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DAEC EMERGENCY PLANNING DEPARTMENT PROCEDURE TRANSMITTAL ACKNOWLEDGEMENT MEMO (TAM-53)

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Re: Entire EAL Basis Document (Table of Contents Rev) (Copy 91)

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Please perform the following to your assigned manual. If you have any questions regarding this TAM please contact Don A. Johnson at 319-851-7872.

	REMOVE	INSERT
EAL EBD-E (PWR: 21716) New Section	Rev. 0	Rev. 0
EAL Table of Contents Revision	Rev. 12	Rev. 13
EAL EBD-DEF (PWR: 19683)	Rev. 1	Rev. 2
EAL EBD-H (PWR: 21677)	Rev. 4	Rev. 5
EAL EBD-ORG (PWR: 19684)	Rev. 2	Rev. 3

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3313 DAEC Rd.
Palo, IA 52324

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EPTools updated: _____

A045

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Effective Date: 8/5/2003

AC - Alternating Current

Affecting (in regard to events such as fire, flood, or missiles) - Causing degraded equipment performance as determined by physical observation or by indications in the Control Room or at local control stations.

Alert - Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the EPA Protective Action Guide (PAG) exposure levels.

All - Initiating Condition applies to all Technical Specification operating modes as well as defueled operation.

AOP - Abnormal Operating Procedure

APRM - Average Power Range Monitor

ARM - Area Radiation Monitor

ATWS - Anticipated Transient Without Scram

Barrier - Same as "Fission Product Barrier", below.

Barrier Monitoring Ability - This is a judgment factor in determining whether a fission product barrier is lost or potentially lost. Decreased ability to monitor a barrier results from a loss of/lack of reliable indicators, including instrumentation operability concerns, readings from portable instrumentation, and consideration for offsite monitoring results.

Becquerel - A measurement of radioactive decay rate equal to one disintegration per second.

BOP - Balance of Plant

BWR - Boiling Water Reactor

CAM - Continuous Air Monitor

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CDE - Committed Dose Equivalent as defined in 10 CFR 20.1003

CEDE - Committed Effective Dose Equivalent as defined in 10 CFR 20.1003

CFM - Cubic Feet per Minute

CFS - Cubic Feet per Second

Cold condition - This refers to the condition where the reactor coolant temperature is less than or equal to 212°F.

Cold shutdown - As defined in Technical Specification Table 1.1-1, the reactor is in the shutdown mode, the reactor coolant temperature is less than or equal to 212°F, and all reactor vessel head closure bolts fully tensioned.

Compensatory non-alarming indications - Information displayed in the main control room including analog and digital parameter displays, trend recorders, the Safety Parameter Display System (SPDS), and the plant process computer.

Confinement Boundary - the barrier (Dry Shielded Canister (DSC)) that separates areas containing radioactive substances, spent nuclear fuel or high-level waste, and the environment.

Control - As applied to remote shutdown capability, this is the ability to manipulate plant parameters without reliance on control room devices or instrumentation using components and methods specified by Abnormal Operating Procedure 915, Shutdown Outside Control Room.

Contiguous - Being in actual contact: touching along a boundary or at a point.

CPS - Counts Per Second

CRD - Control Rod Drive

CSCS - Core Standby Cooling System

CST - Condensate Storage System

Curie (Ci) - A measurement of radioactive decay rate equal to 3.70E+10 disintegration's per second (becquerels).

CW - Circulating Water

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DAEC - Duane Arnold Energy Center

DC - Direct Current

DEQ - Dose Equivalent

Dominant accident sequences - These will lead to degradation of all fission product barriers. Dominant accident sequences leading to core damage at DAEC include complete loss of 125 VDC, loss of decay heat removal, ATWS with failure of Standby Liquid Control, prolonged station blackout, and loss of offsite power with early HPCI/RCIC failure.

DSC - Dry Shielded Canister

DW - Drywell

EAL Threshold Value - A pre-determined, site-specific, observable condition indicating the criteria necessary for declaration of an Emergency Action Level (EAL).

EC - Emergency Coordinator

ECCS - Emergency Core Cooling System

EDE - Effective Dose Equivalent as defined in 10 CFR 20.1003

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 (on-site 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.

Emergency Class - Same as "Emergency Classification Level" below.

Emergency Classification Level - These are taken from 10 CFR 50, Appendix E. They are, in escalating order: (Notification of) Unusual Event (UE), Alert, Site Area Emergency (SAE), and General Emergency (GE).

EOP - Emergency Operating Procedure

EPA - Environmental Protection Agency

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EPIP - Emergency Plan Implementing Procedure

ESF - Engineered Safety Features

ESS - Engineered Safety Systems

Establish - Make arrangements for a stated condition, e.g., establish communications with control room.

ESW - Emergency Service Water

Fission Product Barrier - One of the three principal barriers to uncontrolled release of radionuclides: Fuel Clad, Reactor Coolant System (RCS), and the Primary Containment.

FP - Fuel Pool

Fuel Clad (Barrier) - The zirconium alloy tubes that contain the fuel pellets.

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. Releases can reasonably be expected to exceed EPA Protective Action Guide (PAG) exposure levels offsite for more than the immediate site area.

GPM - Gallons Per Minute

GSW - General Service Water

Hot shutdown - As defined in Technical Specification Table 1.1-1, the reactor mode switch is in the shutdown position and the reactor coolant temperature is greater than 212°F and all reactor vessel head closure bolts fully tensioned.

HPCI - High Pressure Coolant Injection (system).

HSM - Horizontal Storage Module

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Identified Leakage - Identified Leakage shall be:

- a. Leakage into the drywell such as that from pump seals or valve packing that is captured and conducted to a sump or collecting tank, or
- b. Leakage into the drywell atmosphere from sources that are both specifically located and known not to interfere with the operation of the leakage detection systems.

IDLH - Immediately Dangerous to Life and Health

Inadvertent - Accidental or unintentional, e.g., the event occurred because procedures were not strictly adhered to.

Independent Spent Fuel Storage Installation (ISFSI) - The on site facility where the loaded Dry Shielded Canisters (DSCs) will be stored in Horizontal Storage Modules (HSMs). The installation is intended for interim storage until the spent fuel is removed from the plant site.

Imminent - No turnaround in safety system performance is expected and escalation to a higher emergency classification level is expected to occur within two hours.

Implement - Commence a required program or series of procedures.

In service - A component or system in the appropriate configuration for normal operation and is considered *operable* as defined in the Technical Specifications.

Indicator - The name for the row on the fission barrier table that is used for convenient grouping of similar symptoms.

Initiate - Take action to begin a process

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.

IPE - Individual Plant Examination

IPOI - Integrated Plant Operating Instruction

IRM - Intermediate Range Monitor

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Isolate - Remove from service by closing off the flow path

ISFSI – Independent Spent Fuel Storage Installation

kV - Kilovolt(s)

LCO - Limiting Condition for Operation

LLRPSF - Low Level Radwaste Processing and Storage Facility

LOCA - Loss of Coolant Accident

LOOP - Loss of Offsite Power

Loss (of a fission product barrier) - A severe challenge to a fission product barrier exists such that the barrier is considered incapable of performing its safety function.

LPCI - Low Pressure Coolant Injection

MCC - Motor Control Center

MCUTL - Maximum Core Uncovery Time Limit

Microcurie (μCi) - One millionth of a curie, *i.e.*, $3.7\text{E}+4$ disintegration's per second (becquerels).

MIDAS - Meteorological Information and Dose Assessment System, primary method for detecting and quantifying gaseous releases at the DAEC.

Millicurie (*mCi*) - One thousandth of a curie, *i.e.*, $3.7\text{E}+7$ disintegration's per second (becquerels).

Millirem (*mrem*) - One thousandth of a rem

MPH - Miles Per Hour

mR - milliroentgen, *i.e.*, one thousandth of a roentgen (R)

MSIV - Main Steam Isolation Valve

MSL - Main Steam Line

NEI - Nuclear Energy Institute (formerly NUMARC)

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Notification of Unusual Event (NOUE) - Same as "Unusual Event", below.

NPSH - Net Positive Suction Head

NUMARC - Nuclear Utility Management and Resources Council (now NEI)

OBE - Operating Basis Earthquake

ODAM - Offsite Dose Assessment Manual

Operable - A system is considered capable of performing its function in accordance with the applicable Technical Specification requirements. Implicit in this definition is the assumption that all auxiliary equipment required for the system is also operable.

Operating Modes- The applicable operating modes for each Initiating Condition/Emergency Action Level is then listed based on NUMARC/NESP-007 mode descriptions. The DAEC EALs use the operating modes defined in Technical Specifications Table 1.1-1. These are:

1 - Run/Power Operation

4 - Cold Shutdown^(a)

2 - Startup

5 - Refueling^(b)

3 - Hot Shutdown^(a)

^(a)All reactor vessel head closure bolts fully tensioned.

^(b)One or more reactor vessel head closure bolts less than fully tensioned.

OSS - Operations Shift Supervisor

PAG - Protective Action Guide

Planned - Loss of a component or system due to expected events such as scheduled maintenance and testing activities.

Potential Loss (of a fission product barrier) - A challenge to a fission product barrier exists such that the barrier is considered degraded in its ability to perform its safety function.

Primary Containment (Barrier) - The drywell, the torus, their respective interconnecting paths, and other connections up to and including the outermost containment isolation valves.

Protected Area - Any area encompassed by physical barriers and to which access is controlled.

PSIG - Pounds per Square Inch Gauge

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RB - Reactor Building

RBCCW - Reactor Building Closed Cooling Water (system)

RCIC - Reactor Core Isolation Cooling (system)

RCS - Reactor Coolant System

RCS Barrier - The reactor coolant system pressure boundary including the reactor pressure vessel and all reactor coolant system piping up to and including the outermost isolation valves.

Recognition Category - A logical grouping of Initiating Conditions, e.g., System Malfunctions.

Rem - Unit of radiation dose as defined in 10 CFR 20.1004

Required - Action taken (such as entry into emergency operating procedure) is neither optional nor merely suggested; rather, it is imperative based on existing conditions.

RHR - Residual Heat Removal (system)

RHRSW - Residual Heat Removal Service Water (system)

Roentgen (R) - Unit of ionizing radiation energy absorbed in a cubic centimeter of air

RPV - Reactor Pressure Vessel

RWCU - Reactor Water Clean-Up (system)

SBDG - Standby Diesel Generator

SBGT - Standby Gas Treatment (system)

SBLC - Standby Liquid Control (system)

SBO - Station Blackout

S/D - Shutdown

SDC - Shutdown Cooling

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SDV - Scram Discharge Volume

Significant transient - (See also, "Transient", below.) Includes response to automatic or manually initiated functions such as scrams, runbacks involving greater than 25% thermal power change, ECCS injections, or undampened thermal power oscillations greater than normal.

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. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guide (PAG) exposure levels except near the site boundary.

SPDS - Safety Parameter Display System

SRM - Startup Range Monitor

SRO - Senior Reactor Operator

SRV - Safety-Relief Valve

Sustained wind speed - Baseline wind speed measured by meteorological tower that does not include gusts

TAF - Top of Active Fuel (344.5 inches above bottom of RPV)

TEDE - Total Effective Dose Equivalent as defined in 10 CFR 20.1003

Total Leakage - Sum of Identified Leakage and Unidentified Leakage.

Transient - A condition that: (1) is beyond the expected steady-state fluctuations in temperature, pressure, power level, or water level, and (2) is beyond the normal manipulations of the Control Room operating crew, and (3) is expected to require actuation of fast-acting automatic control or protection systems to bring the reactor to a new safe, steady-state condition.

TSC - Technical Support Center

Uncontrolled - Condition is not the result of planned actions by the plant staff in accordance with procedures.

Unisolable - Actions taken from the Main Control Board or locally are not successful in eliminating the leakage path.

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Unidentified Leakage - All leakage into the drywell that is not identified leakage.

Unplanned - Used to preclude the declaration of an emergency where a component or system has been removed intentionally from service (e.g., for maintenance and/or testing activities). As used in the context of radioactive releases, "unplanned" includes any release for which a radioactive 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.

Unusual Event (UE) - Events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

VAC - Volt(s) Alternating Current

Vital Area - any area which contains vital equipment.

Vital Equipment - Any equipment, system, device or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

VDC - Volt(s) Direct Current

Valid - Indication is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results.

WEC - Water Effluent Concentration

Effective Date: 8/5/2003

The format of the EAL Basis information was developed to address training needs, to facilitate NRC approval, and to facilitate future revisions and 10 CFR 50.54(q) evaluations. Each EAL Basis is organized in the following manner:

1. Emergency Action Level (EAL) Basis Information Organized by Initiating Condition (IC)

Initiating Condition Identifier

For consistency, DAEC has chosen to make its Initiating Condition (IC) identifiers identical to those used in NEI 99-01. The EAL Technical Basis information is organized by generic IC identifier number and name. DAEC uses five Recognition Categories identified in NEI 99-01. These are:

- A - Abnormal Rad Levels/Radiological Effluent
- F - Fission Product Barrier Degradation
- H - Hazards and Other Conditions Affecting Plant Safety
- S - System Malfunctions
- E - Independent Spent Fuel Storage Installation (ISFSI)

For the A, H, and S recognition categories, all EAL basis information is organized by IC identifier in escalating emergency class order from Unusual Event through General Emergency. For the E recognition category, all EAL basis information is organized by IC identifier but do not exceed an Unusual Event. For the F recognition category, the initiating conditions are the combinations of fission product barrier losses and potential losses that correspond to each emergency classification level. The individual indicators used on the fission barrier table are separately discussed below. The generic IC identifiers use two letters followed by one number. The first letter corresponds to the event category as shown above. The second letter corresponds to the emergency classification level for the IC:

- U - (Notification of) Unusual Event
- A - Alert
- S - Site Area Emergency
- G - General Emergency

The number designates whether the IC is the first, second, third, etc., IC for that recognition category under that emergency classification. For example, SU2 is the designator for the second System Malfunction recognition category IC in the Unusual Event classification, etc. Generic information is used from NEI/NESP-007, Revision 4, dated May, 1999.

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Event Type

This is the label of the applicable row for the EAL Tables shown in EPIP Appendix 1. The event type lists the general area of concern and includes Offsite Rad Conditions, Onsite Rad Conditions, Natural Disasters, Fire, Other Hazards and Failures, Security, Control Room Evacuation, EC/OSM Judgment, Loss of Power, RPS Failure, Inability to Maintain Shutdown Conditions, Instrumentation/Communication, Coolant Activity, and Coolant Leak. This structure was chosen to be consistent with the previous EAL presentation which is already familiar to the Emergency Coordinators and Operations Shift Managers.

Applicable Operating Modes

The applicable operating modes for each Initiating Condition/Emergency Action Level is then listed based on NUMARC/NESP-007 mode descriptions. The DAEC EALs use the operating modes defined in Technical Specifications Table 1.1-1. These are:

- 1 - Run/Power Operation
- 2 - Startup
- 3 - Hot Shutdown^(a)
- 4 - Cold Shutdown^(a)
- 5 - Refueling^(b)

^(a)All reactor vessel head closure bolts fully tensioned.

^(b)One or more reactor vessel head closure bolts less than fully tensioned.

Operating mode applicability of EALs is based on the operating mode that the plant was in immediately before the event sequence leading to entry into the emergency classification. For example, events/conditions addressed by EALs applicable to Run mode are expected to lead to reactor trip which should bring the plant to Hot Shutdown (Mode 3). However, the appropriate emergency classification would still be based on the applicable EALs for Run/Power Operation (Mode 1) for these events/conditions. If "ALL" operating modes are specified for the EAL, then the EAL applies to all modes identified above plus defueled conditions.

EAL Threshold Value

The EAL Threshold Value is then listed. This list contains the values, parameters and/or conditions needed for Classification decision making. EAL determination is made from the EAL Threshold Value criteria. When more than one criteria is provided, logic phrasing is used to describe whether several conditions need to be met or only one is necessary.

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DAEC EAL Information

This contains the plant-specific information used to implement the generic EALs. This section will also include the basis, as appropriate, for deviation from generic EALs. As appropriate, description of any supporting calculations, their underlying bases and assumptions, and their results are included in this section.

References

The references used to develop the DAEC EAL Information are listed here, as appropriate.

2. Fission Product Barrier Table Indicators

The basis information for the fission barrier table indicators is organized similarly to the other basis information described above. For each barrier - fuel clad, RCS, and primary containment - basis information is organized by "Indicator." The indicator is the name for the row on the fission barrier table and is used for convenient grouping of similar symptoms, similar to the "Event Type" used for the A, H, and S EALs described above. Indicators include Radiation/Core Damage, RPV Level, Leakage, Primary Containment Atmosphere, and EC/OSM Judgment.

After the DAEC Indicator, the applicable generic BWR fission product barrier indicators are then displayed, showing both the generic loss and potential loss conditions, as applicable. Next displayed is the appropriate DAEC information and references. These are displayed in the same manner as the A, H, and S recognition category basis information described above.

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**Usage Level
REFERENCE**

Effective Date: 8/5/2003

TECHNICAL REVIEW	
Prepared and Verified by: <u><i>Thom Tubbs</i></u>	Date: <u>6/20/03</u>
Validated by: <u><i>Monica P. Zimmerman</i></u> Emergency Planning Staff	Date: <u>7/4/03</u>

PROCEDURE APPROVAL	
<p>I am responsible for the technical content of this procedure and for obtaining the necessary approval from the State and County Emergency Management officials prior to implementation.</p> <p>Documentation of State and County Emergency Management approval is via NEP-2003-0006.</p>	
Approved by: <u><i>Paul Sullivan</i></u> Manager, Emergency Planning	Date: <u>7/7/03</u>

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EU1 Damage To A Loaded Cask Confinement Boundary

EVENT TYPE: Independent Spent Fuel Storage Installation (ISFSI)

OPERATING MODE APPLICABILITY: Not Applicable

EAL THRESHOLD VALUE: (1 or 2 or 3)

1. Any one of the following natural phenomena events with resultant visible damage to or loss of a loaded cask confinement boundary:
 - Report by plant personnel of a tornado strike.
 - Report by plant personnel of a seismic event.
2. The following accident condition with resultant visible damage to or loss of a loaded cask confinement boundary:
 - A loaded transfer cask is dropped as a result of normal handling or transporting.
3. Any condition in the opinion of the EC/OSM that indicates loss of loaded fuel storage cask confinement boundary.

DAEC EAL INFORMATION:

The CONFINEMENT BOUNDARY is the barrier (Dry Shielded Canister (DSC)) that separates areas containing radioactive substances, spent nuclear fuel or high-level waste, and the environment.

During all packaging, transfer, and storage activities, the DSC is completely enclosed in one of two additional containers, the DSC transfer cask or the horizontal storage module, and is never exposed to the environment. Both of these devices provide physical missile protection and radiation shielding for the DSC.

Because the CONFINEMENT BOUNDARY is not directly accessible for visible inspection, the DAEC EAL definition of VISIBLE DAMAGE to the CONFINEMENT BOUNDARY is defined as: damage to the DSC transfer cask or horizontal storage module that is readily observable without measurements, testing, or analysis. Damage is sufficient to cause concern regarding the continued operability or reliability of the dry shielded canister inside the transfer cask or horizontal storage module. Example damage includes: deformation due to heat, impact, or unplanned movement, denting, penetration, rupture, cracking, or spalling of concrete to expose concrete reinforcing bar, or reduction in depth or configuration of radiation shielding materials. Surface blemishes (e.g., paint fading, paint chipping, concrete cracks or scratches) are not included in visible damage.

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For the events of concern here, the key issue is whether the resultant **damage to or loss of the loaded fuel cask CONFINEMENT BOUNDARY** leads to the degradation of the fuel during transfer or storage, or poses an operational safety problem with respect to its removal from storage. The wind speed, earthquake intensity, height of loaded transfer cask drop as a result of normal handling or transporting etc., in and of themselves, are not the key issue.

EAL Threshold Values for earthquakes are addressed in accordance with AOP 901, "Earthquake."

EAL Threshold Values for Tornadoes are addressed in accordance with AOP 903, "Tornado."

For EAL 1 and EAL 2, the results of the ISFSI Safety Analysis Report (SAR) per NUREG-1536 or SAR referenced in the cask's Certificate of Compliance and the related NRC Safety Evaluation Report were used to develop the DAEC list of natural phenomena events and accident conditions. These EALs address responses to a dropped cask, a tipped over cask, or natural phenomena affecting a cask (e.g., seismic event, tornado, etc.) or a dropped cask. (Reference Action Request OTH026062 for credible and non-credible event analysis.)

For EAL 3, any condition not explicitly detailed as an EAL threshold value, which, in the judgment of the EC/OSM, is a potential degradation in the level of safety of the ISFSI. EC/OSM judgment is to be based on known conditions and the expected response to mitigating activities within a short time period.

REFERENCES:

1. "Methodology for Development of Emergency Action Levels," NEI 99-01 Revision 4, January 2003 (DAEC EU1 is renamed from NEI E-HU1)
2. Abnormal Operating Procedure (AOP) 901, "Earthquake"
3. Abnormal Operating Procedure (AOP) 903, "Tornado"
4. NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems"
5. SAR referenced in the cask's Certificate of Compliance and the related NRC Safety Evaluation Report
6. Action Request OTH026062

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EU2 Confirmed Security Event With Potential Loss Of Level Of Safety Of The ISFSI

EVENT TYPE: Independent Spent Fuel Storage Installation (ISFSI)

OPERATING MODE APPLICABILITY: Not Applicable

EAL THRESHOLD VALUE:

1. Suspected sabotage device affecting a horizontal storage module, dry shielded canister or transfer cask, or found inside ISFSI protected area.
2. Confirmed tampering with a horizontal storage module, dry shielded canister or transfer cask.
3. A hostage situation that disrupts normal ISFSI operations.
4. Civil disturbance or strike that disrupts normal ISFSI operations.
5. Internal disturbance that is not short lived or is not a harmless outburst involving one or more individuals within the ISFSI protected area.
6. Intrusion into the ISFSI protected area by a hostile force.
7. Any security event of increasing severity that persists for ≥ 30 minutes:
 - Credible bomb threats
 - Extortion
 - Suspicious fire or Explosion
 - Significant Security System Hardware Failure
 - Loss of Guard Post Contact

DAEC EAL INFORMATION:

Consultation with Security is required to determine these threshold values.

Security events which do not represent a potential degradation in the level of safety of the ISFSI are reported under 10 CFR 73.71 or in some cases under 10 CFR 50.72.

Reference is made to DAEC security shift supervision because these individuals are the designated personnel 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 Security Plan.

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EAL 1 describes a suspected sabotage device affecting a Horizontal Storage Module, Dry Shielded Canister or Transfer Cask, or located inside the ISFSI Protected Area. This is considered a potential degradation in the level of safety of the ISFSI.

EAL 2 is for confirmed tampering with a Horizontal Storage Module, Dry Shielded Canister or Transfer Cask located inside the Protected Area at the ISFSI as well as in transport to the ISFSI. This is considered a potential degradation in the level of safety of the ISFSI.

EAL 3 identifies a hostage situation that disrupts normal ISFSI operations. A hostage situation is considered to disrupt normal operations if it results in the inability to perform surveillance activities, or alters other activities at the ISFSI or during transport operations.

EAL 4 describes a civil disturbance or strike which are considered to be spontaneous activities that disrupt normal ISFSI operations. A civil disturbance or strike is considered to disrupt normal ISFSI operations if it initially disrupts normal ingress or egress to the ISFSI Protected Area, or if it requires assistance from the Local Law Enforcement Agencies (LLEA) to control.

EAL 5 deals with suspicious internal disturbances that may have been planned by one or more individuals as a diversion to gain entry to the ISFSI Protected Area.

EAL 6 is an intrusion of a hostile force into the ISFSI Protected Area representing a potential substantial degradation of the level of safety of the ISFSI. A civil disturbance which penetrates the Protected Area can be considered a hostile force.

EAL 7 is for security events of increasing severity that persist for ≥ 30 minutes. A security event is considered to be "of increasing severity" if the event is NOT under control of the security force within 30 minutes.

NOTE: Credible threat events for the ISFSI are covered under EALs HU4, "Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant," and HA4, "Security Event in a Plant Protected Area."

REFERENCES:

1. Methodology for Development of Emergency Action Levels," NEI 99-01 Revision 4, January 2003 (DAEC EU2 is renamed from NEI E-HU2)
2. Abnormal Operating Procedure (AOP) 914, "Security Events"

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HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY CATEGORY	PAGE 1 of 30

**Usage Level
REFERENCE**

Effective Date: 8/5/2003

TECHNICAL REVIEW	
Prepared and Verified by: <u><i>Thom W. Walsh</i></u>	Date: <u>7/3/03</u>
Validated by: <u><i>Manoel P. Guimaraes</i></u> Emergency Planning Staff	Date: <u>7/7/03</u>

PROCEDURE APPROVAL	
<p>I am responsible for the technical content of this procedure and for obtaining the necessary approval from the State and County Emergency Management officials prior to implementation.</p> <p>Documentation of State and County Emergency Management approval is via NEP- <u>2003 - 0024</u>.</p>	
Approved by: <u><i>Paul Suller</i></u> Manager, Emergency Planning	Date: <u>7/29/03</u>

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HU1 Natural and Destructive Phenomena Affecting the Protected Area

EVENT TYPE: Natural Disasters, Other Hazards and Failures

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

Any one of the following phenomena affecting the Protected Area:

1. Valid Amber Design Basis Earthquake (DBE) light and the wailing seismic alarm on Panel 1C35 are both activated indicating an acceleration greater than ± 0.01 gravity.
2. Report by plant personnel of tornado striking within protected area boundary.
3. Assessment by the control room that a destructive event has occurred.
4. Vehicle crash into plant structures or systems within protected area boundary that are determined to be Safe Shutdown Areas.
5. Report by plant personnel of an unanticipated explosion within the protected area boundary resulting in visible damage to permanent structures or equipment required for Safe Shutdown.
6. Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.
7. River flood water levels above 757.0 ft.
8. The Max Normal operating water level exceeding and EOP 3 limits.
9. River water level below 725 ft. 6 in.

DAEC EAL INFORMATION:

EAL Threshold Value 1 addresses earthquakes that are detected in accordance with AOP 901. For DAEC, a minimum detectable earthquake that is indicated on panel 1C35 is an acceleration greater than ± 0.01 Gravity.

DAEC EAL Threshold Value 2 addresses report of a tornado striking within the protected area or within the plant switchyard.

DAEC EAL Threshold Value 3 allows for the control room to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification. No attempt is made to assess the actual magnitude of the damage. Such damage can be due to collision, tornadoes, missiles, or any other cause. Damage can be indicated by report to the control room, physical observation, or by Control Room/local control station instrumentation. Such items as scorching, cracks, dents, or discoloration of equipment or structures required for safe shutdown are addressed by this EAL.

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DAEC EAL Threshold Value 4 addresses a vehicle (automobile, aircraft, forklift, truck or train) crash that may potentially damage plant structures containing functions and systems required for safe shutdown of the plant. This does not include vehicle crashes with each other or damage to office or warehouse structures. Escalation to Alert under HA1 would occur if damage was sufficient to affect the ability to achieve or maintain safe shutdown, e.g., damage made required equipment inoperable or structural damage was observed such as bent supports or pressure boundary leakage.

Safe Shutdown Areas	
Category	Area
Electrical Power	Switchyard, 1G31 DG and Day Tank Rooms, 1G21 DG and Day Tank Rooms, Battery Rooms, Essential Switchgear Rooms, Cable Spreading Room
Heat Sink/ Coolant Supply	Torus Room, Intake Structure, Pumphouse
Containment	Drywell, Torus
Emergency Systems	NE, NW, SE Corner Rooms, HPCI Room, RCIC Room, RHR Valve Room, North CRD Area, South CRD Area
Other	Control Building, Remote Shutdown Panel 1C388 Area, Panel 1C56 Area, SGBT Room

DAEC EAL Threshold Value 5 addresses explosions within the protected area. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures or equipment. Damage can be indicated by report to the control room, physical observation, or by Control Room/local control station instrumentation. Such items as scorching, cracks, dents, or discoloration of equipment or structures required for safe shutdown are addressed by this EAL. The EC/OSM needs to consider the security aspects of the explosion, if applicable.

DAEC EAL Threshold Value 6 addresses turbine failure causing observable damage to the turbine casing or damage to turbine or generator seals.

DAEC EAL Threshold Value 7 addresses the observed effects of flooding in accordance with AOP 902. Plant site finished grade is at elevation 757.0 ft. Personnel doors and railroad and truck openings at or near grade would require protection in the event of a flood above elevation 757.0 ft. Therefore, EAL 7 uses a threshold of flood water levels above 757.0 ft.

DAEC EAL Threshold Value 8 addresses internal flooding can be due to system malfunctions, component failures, or repair activity mishaps (such as failed freeze seal) that can threaten safe operation of the plant.

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Therefore, this EAL is based on a valid indication that the water level is higher than the maximum normal operating limits. The Maximum Normal Operating Limits are defined as the highest values of the identified parameter expected to occur during normal plant operating conditions with all directly associated support and control systems functioning properly. Exceeding these limits is an entry condition into EOP 3, Secondary Containment Control and may be an indication that water from a primary system is discharging into secondary containment. Exceeding the maximum normal operating limit is interpreted as a potential degradation in the level of the safety of the plant and is appropriately treated as an Unusual Event emergency classification. The maximum normal operating water level limits are taken from AOP 902 and EOP 3 and are shown in the table below:

Maximum Operating Limits - Water Levels			
Affected Location	Indicator	Maximum Normal OL	Maximum Safe OL
HPCI Room Area	LI 3768	2 inches	6 inches
RCIC Room Area	LI 3769	3 inches	6 inches
A RHR Corner Room SE Area	LI 3770	2 inches	10 inches
B RHR Corner Room NW Area	LI 3771	2 inches	10 inches
Torus Area	LI 3772	2 inches	12 inches

EAL Threshold Value 9 addresses the effects of low river water level. The intake structure for the safety-related water supply systems (river water, RHR service water, and emergency service water) is located on the west bank of the Cedar River. An overflow-type barrier across the river was designed and constructed in accordance with Seismic Category I criteria to intercept the stream bed flow and divert it to the intake structure. This makes the entire flow of the river available to the safety-related water supply systems. A minimum flow of 13 cubic feet per second (cfs) from a minimum 1000-year river flow of 60 cfs must be diverted. The top of the barrier wall is at elevation 725 ft. 6 in. River water level below this level represents a potential degradation in the level of safety of the plant and is addressed by EAL Threshold Value 9.

In this EAL, "Vital Area" is defined as plant structures or areas containing equipment necessary for a safe shutdown.

REFERENCES:

1. Abnormal Operating Procedure (AOP) 901, Earthquake
2. Abnormal Operating Procedure (AOP) 902, Flood
3. Abnormal Operating Procedure (AOP) 903, Tornado
4. Emergency Operating Procedure (EOP)-3, Secondary Containment Control
5. EOP Basis Document, EOP-3, Secondary Containment Control
6. UFSAR Chapter 3, Design of Structures, Components, Equipment, and Systems
7. Bechtel Drawing BECH-M017, Equipment Location - Intake Structure Plans at Elevations, Rev. 6

HU2 Fire Within Protected Area Not Extinguished Within 15 Minutes of Detection

EVENT TYPE: Fire

HU1

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OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

1. Fire in buildings or areas contiguous to any of the following areas not extinguished within 15 minutes of control room notification or verification of a control room alarm:
 - Reactor, turbine, control, admin/security
 - Intake structure
 - Pump house

DAEC EAL INFORMATION:

The purpose of this EAL is to address the magnitude and extent of fires that may be potentially significant precursors to damage to safety systems. This includes such items as fires within the administration building, and security building (buildings contiguous to the reactor building, turbine building and control building), yet, excludes fires in the warehouse or construction support center, waste-basket fires, and other small fires of no safety consequence. 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 notification of a VALID fire detection system alarm. Verification of a fire detection system alarm includes actions that can be taken within the control room or other nearby location to ensure that the alarm is not spurious. A verified alarm is assumed to be an indication of a FIRE unless it is disproved within the 15-minute period by personnel dispatched to the scene. In other words, a personnel report from the scene may be used to disprove a sensor alarm if received within 15 minutes of the alarm.

Per AOP 913, the location of a fire can be determined by observing 1C40B alarm messages, Zone Indicating Unit (ZIU) alarms, or fire annunciators on panels 1C40 and 1C40A. The location of a fire can also be determined by verbal report of the person discovering the fire. *Verification* of the alarm in this context means those actions taken to determine that the control room alarm is not spurious.

REFERENCES:

1. Abnormal Operating Procedure (AOP) 913, Fire
2. Abnormal Operating Procedure (AOP) 914, Security

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HU3 Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant

EVENT TYPE: Other Hazards and Failures

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

Safe operation of the plant is jeopardized by one of the following:

1. Report or detection of toxic or flammable gases that could enter within the site area boundary in amounts that can affect normal operation of the plant.
2. Report by Local, County or State Officials for potential evacuation of site personnel based on offsite event.

DAEC EAL INFORMATION:

This Threshold Value is based on releases in concentrations within the site boundary that will affect the health of plant personnel or affecting the safe operation of the plant with the plant being within the evacuation area of an offsite event (i.e., tanker truck accident releasing toxic gases, etc.) The evacuation area is as determined from the DOT Evacuation Tables for Selected Hazardous Materials, in the DOT Emergency Response Guide for Hazardous Materials.

For the purposes of this EAL, CO₂ (such as is discharged by the fire suppression system) is not toxic. CO₂ can be lethal if it reduces oxygen to low concentrations that are immediately dangerous to life and health (IDLH). *CO₂ discharge into an area is not basis for emergency classification under this IC unless: (1) Access to the affected area is required, and (2) CO₂ concentration results in conditions that make the area uninhabitable or inaccessible (i.e., IDLH).*

REFERENCES:

1. UFSAR Section 2.2, Nearby Industrial, Transportation, and Military Facilities
2. UFSAR Section 6.4, Habitability Systems

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HU4 Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant

EVENT TYPE: Security

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

1. Suspected sabotage device discovered within plant Protected Area.
2. Suspected sabotage device discovered outside the Protected Area in the plant switchyard or ISFSI.
3. Confirmed tampering with safety related equipment.
4. A hostage situation that disrupts normal plant or ISFSI operations.
5. Civil disturbance OR strike which disrupts normal plant or ISFSI operations.
6. Internal disturbance that is not short lived of that is not a harmless outburst involving one or more individuals within the Protected Area or ISFSI.
7. Credible Security Threat of "LO" Severity

DAEC EAL INFORMATION:

Security events which do not represent at least 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. The term "suspected sabotage device" is used in place of "bomb device" for consistency with the DAEC Safeguards Contingency Plan.

Consultation with Security supervision is required to determine these Threshold Values.

EAL 1 describes a suspected sabotage device discovered within the Protected Area but outside an area that contains safety functions or systems. It is a potential degradation of the level of safety of the plant and is an UNUSUAL EVENT.

EAL 2 describes a suspected sabotage device discovered in the plant switchyard or ISFSI representing a potential degradation of the level of safety of the plant.

EAL 3 is for confirmed tampering and is adapted from the list of security plan contingencies.

EAL 4 identifies a hostage situation that disrupts normal plant or ISFSI operations. A hostage situation is considered to disrupt normal operations if it results in the inability to perform surveillance activities, alters unit operations, or as described in the security plan.

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EAL 5 describes a civil disturbance or strike is considered to be a spontaneous activity that disrupts normal plant or ISFSI operations. A civil disturbance or strike is considered to disrupt normal plant operations if it initially disrupts normal ingress or egress to the owner controlled or protected area, or if it requires assistance from the Local Law Enforcement Agencies (LLEA) to control.

EAL 6 deals with suspicious internal disturbances that may have been planned by unauthorized personnel as a diversion to gain entry to the site property.

EAL 7 ensures that appropriate notifications for the security threat are made in a timely manner. The determination of a Credible Security Threat of "LO" or "HI" Severity is based on information found in NMC SE-0018, "Security Threat Assessment". The emergency response to a Credible Security Threat of "LO" Severity is initiated through AOP 914, "Security Events" and EPIP 2.8, "Security Threat". A Credible Security Threat of "HI" Severity would escalate this classification to the ALERT status as an HA4. Only the plant to which the specific threat is made need declare the Notification of Unusual Event.

Suspected sabotage devices discovered within the plant Vital Area would result in escalation via other Security EALs.

REFERENCES:

1. Abnormal Operating Procedure (AOP) 914, Security Events
2. NMC SE-0018, "Security Threat Assessment"
3. EPIP 2.8, "Security Threat"
4. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 NEI 99-01 Revision 4*, May 1999/September 2002
5. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 NEI 97-03* August 1997

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HU5 Other Conditions Existing Which in the Judgment of the EC/OSM Warrant Declaration of an Unusual Event

EVENT TYPE: EC/OSM Judgment

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

1. Other conditions exist which in the judgment of the Emergency Director indicate a potential degradation of the level of safety of the plant.

DAEC EAL INFORMATION:

The EAL addresses conditions that fall under the Notification of Unusual Event emergency classification description contained in NUREG-0654, Appendix 1, that is retained under the generic methodology.

Events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

Per EPIP 2.5, the Emergency Coordinator/Operations Shift Manager (EC/OSM) is the title for the emergency director function at DAEC.

REFERENCES:

1. Emergency Plan Implementing Procedure (EPIP) 2.5, Control Room Emergency Response Operation
2. NUREG-0654/FEMA-REP-1, *Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants*, Revision 1, October 1980, Appendix 1

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HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area

EVENT TYPE: Natural Disasters, Other Hazards and Failures

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

Any one of the following phenomena affecting the Protected Area:

1. Valid Amber Operating Basis Earthquake (OBE) light and the wailing seismic alarm on Panel 1C35 are both activated indicating an acceleration greater than ± 0.06 gravity
2. Tornado striking plant vital areas.
3. Assessment by the control room that damage has affected Safe Shutdown Areas.
4. Vehicle crash affecting plant vital areas.
5. Sustained high wind speed of 95 miles per hour or above affecting plant vital areas.
6. Missiles affecting safe shutdown areas.
7. River flood water levels above 767.0 ft.
8. The Max Safe operating water level exceeding and EOP 3 limits in two or more areas AND reactor shutdown is required.
9. River water level below 724 ft. 6 in.

DAEC EAL INFORMATION:

There are no significant deviations from the generic EALs. *For the events of concern here, the key issue is not the wind speed, earthquake intensity, etc., but whether there is resultant damage to equipment or structures required to achieve or maintain safe shutdown, regardless of the cause.* Determination of damage affecting the ability to achieve or maintain safe shutdown can be indicated by reports to the control room, physical observation or by Control Room/local control station instrumentation.

EAL Threshold Value 1 addresses OBE events that are detected in accordance with AOP 901. For DAEC, the OBE is associated with a peak horizontal acceleration of ± 0.06 Gravity.

DAEC EAL Threshold Value 2 addresses report of a tornado striking a plant vital area.

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DAEC EAL Threshold Value 3 addresses a report to the control room of damage affecting safe shutdown areas. The reported damage can be from tornadoes, high winds, flooding, missiles, collisions, or any other cause.

DAEC EAL Threshold Value 4 addresses vehicle (automobile, aircraft, forklift, truck or train) confirmed crashes affecting plant vital areas. This does not include vehicle crashes with each other or damage to office or warehouse structures.

DAEC EAL Threshold Value 5 addresses sustained high wind speeds as measured by the 33-Foot or 156-Foot elevations on the Meteorological Tower. *Sustained wind speed* means the baseline wind speed measured by meteorological tower that does not include gusts. The design basis wind speed is 105 miles per hour. However, the meteorological instrumentation is only capable of measuring wind speeds up to 100 miles per hour. Thus the alert level for sustained high wind speed, 95 miles per hour, is selected to be on-scale for the meteorological instrumentation and to conservatively account for potential measurement errors.

DAEC EAL Threshold Value 6 addresses missiles affecting safe shutdown areas. Such missiles can be from any cause, e.g., tornado-generated; turbine, pump or other rotating machinery catastrophic failure; or generated from an explosion.

Per AOPs 913 and 914, the following areas are identified as safe shutdown areas and are shown on the EAL tables. This table is displayed as an aid to the Emergency Coordinator in determining appropriate areas of concern.

Safe Shutdown Areas	
Category	Area
Electrical Power	Switchyard, 1G31 DG and Day Tank Rooms, 1G21 DG and Day Tank Rooms, Battery Rooms, Essential Switchgear Rooms, Cable Spreading Room
Heat Sink/ Coolant Supply	Torus Room, Intake Structure, Pumphouse
Containment	Drywell, Torus
Emergency Systems	NE, NW, SE Corner Rooms, HPCI Room, RCIC Room, RHR Valve Room, North CRD Area, South CRD Area
Other	Control Building, Remote Shutdown Panel 1C388 Area, Panel 1C56 Area, SGBT Room

DAEC EAL Threshold Value 7 addresses river water levels exceeding design flood water levels. All Seismic Category I structures and non-seismic structures housing Seismic Category I equipment are designed to withstand the hydraulic head resulting from the "maximum probable flood" to which the site

could be subjected. The design flood water is at elevation 767.0 ft. Major equipment penetrations in the exterior walls are located above elevation 767.0 ft. Openings below the flood level are either watertight or are provided with means to control the inflow of water in order to ensure that a safe shutdown can be achieved and maintained. Consideration has also been given to providing temporary protection for openings in the exterior walls up to flood levels of 769.0 ft. All buildings were also checked for uplift (buoyancy) for a flood level at elevation 767.0 ft, and the minimum factor of safety used was 1.2. Therefore, DAEC EAL 7 uses as its threshold flood water levels above 767 feet.

DAEC EAL Threshold Value 8 addresses internal flooding consistent with the requirements of EOP 3, Secondary Containment Control. If RPV pressure reduction will decrease leakage into secondary containment then this is due to leakage from the primary system, which is addressed by the Fission Barrier Table indicators and System Malfunction EALs, and is not addressed here. Therefore, EAL 8 addresses conditions in which water level in two or more areas is above Maximum Safe Operating Limits and reactor shutdown is *required*. *Required* means that the reactor shutdown was procedurally mandated by EOP 3 and is not merely performed as a precaution or inadvertently. *Maximum Safe Operating Limits* are defined as the highest parameter value at which neither (1) equipment necessary for safe shutdown of the plant will fail nor (2) personnel access necessary for the safe shutdown of the plant will be precluded. The internal flooding can be due to system malfunctions, component failures, or repair activity mishaps (such as failed freeze seal) that can threaten safe operation of the plant. This includes water intrusion on equipment that is not designed to be submerged (e.g., motor control centers).

The maximum safe operating water level limits are taken from EOP 3 and are shown on the table below:

Maximum Operating Limits - Water Levels			
Affected Location	Indicator	Maximum Normal OL	Maximum Safe OL
HPCI Room Area	LI 3768	2 inches	6 inches
RCIC Room Area	LI 3769	3 inches	6 inches
A RHR Corner Room SE Area	LI 3770	2 inches	10 inches
B RHR Corner Room NW Area	LI 3771	2 inches	10 inches
Torus Area	LI 3772	2 inches	12 inches

DAEC EAL Threshold Value 9 addresses the effects of low river water level. The intake structure for the safety-related water supply systems (river water, RHR service water, and emergency service water) is located on the west bank of the Cedar River. The overflow weir is at elevation 724 feet 6 inches. River level at or below this elevation will result in all river flow being diverted to the safety related water supply systems. The top of the intake structure around the pump wells is at elevation 724 feet. If the river water level dropped to this level, the pump suction would have no continuous supply. Therefore, this EAL uses a threshold of water level below 724 feet 6 inches as a potential substantial degradation of the ultimate heat sink capability.

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In this EAL, "Vital Area" is defined as plant structures or areas containing equipment necessary for a safe shutdown.

REFERENCES:

1. Abnormal Operating Procedure (AOP) 901, Earthquake
2. Abnormal Operating Procedure (AOP) 902, Flood
3. Abnormal Operating Procedure (AOP) 903, Tornado
4. Abnormal Operating Procedure (AOP) 913, Fire
5. Abnormal Operating Procedure (AOP) 914, Security Events
6. UFSAR Chapter 3, Design of Structures, Components, Equipment, and Systems
7. Bechtel Drawing BECH-M017, Equipment Location - Intake Structure Plans at Elevations, Rev. 6
8. EOP Basis Document, EOP 3 - Secondary Containment Control
Emergency Operating Procedure (EOP) 3, Secondary Containment Control

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HA2 Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown

EVENT TYPE: Fire

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

1. Fire or explosion affecting one of the following systems or areas of concern.

SYSTEMS

- Reactivity Control
- Containment (Drywell/Torus)
- RHR/Core Spray/SRV's
- HPCI/RCIC
- RHRSW/River Water/ESW
- Onsite AC Power/EDG's
- Offsite AC Power
- Instrument AC
- DC Power
- Remote Shutdown Capability

AREAS

- Reactor, Turbine, Control, Admin/Security
- Intake Structure
- Pump House

AND

2. Affected system parameter indications show degraded performance or plant personnel report VISIBLE DAMAGE to permanent structures or equipment within the specified area.

DAEC EAL INFORMATION:

There is no significant deviation from the generic EAL. Of particular concern for this EAL are fires that may be detected in the reactor building, control building, turbine building, pumphouse, and intake structure as shown in Tabs 1 and 3 of AOP 913. Damage from fire or explosion can be indicated by physical

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observation, or by Control Room/local control station instrumentation.. *No attempt is made in this EAL to assess the actual magnitude of the damage.*

Per AOP 913, the location of a fire can be determined by observing 1C40B alarm messages, Zone Indicating Unit (ZIU) alarms, or fire annunciators on panels 1C40 and 1C40A.

NOTE:

Scope of Systems and Equipment of concern established by review of Appendix R Safe Shutdown credited systems. Only those systems directly affecting safe shutdown or heat removal are listed for consideration, due to fire damage. Support Systems and equipment such as HVAC and specific instrumentation, while included in Appendix R analysis is not considered an immediate threat to the ability to shutdown the plant and remove decay heat.

This EAL addresses a FIRE / EXPLOSION and not the degradation in performance of affected systems. System degradation is addressed in the System Malfunction EALs. 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. Thus, the designation of a single train was intentional and is appropriate when the FIRE / EXPLOSION is large enough to affect more than one component. Lagging fires, fires in waste containers or any miscellaneous fires that may be in the vicinity of safety systems, but do not cause damage to these systems, should NOT be considered for this EAL.

With regard to EXPLOSIONS, *only those EXPLOSIONS of sufficient force to damage permanent structures or identified equipment required for safe operation, should be considered.* As used here, an EXPLOSION is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. The occurrence of the EXPLOSION with reports of evidence of damage (e.g., deformation, scorching) is sufficient for the declaration. *The EC/OSM also needs to consider any security aspects of the EXPLOSIONS, if applicable.*

REFERENCES:

1. Abnormal Operating Procedure (AOP) 913, Fire
2. Abnormal Operating Procedure (AOP) 914, Security Events
3. Abnormal Operating Procedure (AOP) 915, Shutdown Outside Control Room
4. UFSAR Section 6.4, Habitability Systems

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HA3 Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown

EVENT TYPE: Other Hazards and Failures

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

One of the following:

1. Report or detection of toxic gases within a Safe Shutdown Area in concentrations that will be life threatening to plant personnel.

OR

2. Report or detection of flammable gases within a Safe Shutdown Area in concentrations that will affect the safe operation of the plant.

DAEC EAL INFORMATION:

This EAL, in addition to EAL HA5, also addresses entry of toxic gases that may result in control room evacuation in accordance with AOP 915.

For the purposes of this EAL, CO₂ (such as is discharged by the fire suppression system) is not toxic. CO₂ can be lethal if it reduces oxygen to low concentrations that are immediately dangerous to life and health (IDLH). *CO₂ discharge into an area is not basis for emergency classification under this IC unless: (1) Access to the affected area is required, and (2) CO₂ concentration results in conditions that make the area uninhabitable or inaccessible (i.e., IDLH).*

TOXIC - Exposure to the worker in excess of the limits specified in 29 CFR 1910.1000. In practice, this should be considered for concentrations which are capable of producing incapacitation of the worker.

The source of the release is NOT of immediate concern for these threshold values. The concern is for the health and safety of plant personnel and their ability to maintain the plant in a safe operating condition.

This EAL is based on gases that have entered plant structures that will affect the safe operation of the plant. These structures include buildings and areas contiguous to plant vital areas and other significant

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buildings or areas. The intent of this EAL is NOT to include buildings or other areas that are NOT contiguous or immediately adjacent to plant vital areas.

Per AOPs 913 and 914, the following areas are identified as safe shutdown areas. *This table is displayed as an aid to the Emergency Coordinator in determining appropriate areas of concern.*

Safe Shutdown Areas	
Category	Area
Electrical Power	Switchyard, 1G31 DG and Day Tank Rooms, 1G21 DG and Day Tank Rooms, Battery Rooms, Essential Switchgear Rooms, Cable Spreading Room
Heat Sink/Coolant Supply	Torus Room, Intake Structure, Pumphouse
Containment	Drywell, Torus
Emergency Systems	NE, NW, SE Corner Rooms, HPCI Room, RCIC Room, RHR Valve Room, North CRD Area, South CRD Area
Other	Control Building, Remote Shutdown Panel 1C388 Area, Panel 1C56 Area, SBTG Room

REFERENCES:

1. Abnormal Operating Procedure (AOP) 913, Fire
2. Abnormal Operating Procedure (AOP) 914, Security Events
3. Abnormal Operating Procedure (AOP) 915, Shutdown Outside Control Room
4. UFSAR Section 6.4, Habitability Systems

HA4 Security Event in a Plant Protected Area**EVENT TYPE:** Security**OPERATING MODE APPLICABILITY:** All**EAL THRESHOLD VALUE**

1. Intrusion into plant Protected Area or ISFSI by a hostile force.
2. Sabotage device discovered in the plant Protected Area or ISFSI.
3. Any security event of increasing severity that persists for ≥ 30 minutes:
 - a. Credible bomb threats
 - b. Extortion
 - c. Suspicious Fire or Explosion
 - d. Significant Security System Hardware Failure
 - e. Loss of Guard Post Contact
4. Credible Security Threat of "HI" Severity

DAEC EAL INFORMATION:

EAL 1 is an intrusion of a hostile force into the Protected Area or ISFSI representing a potential for a substantial degradation of the level of safety of the plant. A civil disturbance, which penetrates the Protected Area, can be considered a hostile force.

EAL 2 is the discovery of a sabotage device in the Plant Protected area or ISFSI.

EAL 3 security events represent an escalated threat to plant safety above that contained in the Unusual Event. Under this EAL, adversaries within the Protected Area are not yet affecting nuclear safety systems, engineered safety features, or reactor shutdown capability that are located within the vital area. A security event is considered to be "of increasing severity" if events are NOT under control of the security force within 30 minutes. Intrusion into a vital area by a hostile force will escalate this event to a Site Area Emergency.

EAL 4 is the determination of "Credible Security Threat of HI Severity" based on information found in NMC SE-0018, "Security Threat Assessment". The emergency response to a "Credible Security Threat of HI Severity" is initiated through AOP 914, "Security Events" and EPIP 2.8, "Security Threat".

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REFERENCES:

1. NMC SE-0018, "Security Threat Assessment"
2. Abnormal Operating Procedure (AOP) 914, Security Events
3. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 NEI 99-01 Revision 4*, May 1999/September 2002
4. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 NEI 97-03* August 1997

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HA5 Control Room Evacuation Has Been Initiated

EVENT TYPE: Control Room Evacuation

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

1. Entry into AOP 915 and initiation of control room evacuation.

DAEC EAL INFORMATION:

The applicable procedure for control room evacuation at DAEC is AOP 915.

Evacuation of the Control Room represents a potential for substantial degradation of the level of safety of the plant and therefore requires an ALERT declaration. Additional support, monitoring and direction is required and accomplished by activation of the Technical Support Center at the ALERT classification level.

REFERENCES:

1. Abnormal Operating Procedure (AOP) 915, Shutdown Outside Control Room
2. UFSAR Section 6.4, Habitability Systems

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HA6 Other Conditions Existing Which in the Judgment of the EC/OSM Warrant Declaration of an Alert

EVENT TYPE: EC/OSM Judgment

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

1. Other conditions exist which in the Judgment of the Emergency Director indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted.

DAEC EAL INFORMATION:

Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant Any releases are expected to be limited to a small fraction of the EPA Protective Action Guideline exposure levels.

Per EPIP 2.5, the Emergency Coordinator/Operations Shift Manager (EC/OSM) is the title for the emergency director function at DAEC. The EAL addresses conditions that fall under the Alert emergency classification description contained in NUREG-0654, Appendix 1.

REFERENCES:

1. Emergency Plan Implementing Procedure (EPIP) 2.5, Control Room Emergency Response Operations
2. NUREG-0654/FEMA-REP-1, *Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants*, Revision 1, October 1980, Appendix 1

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HS1 Security Event in a Plant Vital Area

EVENT TYPE: Security

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

One of the following:

1. Intrusion into plant Vital Area by a hostile force.
2. A security event which results in the loss of control of any Vital Area (other than the Control Room).
3. **IMMINENT** loss of physical control of the facility (remote shutdown capability) due to a security event.
4. A confirmed sabotage device discovered in a vital area.

DAEC EAL INFORMATION:

IMMINENT - Mitigation actions have been ineffective and trended information indicates that the event or condition will occur within 2 hours.

This threshold value escalates from the ALERT Protected Area intrusion to a Vital Area intrusion of a hostile force.

A security event is as defined in the Safeguards Contingency Plan.

Loss of physical control of the Control Room OR loss of physical control of the remote shutdown capability due to a security event, is to be classified as a GENERAL EMERGENCY per Initiating Condition HG1.

A "confirmed sabotage device" is a determination made by the security force through the Security Plan, Contingency procedures and other guidance documentation.

This class of security events represents an escalated threat to plant safety above that contained in HA4, Security Event in a Plant Protected Area, in that a hostile force has progressed from the Protected Area to the Vital Area. *Under the condition of concern here, the adversaries are considered to be in a position to directly and negatively affect nuclear safety systems, engineered safety features, or reactor shutdown capability.*

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REFERENCES:

1. Abnormal Operating Procedure (AOP) 914, Security Events
2. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4, May 1999*

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HS2 Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established

EVENT TYPE: Control Room Evacuation

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

The following conditions exist:

- 1) Control room evacuation has been initiated.

AND

- 2) Control of the plant cannot be established per AOP 915 within 20 minutes.

DAEC EAL INFORMATION:

There is no significant deviation from the generic EAL. The applicable procedure for control room evacuation at DAEC is AOP 915. Based on the results of the analysis described below, DAEC uses 20 minutes as the site-specific time limit for establishing control of the plant. DAEC has satellite panels associated with the remote shutdown panel at various locations through out the plant. Control of the plant from outside the control room is assumed when the controls are transferred to remote shutdown panel 1C388 in accordance with AOP 915.

The EC/OSM is expected to make a reasonable, informed judgment within the 20 minute time limit that control of the plant from the remote shutdown panel has been established. The intent of the EAL is that control of important plant equipment and knowledge of important plant parameters has been achieved in a timely manner. Primary emphasis should be placed on those components and instruments that provide protection of and information about safety functions. At a minimum, consistent with the Appendix R safe shutdown analysis described above, these safety functions include reactivity control, maintaining reactor water level, and decay heat removal.

General Electric performed analyses to demonstrate compliance with the requirements of 10 CFR 50 Appendix R for DAEC. The evaluation of Reactor Coolant Inventory was performed using the GE evaluation model (SAFE). The SAFE code determines if the reactor coolant inventory is above the TAF during the safe shutdown operation. If core uncover occurs, the fuel clad integrity evaluation is performed by determining the duration of the core uncover and the resulting peak cladding temperature (PCT). The PCT calculations were performed by incorporating the SAFE output into the Core Heatup Analysis code (CHASTE). The details of these calculations are provided in Section 4 of the final report for DAEC

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Appendix R analyses ("Safe Shutdown Appendix R Analyses for Duane Arnold Energy Center", MDE-44-036).

The required analyses include evaluation of the safe shutdown capability of the remote shutdown system for various control room fire events assuming: (1) no spurious operation of equipment, (2) spurious operation of a safety-relief valve (SRV) for 20 minutes, (3) spurious operation of a SRV for 10 minutes, and (4) spurious leakage from a one-inch line. The analyses show that the worst case spurious operation of SRV or isolation valves on a one-inch liquid line (high-low pressure interface) will not affect the safe shutdown ability of the remote shutdown system for DAEC in case of a fire requiring control room evacuation before the identified time limit for the necessary operator actions at the auxiliary shutdown panels. For the limiting cases of worst case spurious leakage from a one-inch line and spurious operation of a SRV, operator control within 20 minutes would not impact the integrity of the fuel clad, the reactor pressure vessel, and the primary containment.

REFERENCES:

1. Abnormal Operating Procedure (AOP) 915, Shutdown Outside Control Room
2. General Electric Report MDE-44-0386, *Safe Shutdown Appendix R Analysis for DAEC*, March 1986
3. UFSAR Section 6.4, Habitability Systems
4. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999

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HS3 Other Conditions Existing Which in the Judgment of the <EC/OSM> Warrant Declaration of Site Area Emergency

EVENT TYPE: EC/OSM Judgment

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

1. Other conditions exist which in the Judgment of the Emergency Director indicate actual or likely major failures of plant functions needed for protection of the public.

DAEC EAL INFORMATION:

There is no significant deviation from the generic EAL.

Per EPIP 2.5, the Emergency Coordinator/Operations Shift Manager (EC/OSM) is the title for the emergency director function at DAEC. The EAL addresses conditions that fall under the Site Area Emergency classification description contained in NUREG-0654, Appendix 1.

Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Any releases are not expected to exceed EPA Protective Action Guidelines beyond the site boundary but could be exceeded onsite.

REFERENCES:

1. Emergency Plan Implementing Procedure (EPIP) 2.5, Control Room Emergency Response Operation
2. NUREG-0654/FEMA-REP-1, *Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants*, Revision 1, October 1980, Appendix 1

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HG1 Security Event Resulting in Loss Of Ability to Reach and Maintain Cold Shutdown

EVENT TYPE: Security

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

One of the following:

1. Loss of physical control of the control room due to security event.

OR

2. Loss of physical control of the remote shutdown capability due to security event.

DAEC EAL INFORMATION:

This EAL is an escalation of the SITE AREA EMERGENCY, HS1 declaration for a hostile force intrusion of a Vital Area taking physical control of either the Control Room **OR** taking over the remote shutdown capabilities which results in the loss of physical control of the facility. This also includes areas where any switches that transfer control of safe shutdown equipment to outside the control room are located.

REFERENCES:

1. Abnormal Operating Procedure (AOP) 914, Security Events
2. UFSAR Section 6.4, Habitability Systems

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HG2 Other Conditions Existing Which in the Judgment of the EC/OSM Warrant Declaration of General Emergency

EVENT TYPE: EC/OSM Judgment

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE:

Other conditions exist which in the Judgment of the Emergency Director indicate:

1) Actual or imminent substantial core degradation with potential for loss of containment

OR

2) There is a potential for uncontrolled radionuclide releases. These releases can reasonably be expected to exceed EPA PAG plume exposure levels outside the site boundary.

DAEC EAL INFORMATION:

Per EPIP 2.5, the Emergency Coordinator/Operations Shift Manager (EC/OSM) is the title for the emergency director function at DAEC

GENERAL EMERGENCY - Events are in process or have occurred which involve actual or IMMEDIATE substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

IMMINENT - Mitigation actions have been ineffective and trended information indicates that the event or condition will occur within 2 hours.

POTENTIAL - Mitigation actions are not effective and trended information indicates that the parameters are outside desirable bands and not stable or improving.

This Emergency Action Level allows for classification of events which in the judgment of the Emergency Director warrant the GENERAL EMERGENCY classification but do not fit into any other GENERAL EMERGENCY criteria. Emergency Director judgment is to be based on known conditions and the expected response to mitigating activities within a short time period arbitrarily set at 2 hours. Classification of a GENERAL EMERGENCY is not to be delayed pending an extended evaluation of possibilities and probabilities. If time allows and the offsite response organizations are active, consultation with the effected state and the NRC is prudent prior to classification.

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REFERENCES:

1. Emergency Plan Implementing Procedure (EPIP) 2.5, Control Room Emergency Response Operation
2. NUREG-0654/FEMA-REP-1, *Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants*, Revision 1, October 1980, Appendix 1
3. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999