** All Safety Related DC Batteries Not Being Charged for 24 Hours or Longer Due to Loss of Power to PIP Busses. *Op. Modes: Power Operation, Startup, Hot Standby, Safe/Stable Shutdown*	**SA1** All Safety Related DC Batteries Not Being Charged for 60 Minutes or Longer Due to Loss of Power to PIP Busses. *Op. Modes: Power Operation, Startup, Hot Standby, Safe/Stable Shutdown*	**SU1** All Safety Related DC Batteries Not Being Charged for 30 Minutes or Longer Due to Loss of Power to PIP Busses. *Op. Modes: Power Operation, Startup, Hot Standby, Safe/Stable 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 From the Reactor control Console 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 From the Reactor Control Console are Successful in Shutting Down the Reactor *Op. Modes: Power Operation, Startup*	**SU2** Inability to Reach Required Shutdown Within Technical Specification Limits. *Op. Modes: Power Operation, Startup, Hot Standby, Safe Shutdown*
	SS6 Inability to Monitor a SIGNIFICANT TRANSIENT in Progress. *Op. Modes: Power Operation, Startup, Hot Standby, Safe Shutdown*	**SA4** Loss of Indicating and Monitoring Functions. *Op. Modes: Power Operation, Startup, Hot Standby, Safe Shutdown*	
	SS3 Loss of All Vital DC Power for 15 Minutes or Longer. *Op. Modes: Power Operation, Startup, Hot Standby, Safe Shutdown*		**SU4** Fuel Clad Degradation. *Op. Modes: Power Operation, Startup, Hot Standby*
			SU5 RCS Leakage. *Op. Modes: Power Operation, Startup, Hot Standby, Safe Shutdown*
			SU6 UNPLANNED Loss of All Onsite OR Offsite Communications Capabilities. *Op. Modes: Power Operation, Startup, Hot Standby, Safe Shutdown*
			SU8 Inadvertent Criticality. *Op Modes: Hot Standby, Safe Shutdown*

SU1

Initiating Condition -- **NOTIFICATION OF UNUSUAL EVENT**

All Safety Related DC Batteries Not Being Charged for Greater Than 30 Minutes Due to Loss of Power to PIP Busses.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe/Stable Shutdown

Example Emergency Action Level:

AP1000
1. PIP Busses ECS-ES-1 and ECS-ES-2 de-energized for greater than 30 minutes.

Basis:

Prolonged de-energization of the PIP busses reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of DC Power. 30 minutes was selected as a threshold to exclude transient or momentary losses of AC power.

References:

APP-ECS-E8-001
APP-ZOS-E8-001
Technical Specification 3.8

SYSTEM MALFUNCTION

SU2

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

Inability to Reach Required Shutdown Within Technical Specification Limits.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe Shutdown

Emergency Action Level:

1. Plant is not brought to required operating mode within Technical Specifications LCO Action Statement Time.

Basis:

Limiting Conditions of Operation (LCOs) require the plant to be brought to a required shutdown mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. An immediate NOUE is required when the plant is not brought to the required operating mode within the allowable action statement time in the Technical Specifications. Declaration of a NOUE is based on the time at which the LCO-specified action statement time period elapses under the site Technical Specifications and is not related to how long a condition may have existed**.**

References:

Technical Specification 3.0.3

SYSTEM MALFUNCTION

SU4

Initiating Condition -- **NOTIFICATION OF UNUSUAL EVENT**

Fuel Clad Degradation.

Operating Mode Applicability: Power Operation
Startup
Hot Standby

Emergency Action Levels: (1 or 2)

1. Liquid Sample Radiation Monitor PSS-RICA-050 High Alarm Setpoint [TBD] µCi/cc indicating fuel clad degradation greater than Technical Specification 3.4.10 allowable limits.

   OR

2. Dose equivalent I-131 greater than 60 µCi/gm OR dose equivalent Xe-133 greater than 280 µCi/gm for more than 6 hours from sampling and analysis.

Basis:

This IC is included as a NOUE because it is considered to be a potential degradation in the level of safety of the plant and a potential precursor of more serious problems. Threshold 1 addresses site-specific radiation monitor readings such as BWR air ejector monitors, PWR failed fuel monitors, etc., that provide indication of fuel clad integrity. Threshold 2 addresses coolant samples exceeding coolant technical specifications for iodine spike. Escalation of this IC to the Alert level is via the Fission Product Barrier Degradation Monitoring ICs.

References:

APP-PSS-M3C-101
Tech Spec 3.4.10

SYSTEM MALFUNCTION

SU5

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

RCS Leakage.

Operating Mode Applicability: Power Operation
Startup
Hot Standby
Safe Shutdown

Emergency Action Levels: (1 or 2)

1. Unidentified leakage greater than 5 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 Technical Specification 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 Technical Specification limit. In either case, escalation of this IC to the Alert level is via Fission Product Barrier Degradation ICs.

References:

Technical Specification 3.4.7

SYSTEM MALFUNCTION

SU6

Initiating Condition - NOTIFICATION OF UNUSUAL EVENT

UNPLANNED Loss of All Onsite or Offsite Communications Capabilities.

Operating Mode Applicability: Power Operation
Startup
Hot Standby
Safe Shutdown

Emergency Action Levels: (1 or 2)

1. Loss of all of the following onsite communications capability affecting the ability to perform routine operations.
   - EFS
   - TVS
   - [Site specific – TBD]

2. Loss of all of the following off-site communication methods affecting the ability to perform offsite notifications:

(site-specific list of communications methods)

Basis:

The purpose of this IC and its associated Thresholds 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 problems with offsite authorities. The loss of offsite communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

The availability of one method of ordinary offsite communications is sufficient to inform state and local authorities of plant conditions. EFS and TVS are comprised of the following:

- Wireless Telephone System
- Telephone-Page System
- Sound Powered System
- Security Communication System
- Closed Circuit Television System

[*Site-specific list for offsite communications loss must encompass the loss of all means of communications with offsite authorities. This should include the ENS, commercial telephone lines, telecopy transmissions, and dedicated phone systems*.]

References:

APP-EFS-J7-001
APP-TVS-J7-001

SYSTEM MALFUNCTION

SU8

Initiating Condition **-- NOTIFICATION OF UNUSUAL EVENT**

Inadvertent Criticality.

OPERATING MODE APPLICABILITY Hot Standby
Safe Shutdown

Emergency Action Level:

1. An UNPLANNED sustained positive startup rate.

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.

Escalation would be by the Fission Product Barrier Matrix, as appropriate to the operating mode at the time of the event, or by Emergency Director judgment.

References:

APP-PMS-J1-003

SYSTEM MALFUNCTION

SA1

Initiating Condition -- **ALERT**

All Safety Related DC Batteries Not Being Charged for Greater Than 60 Minutes Due to Loss of Power to PIP Busses.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe/Stable Shutdown

Example Emergency Action Level:

AP1000
1. PIP Busses ECS-ES-1 and ECS-ES-2 de-energized for greater than 60 minutes.

ESBWR
1. PIP Busses 1000A3 and 1000B3 de-energized for greater than 60 minutes.

Basis:

This IC and the associated EALs are intended to provide an escalation from IC SU1. Prolonged de-energization of the PIP busses reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of DC Power. 60 minutes was selected as an escalation to ensure augmented support is available to the operating crew.

The condition indicated by this IC is the degradation of the AC power systems.

References:

APP-ECS-E8-001
APP-EDS-E8-001
APP-IDS-E8-001
Tech Spec 3.8

SYSTEM MALFUNCTION

SA2

Initiating Condition -- **ALERT**

Automatic Trip Fails to Shutdown the Reactor AND the Manual Actions Taken from the Reactor Control Console are Successful in Shutting Down the Reactor

Operating Mode Applicability: Power Operation
Startup

Emergency Action Level:

1. An Automatic PMS Trip failed to shutdown the reactor

   AND

   Manual actions taken at the reactor control console successfully shutdown the reactor as indicated by Intermediate Range Nuclear Instrumentation less than [1.0E-8 amps].

Basis:

A manual actuation is any set of actions by the reactor operator(s) at the reactor control console which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor.

[*If the manual scram (trip) switches/pushbuttons on the control room console panels are considered an automatic input into the Reactor Protection System, a failure to scram (trip) without any other automatic input would make this threshold applicable.*]

If actions taken at the reactor control console fail to shutdown the plant, the event would escalate to a Site Area Emergency.

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.

References:

APP-PMS-J7-001
APP-DAS-J7-001
APP-PLS-J7-001
APP-RCS-M3-001
Technical Specification 3.3.1

SYSTEM MALFUNCTION

SA4

Initiating Condition -- ALERT

UNPLANNED Loss of Indicating and Monitoring Functions.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe Shutdown

Emergency Action Level:

Note: *The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.*

1. Loss of All PLS and PMS 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 Alert will be escalated to a Site Area Emergency if the operating crew cannot monitor the transient in progress.

References:

APP-PMS-J7-001
APP-DAS-J7-001
APP-PLS-J7-001
APP-DDS-J7-001

SS1

Initiating Condition -- SITE AREA EMERGENCY

All Safety Related DC Batteries Not Being Charged for Greater Than 24 Hours Due to Loss of Power to PIP Busses.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe/Stable Shutdown

Example Emergency Action Level:

AP1000
1. PIP Busses ECS-ES-1 and ECS-ES-2 de-energized for 24 hours or longer.

Basis:

Prolonged de-energization of the PIP busses reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of DC Power. 24 hours was selected as a threshold to escalate for recognition of the seriousness of the issue in that power has been unable to be restored through normal and abnormal operating procedures.

Escalation to General Emergency is via Fission Product Barrier Degradation or IC SG1, “Prolonged Loss of All Off-site and On-site AC Power for greater than 72 hours."

References:

APP-ECS-E8-001
APP-EDS-E8-001
APP-IDS-E8-001
Tech Spec 3.8

SYSTEM MALFUNCTION

SS2

Initiating Condition -- **SITE AREA EMERGENCY**

Automatic Trip Fails to Shutdown the Reactor AND Manual Actions Taken from the Reactor Control Console are NOT Successful in Shutting Down the Reactor.

Operating Mode Applicability: Power Operation
Startup

Emergency Action Level:

1. An Automatic PMS Trip failed to shutdown the reactor

   AND

   Manual actions taken at the reactor control console DO NOT shutdown the reactor as indicated by Intermediate Range Nuclear Instrumentation greater than [1.0E-8 amps].

Basis:

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. A Site Area Emergency is indicated because conditions exist that lead to IMMINENT loss or potential loss of both fuel clad and RCS.

A manual trip/scram initiation is not considered successful if action away from the Control Room control panels was required to trip/scram the reactor.

A manual trip/scram is any set of actions by the reactor operator(s) at the Control Room control panels which causes control rods to be rapidly inserted into the core and brings the reactor subcritical[*(e.g., reactor trip button, Alternate Rod Insertion)*].

Escalation of this event to a General Emergency would be due to a prolonged condition leading to challenges in maintaining core-cooling or heat sink.

References:

APP-PMS-J7-001
APP-DAS-J7-001

Initiating Condition -- SITE AREA EMERGENCY

Loss of All Vital DC Power.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe Shutdown

Emergency Action Level:

***Note**: The Emergency Director should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.*

1. Less than [TBD] bus voltage on all of the following IE DC Busses for 15 minutes or longer.

IDSA-EA-1	IDSC-EA-1
IDSA-EA-2	IDSC-EA-2
IDSB-EA-1	IDSC-EA-3
IDSB-EA-2	IDSD-EA-1
IDSB-EA-3	IDSD-EA-2

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. Fifteen minutes for the initiating condition was selected as a threshold to exclude transient or momentary power losses.

[*(Site-specific) bus voltage should be based on the minimum bus voltage necessary for the operation of safety related equipment. This voltage value should incorporate a margin of at least 15 minutes of operation before the onset of inability to operate those loads. This voltage is usually near the minimum voltage selected when battery sizing is performed. Typically the value for the entire battery set is approximately 105 VDC. For a 60 cell string of batteries the cell voltage 1.75 Volts per cell. For a 58 string battery set the minimum voltage is typically 1.81 Volts per cell.*]

Escalation to a General Emergency would occur by Abnormal Rad Levels/Radiological Effluent, Fission Product Barrier Degradation, or Emergency Director judgment ICs.

References:

APP-ECS-E8-001
APP-EDS-E8-001
APP-IDS-E8-001
Tech Spec 3.8

SS6

Initiating Condition -- SITE AREA EMERGENCY

Inability to Monitor a SIGNIFICANT TRANSIENT in Progress.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe Shutdown

Emergency Action Level:

1. a. Loss of all PLS, PMS and DAS Indication and Monitoring capability

AND

b. A SIGNIFICANT TRANSIENT in progress.

Basis:

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

References:

APP-PMS-J7-001
APP-DAS-J7-001
APP-PLS-J7-001
APP-DDS-J7-001

Initiating Condition -- **GENERAL EMERGENCY**

All Safety Related DC Batteries Not Being Charged for Greater Than 72 Hours Due to Loss of Power to PIP Busses.

Operating Mode Applicability:

Power Operation
Startup
Hot Standby
Safe/Stable Shutdown

Example Emergency Action Level:

AP1000
1. PIP Busses ECS-ES-1 and ECS-ES-2 de-energized for greater than 72 hours.

Basis:

The DC Battery design is for at least 72 hours of safety related power. If the DC busses have been de-energized, then the reactor is being maintained in a safe shutdown condition by gravity and natural circulation. This reduces the fission product barrier protection for the plant to being dependent on the non-safety related ancillary diesels to ensure safety, creating a potential threat to all three fission product barriers. As the batteries would be beyond their design capability, operators would also be dependent upon indications powered by the ancillary diesels for monitoring plant status and other functions.}

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 General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one 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.

Under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, it is necessary to give the Emergency Director a reasonable idea of how quickly to declare a General Emergency 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 Director judgment as it relates to IMMINENT Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.

References:

APP-ECS-E8-001
APP-EDS-E8-001
APP-IDS-E8-001
Tech Spec 3.8
Tech Spec Basis B 3.8.1

SYSTEM MALFUNCTION

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:

1. Failure of PLS, PMS and DAS to complete a Reactor Trip

   AND

   EITHER of the following exists or has occurred due to continued power generation:

   a. Core Cooling CSF - RED.

   OR

   b. Heat Sink CSF - RED.

Basis:

Automatic and manual trip is not considered successful if action away from the Control Room control panels was required to trip the reactor.

Under the conditions of this EAL, the efforts to bring the reactor subcritical to the extent that the reactor is producing more heat than the maximum decay heat load for which the safety systems were designed. This situation could be a precursor for a core melt sequence.

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 General Emergency declaration is intended to be anticipatory of the fission product barrier matrix declaration to permit maximum offsite intervention time.

References:

APP-PMS-J4-020
APP-PMS-J7-001
APP-DAS-J7-001
APP-PLS-J7-001