Progress Energy

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10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-000131

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-71 and DPR-62
Docket Nos. 50-325 and 50-324
Request for License Amendments – Diesel Generator (DG) Completion Time (CT) Extension for Technical Specification (TS) 3.8.1, "AC Sources - Operating"

Ladies and Gentlemen:

Pursuant to the provisions of 10 CFR 50.90, Carolina Power & Light Company (CP&L), now doing business as Progress Energy Carolinas (PEC), Inc., hereby requests a revision to the Technical Specifications (TS) for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The TS change proposes to extend the Completion Time (CT) of TS 3.8.1 Required Action D.4 for an inoperable diesel generator (DG). A commensurate change is also proposed to extend the maximum Completion Time of TS 3.8.1 Required Actions C.3 and D.4. BSEP will add a supplemental AC power source (i.e., a supplemental diesel generator) with the capability to power any E-bus within one hour from the Station Blackout (SBO) event, and with the capacity to bring the affected unit to cold shutdown, to support this request.

This request is subdivided as follows:

- Enclosure 1, Description and Evaluation of Proposed Change
- Enclosure 2, Proposed BSEP TS and TS Bases (Markup)
- Enclosure 3, Proposed BSEP TS (Retyped Pages)
- Enclosure 4, PRA Evaluation of Risk Impact Including Treatment of Uncertainties
- Enclosure 5, PRA Quality Report
- Enclosure 6, PRA Quantification Data Tables
- Enclosure 7, Commitment List

The PRA Fire Peer Review is scheduled for December 2011. CP&L expects to receive the Fire Peer Review Final Report in January 2012, and will provide the Fire Peer Review supplemental information within 30 days of receipt of the Final Report. This commitment is included in Enclosure 7. A Self Assessment has been performed to evaluate the

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performance of the Fire portion of the PRA. The Self Assessment description and findings are provided in Enclosure 5.

CP&L requests approval of the proposed amendment by February 14, 2013 with implementation prior to startup from the 2013 Brunswick Unit 2 refueling outage.

CP&L has evaluated the proposed change in accordance with 10 CFR 50.91(a)(1), using the criteria in 10 CFR 50.92(c), and determined that there are no significant hazards considerations associated with the proposed TS changes. Additionally, PEC has determined that the proposed TS changes qualify for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

In accordance with 10 CFR 50.91(b)(1), CP&L is notifying the State of North Carolina of this application for amendment by providing a copy of this letter and enclosures to the designated State Official.

Please refer any questions regarding this submittal to Ms. Annette Pope, Supervisor - Licensing/Regulatory Programs, at (910) 457-2184.

I declare under penalty of perjury, that the foregoing is true and correct; executed on December 5, 2011.

Sincerely,

Michael J. Annacone

Enclosures:

1. Description and Evaluation of Proposed Change
2. Proposed BSEP TS and TS Bases (Markup)
3. Proposed BSEP TS (Retyped Pages)
4. PRA Evaluation of Risk Impact Including Treatment of Uncertainties
5. PRA Quality Report
6. PRA Quantification Tables
7. Commitment List

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DIESEL GENERATOR COMPLETION TIME EXTENSION

DESCRIPTION AND EVALUATION OF PROPOSED CHANGE

TABLE OF CONTENTS

DIESEL GENERATOR COMPLETION TIME EXTENSION

DESCRIPTION AND EVALUATION OF PROPOSED CHANGE

1. DESCRIPTION

Pursuant to 10 CFR 50.90, the Brunswick Steam Electric Plant (BSEP) is submitting a request for Technical Specification (TS) changes to license DPR-71 for BSEP Unit 1, and license DPR-62 for BSEP Unit 2. The proposed TS 3.8.1 changes:

a) Extend the Completion Time (CT) for Required Action D.4 (i.e., return of an inoperable diesel generator (DG) to operable status) from 7 days to 14 days; based upon availability of a supplemental AC power source (i.e., a supplemental diesel generator);

b) Make commensurate changes to the maximum Completion Times for Required Action C.3 and D.4 by extending these times from 10 days to 17 days.

These changes will provide operational and maintenance flexibility. They will allow sufficient time to perform DG planned reliability improvement modifications and maintenance activities that cannot be performed within a 7-day Completion Time.

This License Amendment Request (LAR) includes both deterministic justification and risk-based information. The proposed new CT is based on the 14-day CT permitted in Branch Technical Position (BTP) 8-8 (Reference 7.2.5) and application of the BSEP Probabilistic Risk Assessment (PRA) in support of a risk-informed extension, and on additional considerations and compensatory actions. The risk evaluation and deterministic engineering analysis supporting the proposed change have been developed in accordance with the guidelines established in Regulatory Guide 1.177, "An Approach for Plant-Specific Risk-Informed Decision-making: Technical Specifications" (Reference 7.2.1), and NRC Regulatory Guide 1.174, "An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (Reference 7.2.2).

2. PROPOSED CHANGE

2.1. Need for Proposed Change

This TS change is being requested to allow sufficient time to perform planned reliability improvement modifications and adequate preventive maintenance to ensure diesel generator reliability and availability. The proposed change also provides flexibility to resolve DG deficiencies and avoid potential unplanned plant shutdown, along with the potential challenges to safety systems during an unplanned shutdown, should a condition occur requiring DG corrective maintenance.

The purpose of the proposed change is to extend the TS CT for an inoperable DG from 7 days to 14 days. The 14-day CT is needed to (1) provide the necessary time to support planned DG voltage regulator, governor, and starting air replacements/upgrades as described below, and (2) reduce the likelihood and unnecessary burden of a dual unit shutdown should an unplanned DG outage occur with the units at power by providing additional time to repair and reestablish operability of the inoperable DG. To justify the 7-day CT extension, a supplemental AC power source capable of powering any of the four 4.16 kV emergency buses during a Station Blackout (SBO) is required. BSEP will add a supplemental AC power source (i.e., a supplemental diesel generator) with the capability to power any E-bus within one hour from the SBO event, and with the capacity to bring the affected unit to cold shutdown, to support this request.

Planned component replacement/upgrade activities for each DG for the period 2013-2017 include activities requiring an extended 14-day DG CT. Voltage regulator, governor, and diesel starting air component replacements/upgrades require a 14-day CT. It is anticipated that the voltage regulator work (i.e., estimated at 11.5 days total DG outage time) and governor work

(i.e., estimated at 7.5 days total DG outage time) will be performed with the associated unit in a refueling outage (i.e., cold shutdown) to support the required operability testing. It is anticipated that the diesel starting air system work (i.e., estimated at 8 days total DG outage time) will be performed with the associated unit online. The 14-day CT applicable to both the Unit 1 TS and the Unit 2 TS is needed to perform this work. The TS changes will provide operational and maintenance flexibility. They will also allow more time for unanticipated DG repairs. If these replacement activities are combined with other DG maintenance activities and performed over an extended DG CT, the number of entries into the TS Actions and the number of associated DG starts performed for post-maintenance testing prior to exiting the TS will be reduced.

2.2. Proposed Change to Technical Specifications

A description of the proposed TS change is provided below. The specific changes to the BSEP TS and TS Bases for Units 1 and 2 are indicated in the markups provided in Enclosure 2. The retyped (clean) pages of the BSEP TS for Units 1 and 2 are provided in Enclosure 3.

2.2.1. TS 3.8.1 - Required Action and Completion Time - New Required Action

A new Required Action (shown as D.2 in the markup) to "Evaluate availability of SUPP-DG" with a CT of "2 hours AND Once per 12 hours thereafter" is proposed.

2.2.2. TS 3.8.1 - Completion Time - Required Action D.4

The CT for Required Action D.4 (shown as D.5 in the markup) is proposed to be extended from 7 days to 14 days. The existing 7-day CT is proposed to be conditional concurrent with the SUPP-DG unavailable. Additionally, a CT is proposed to limit the time the SUPP-DG is unavailable during the extended CT to 24 hours. The proposed CTs would extend the CT from 7 days to 14 days provided the SUPP-DG is available[1]. The initial and subsequent verification of SUPP-DG availability is described in Section 2.2.1.

2.2.3. TS 3.8.1 - Maximum Completion Time - Required Actions C.3 and D.4

The maximum CT for Required Actions C.3 and D.4 (shown as D.5 in the markup) are proposed to be extended from 10 days to 17 days. The maximum Completion Time limits the total time that Limiting Condition for Operation (LCO) 3.8.1 is not met while concurrently or simultaneously in Conditions C and D. This CT is the sum of the CT for Required Action C.3 (i.e., 72 hours) and D.4 (7 days). BSEP is proposing to increase the CT for Required Action D.4 to 14 days; thus, the maximum CT for Required Action C.3 and D.4 will be increased from 10 days to 17 days.

2.3. Bases for Proposed Change

Consistent with the objectives of the NRC's policy entitled "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement" (60 FR 42622) (Reference 7.2.3), the amendment proposed herein provides (1) safety decision-making enhanced by the use of Probabilistic Risk Assessment (PRA) insights, (2) more efficient use of resources, and (3) a reduction in unnecessary burden.

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[1] SUPP-DG availability to extend the DG CT is addressed in the TS and TS Bases. Enclosure 2 provides marked-up pages for the proposed BSEP TS and TS Bases pages. Enclosure 3 provides the retyped (clean) pages for the proposed BSEP TS.

The Completion Time of Required Action D.4 of TS 3.8.1 currently allows only 7 days to perform maintenance and post-maintenance testing or troubleshoot and repair an inoperable DG, and return it to an operable status when BSEP is in Modes 1, 2, or 3.

The purpose of the proposed change is to extend the TS Completion time for an inoperable DG from 7 days to 14 days. The 14-day CT is needed to (1) provide the necessary time to support planned DG voltage regulator, governor, and starting air replacements/upgrades as described in the next paragraph, and (2) reduce the likelihood and unnecessary burden of a dual unit shutdown should an unplanned DG outage occur with the units at power by providing additional time to repair and reestablish operability of the inoperable DG. To justify the 7-day CT extension, a supplemental AC source power source (i.e., a supplemental DG) capable of powering any of the four 4.16 kV emergency buses during a Station Blackout (SBO) is required. BSEP will add a supplemental AC power source (i.e., a supplemental diesel generator) to support this request.

Planned component replacement/upgrade activities for each DG for the period 2013-2017 include activities requiring an extended 14-day DG CT. Voltage regulator, governor, and diesel starting air component replacements/upgrades require a 14-day CT. It is anticipated that the voltage regulator work (i.e., estimated at 11.5 days total DG outage time) and governor work (i.e., estimated at 7.5 days total DG outage time) will be performed with the associated unit in a refueling outage (i.e., cold shutdown) to support the required operability testing. It is anticipated that the diesel starting air system work (i.e., estimated at 8 days total DG outage time) will be performed with the associated unit online. The 14-day CT applicable to both Unit 1 TS and Unit 2 TS is needed to perform this work.

As a condition for implementing an extended 14-day CT for a single inoperable DG, an independent supplemental DG (SUPP-DG) will be provided to supply power to any of the four 4.16 kV E-buses via the 4.16 kV BOP bus circuit path. By procedure and TS Bases, the SUPP-DG will power only one E-bus at a time during a station blackout (SBO) event. The capacity of the SUPP-DG exceeds that of a station DG. The SUPP-DG description is provided in Section 3.4.

BSEP is subject to a dual unit shutdown should an unplanned DG outage occur, with the DG not restored to operable status within 7 days. The extension of the 7-day CT to 14 days gives extra time for repairing and reestablishing operability of the inoperable DG; thus, reducing the risk of dual-unit shutdown as a result of exceeding the 7-day CT. A 14-day CT is justifiable as a contingency provision for unexpected DG failures and minimizes the need for expedited licensing actions seeking approval of more completion time. Given the conclusions reached by the deterministic and risk-based evaluations that follow, extending the CT associated with an inoperable DG would also provide the following:

1. Enhanced Decision-Making

As noted in its approval of the policy statement on the use of PRA methods, the Commission stated an expectation that the use of PRA technology should be increased to the extent supported by the state of the art in PRA methods and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy. The NRC's Policy Statement regarding the Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities states:

> *PRA and associated analyses (e.g., sensitivity studies, uncertainty analyses, and importance measures) should be used in regulatory matters, where practical within the bounds of the state-of-the-art, to reduce unnecessary conservatism associated with current regulatory requirements, regulatory guides, license commitments, and staff practices.*

The extended Completion Time, to permit a DG to be removed from service for 14 days to perform maintenance or to trouble shoot and repair an inoperable DG, are acceptable from a risk-based approach due to a small increase in Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) consistent with the criteria in Regulatory Guides 1.177 and 1.174 (Reference 7.2.1 and 7.2.2). The results of the risk assessment are provided in Section 4.4.

2. Efficient Use of Resources

The extended Completion Time associated with an inoperable DG will improve the effectiveness of the allowed maintenance period. Plant resources can be more focused on the DG rather than preparation and return to service activities. Under the current CT, a significant portion of maintenance activities is associated with preparation and return to service activities; the duration of which is relatively constant. Longer Completion Time durations allows more maintenance to be accomplished during a given maintenance period and therefore would improve maintenance efficiency.

3. Reduction in Unnecessary Burden

The proposed change provides a reduction in unnecessary burden, because it:

- Allows additional time to perform routine maintenance activities on the DG enhancing the ability to focus quality resources on the activity, and improve maintenance efficiency.
- Increases the time to troubleshoot, repair, and reestablish operability of an inoperable DG during MODE 1, 2, and 3.
- Averts unplanned dual unit shutdown and minimizes the potential need for requests for enforcement discretion.

These proposed changes meet the objectives of the NRC's PRA Policy Statement (60 FR 42622) (Reference 7.2.3).

3. BACKGROUND

3.1. BSEP AC Power System

3.1.1. Offsite AC Power System

3.1.1.1. Introduction

The electrical output of BSEP Unit 1 and Unit 2 is fed to the Carolina Power and Light Company (CP&L) power system network by 230 kilovolt (kV) transmission lines. The plant electrical system was designed to meet the requirements of Regulatory Guides 1.6, 1.9, and 1.22. The plant electrical system has been evaluated and meets the requirements of 10 CFR 50.63, "Station Blackout Rule," dated June 21, 1988, and Regulatory Guide 1.155, "Station Blackout," dated August 1988. The DG and associated distribution systems are capable of supplying loads required for the safe shutdown of one unit and a design basis accident in the other unit, concurrent with the loss of offsite power.

3.1.1.2. Switchyard

The objective of the 230 kV switchyard is to deliver the output of the plant to the various points on the system network and to provide adequate offsite power to start the units, provide power for common plant auxiliary loads, and when necessary supply power for the engineered safety features for a unit in a design basis accident condition while supplying the auxiliary power

requirements for shutdown of the other unit. The 230 kV switchyard is designed to minimize the effect of failures of individual items of equipment so that any single credible event would not interrupt power from the 230 kV system network to both startup auxiliary transformers.

Each BSEP unit has a separate section of the switchyard. Each section is connected to one generator (i.e., through the main power transformer), four transmission lines, the startup auxiliary transformer and one transformer which serves the Caswell Beach (i.e., discharge canal) pumping station. Each switchyard section has a double bus arrangement with double breakers for the generator, each transmission line, and the startup auxiliary transformer.

3.1.1.3. Transmission Lines

The offsite power system includes eight individual 230 kV transmission lines which are connected to CP&L's network. Four of the eight individual lines serve each of the two units. Each 230 kV transmission line is connected to its associated switchyard buses through a double breaker feeder arrangement. This arrangement not only enhances the stability of the two units, it assures the availability of off-site power to BSEP.

The system was designed such that neither the loss of one line nor the coincident loss of the nuclear unit will adversely affect the operation, or cause the trip out of the remaining lines. Power requirements of BSEP for normal unit operation, as well as for the nuclear unit safety buses essential for the safe shutdown of the unit during an accident, are provided by the remaining 230 kV transmission lines.

System design provides for an automatic transfer of power from the onsite power source to the offsite power source in the event of the loss of power generation by the nuclear power unit. Tripping of a generator unit will not cause a trip-out of the 230 kV lines associated with that unit. Power requirements resulting from the loss of the unit will be picked up by the 230 kV transmission lines.

Sufficient redundancy has been provided in the offsite power system for BSEP to permit functioning of systems important to safety. The offsite power system provides sufficient capacity and capability to assure that the safety functions of the plant are maintained.

3.1.1.4. Offsite Power System Analysis

The offsite power system has been designed to maximize the reliability of the incoming power to the plant. It was designed with adequate thermal capacity to carry the expected continuous load and to withstand short circuit forces and all expected environmental conditions such as ice and wind loadings. Each line breaker has an interrupting rating of 20,000 MVa which is adequate to safely interrupt faults. Protective relaying provides for fast detection of faults, and trips the breakers to clear the fault.

The transmission lines meet the requirements of General Design Criterion (GDC) Number 17. Transmission for the plant consists of eight 230 kV lines, four lines for each unit.

3.1.2. Onsite AC Power System

3.1.2.1. Introduction

The BSEP onsite power systems consist of those facilities necessary to interconnect the station generators and offsite power supplies with the onsite power supplies and various site loads. These systems provide the capabilities to interconnect various non-safety and safety-related loads to available power supplies. Additionally, these systems provide necessary power to loads required for accident mitigation and for the safe shutdown of the plant.

Power is distributed within the plant at 4160 V and supplied to major loads at that voltage. The electrical output from the DGs is supplied at 4160 V to four buses which supply loads that are required for safe shutdown and accident mitigation. Unit substations consisting of transformers and switchgear are provided within the plant to step the voltage down to 480 V and supply loads at that voltage.

3.1.2.2. Normal Power System

Normal plant power for each unit's auxiliaries is supplied by the 24-4.16 kV unit auxiliary transformer which is connected to its associated generator output leads. Normal startup power for each unit's auxiliaries is supplied by the 230-4.16 kV startup transformer which is fed from the CP&L 230 kV system. The startup transformers would furnish power required in the event of a design basis accident condition. Standby power is provided by four diesel-driven generators. These units are started automatically on loss of voltage on the 4.16 kV buses or on a loss of coolant accident (LOCA) signal.

Buses 1B, 1C, 1D, 2B, 2C, and 2D are provided with a manually initiated, automatically executed fast bus transfer. The scheme is capable of transferring each bus and its related loads between the normal source (i.e., unit auxiliary transformer) and the preferred source (i.e., startup auxiliary transformer) without de-energizing the bus. The transfer is initiated manually from a control station in the control room which closes the circuit breaker on the source to which the transfer is desired.

Buses 1C, 1D, 2C, and 2D are provided with an automatically initiated, automatically executed, quick dead bus transfer. The scheme is capable of quickly transferring each bus section and its loads from the normal source (i.e., unit auxiliary transformer) to the preferred source (i.e., startup auxiliary transformer) in the event of loss of the normal source or unit trip. The transfer event sequence is designed such that the transferred bus and its loads are disconnected from both voltage sources (i.e., normal and preferred) for a period that does not exceed five cycles and is not less than one cycle nominal value based on 60 Hz. The transfer signal immediately trips the normal source breaker and simultaneously initiates the automatic control sequence for closing the preferred source breaker.

3.1.2.3. Standby AC Power System

The objective of the standby AC power system is to provide a self-contained, highly reliable source of power, as required, for the engineered safety features so that no single credible event can disable the core standby cooling function. The standby AC supply and distribution system for the two units consists of four DGs and four 4.16 kV Class 1E buses.

The design bases of the standby AC power system include:

a. The system is designed so that the failure of any single piece of equipment including a DG, circuit breaker, distribution center, or interconnecting wiring or cabling will not jeopardize the effectiveness of core standby cooling systems.

b. Repair, replacement, or adjustment of any failed or malfunctioning component can be accomplished without negating the effectiveness of the core standby cooling systems.

c. Diesel capacity is such that any three of the four diesels provided can supply all required loads for the safe shutdown of one unit and a design basis accident on the other unit without offsite power.

d. During a SBO event (i.e., loss of offsite power to both units during non-accident conditions, one diesel is operational in the non-blacked out unit and neither diesel is operational in the

blacked out unit), diesel capacity is such that the one operational diesel can supply the required loads for safe shutdown of the non-blackout unit and the required SBO coping loads in the blackout unit.

e. The standby AC power system and its associated equipment are automatically initiated.

The DG units were manufactured by Nordberg Manufacturing Company. Each DG unit has a continuous rating of 3500 kW at 0.8 power factor, 4.16 kV, 3 phase, 60 Hz, and a 2000 hour rating of 3850 kW.

The DG unit start, load and run minimum reliability is 0.975. The 0.975 minimum reliability is demonstrated and maintained by a test and corrective action/maintenance program.

3.1.2.4. 4160 Volt Emergency Power Distribution System Description

There are four emergency buses: E1, E2, E3, and E4.

Feeders from each 4.16 kV emergency bus serve shutdown loads of Units 1 and 2. As an example, one of four residual heat removal (RHR) pump motors for each unit is served from each emergency bus. Other plant loads are the RHR service water pump motor and the conventional service pump motors.

Emergency bus ties and incoming lines from the normal (i.e., preferred) source are provided with two series connected power circuit breakers. The emergency bus tie breakers E3-to-E4 and E4-to-E3 are racked out and have their control power fuses removed. The emergency bus tie breakers E1-to-E2, E2-to-E1, E1-to-E3, E2-to-E4, E3-to-E1 and E4-to-E2 are racked in and have their control power fuses installed. During normal plant operation the E1-to-E2, E2-to-E1, E1-to-E3, E2-to-E4, E3-to-E1 and E4-to-E2 tie breakers are prevented from operating by local selector switches which separate the DC control power from the breaker control logic. The selector switches allow local operation of the breakers during a station blackout or fire event. The selector switches also allow operation of the breakers from the control room if required during events other than a station blackout or fire. These selector switches are key locked and controlled. The E3-to-E4 and E4-to E3 tie breakers are not racked in and the control logic for the E1-to-E2, E2-to-E1, E1-to E3, E2-to-E4, E3-to-E1 and E4-to-E2 tie breakers are not energized without procedural direction.

The intent of the above controls is to prevent two redundant 4.16 kV electrical buses from being tied together except during a Station Blackout or Appendix R fire event.

3.1.2.5. DG Automatic Starting and Loading Conditions

Independent, automatic logic is provided for each emergency bus, E1 through E4, which generates a DG auto-start signal under any of the following conditions:

- Loss of offsite power to either Unit 1 or Unit 2
- Unit trip of either unit
- Engineered safety features, actuation signal, on either unit
- Loss of voltage on the associated emergency bus

Four DGs provide standby power for the engineered safety features on the loss of the normal power sources.

Each DG is connected to its individual 4160 V Class 1E bus. AC loads necessary to the safe shutdown of the plant under accident or non-accident conditions are fed from this distribution system. Once the DG is automatically connected to the emergency buses, the logic recognizes

which plant if either is in an accident condition and automatically starts the appropriate engineered safety features, according to a prescribed timed sequence.

The steady state loading of each diesel generator has been studied for the following conditions:

a. Design basis accident on one unit and orderly shutdown of the other unit under loss of offsite power conditions with three DGs operating (i.e., LOCA/LOOP loading).

b. Simultaneous safe shutdown of both units under loss of offsite power conditions with three DGs operating (i.e., LOOP loading).

c. Station blackout loading with one DG available (i.e., safe shutdown of the non-blackout unit while supplying the SBO coping loads of the blackout unit) (i.e., SBO loading).

To meet analysis requirements for LOCA/LOOP loading, LOOP loading, and SBO loading, no case requires that the 2000 hour rating (3850 kW) of the DG be exceeded. Operation at DG loading between the continuous rating (3500 kW) and the 2000 hour rating (3850 kW) is only expected for short durations and is appropriate when needed as described above.

3.1.2.6. Onsite Power System Analysis

The BSEP onsite power system has been designed to supply systems and components important to safety. Sufficient capacity, capability, and redundancy are provided assuring that plant integrity and all vital functions are maintained in the event of postulated accidents.

In the event of a total loss of the preferred power source, power for the engineered safety features is supplied from the diesel generators.

3.2. **Grid Reliability**

3.2.1. Generic Letter 2006-02, Grid Reliability and the Impact on Risk and the Operability of Offsite Power

BSEP response to Generic Letter (GL) 2006-02, Grid Reliability and the Impact on Risk and the Operability of Offsite Power" (Reference 7.2.7) was provided on March 31, 2006 (i.e., Serial: BSEP 06-0026, ADAMS Accession No. ML061020057), and supplemented on January 25, 2007 (i.e., Serial: BSEP 07-0009, ADAMS Accession No. ML070310316) in response to an NRC issued RAI.

The NRC completed their review of GL 2006-02 as documented in their letter dated June 15, 2007 (i.e., ADAMS Accession No. ML071580124). The proposed amendment does not adversely impact BSEP's compliance with NRC regulatory requirements governing electric power sources and associated personnel training.

3.2.2. Recent Offsite AC Power System Reliability Improvements

Recent Offsite AC Power System reliability improvements include the following:

1. Replacements of the motor operated disconnect switches supplying the Startup transformer with gang operated breakers. Allows both 230 KV buses to be connected to the Startup supply at all times, where previously only one bus could be utilized at a time.

2. Replacements of all switchyard line breakers with independent pole (IPO) breakers; expected to be completed by April 2012. IPO breakers reduce the probability that a

phase to phase fault can persist when a breaker malfunction occurs (i.e. at least two poles are likely to open reducing the event to a line to ground fault).

3. Replaced generator output breakers.

4. Main Transformers have been replaced and updated with condition monitoring equipment.

5. Capacitance coupled voltage transformers (CCVTs) have had high industry failure rates therefore all BSEP CCVTs and associated remote end CCVTs have been replaced.

6. Capacitor banks have been installed at each 230 KV bus for improved control of switchyard reactive loading.

7. All switchyard insulators were coated with room temperature vulcanizing (RTV) elastomeric coating following a 1993 LOOP event in which a severe storm caused unusually high salt contamination and flashover of electrical insulators in the switchyard. Recoating of these insulators is currently in progress.

3.3. **Station Blackout Capability**

3.3.1. Introduction

SBO refers to a complete loss of all offsite and onsite AC power. The SBO rule (10 CR 50.63) requires utilities to assess the impact of a loss of preferred power (i.e., offsite power) concurrent with a loss of the unit's diesel generators. BSEP SBO analysis has been performed in accordance with the guidelines provided in Regulatory Guide 1.155, Station Blackout (Reference 7.2.6), and NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives addressing Station Blackout at Light Water Reactors (Reference 7.2.4), for assessment of BSEP compliance with the requirement of 10 CFR 50.63.

BSEP utilizes the alternate AC source operation approach. BSEP is subject to a minimum station blackout coping capability of four hours with a DG Reliability Target of 0.975.

For BSEP, with its normally dedicated emergency AC power sources, a SBO is assumed to occur on only one unit. The non-blackout unit is capable of sharing a single DG with the blackout unit, after assuming a single failure on the non-blackout unit (i.e., one of the two DGs on the non-blackout unit fails to start). With only one DG available, it will be necessary to load strip and cross-tie the 4.16 kV and 480V substations to provide power to both units. Control power fuses on the blackout unit's cross-tied 4160V emergency bus are removed to prevent tripping of the single operating DG from Residual Heat Removal (RHR), Core Spray (CS), and Nuclear Service Water (NSW) pump starts on possible LOCA signals from the cool down.

It is intended that the SUPP-DG would be connected to the 4.16 kV E-Bus associated with the DG removed from service; however, the SUPP-DG would be available to be connected to any of the four 4.16 kV E-Buses following the licensing basis SBO event. That is, if the DG that was inoperable prior to the SBO is on the non-blackout unit, it would be appropriate to align the SUPP-DG to the 4.16 kV E-Bus in the division on the blackout unit that is not involved in the cross-tie actions per the plant SBO Abnormal Operating Procedure (AOP). The SUPP-DG alignment can be performed concurrent with and independent from the plant SBO AOP cross-tie actions.

The SUPP-DG is a defense-in-depth measure for SBO. The SUPP-DG is not credited in the SBO analysis.

3.3.2. Coping Duration

BSEP is an Alternate AC (AAC) plant subject to a minimum station blackout coping capability of four hours. The required SBO coping duration for BSEP is calculated in accordance with the guidance provided in NUMARC 87-00, Section 3.0. During the first hour of coping, the crosstie with the non-blackout unit is not established and AC power is not available in the blackout unit. After the first hour, the crosstie is established and the AAC power source can support the coping requirements (i.e., supply battery chargers) in the blackout unit. Two 200 kW, 480 VAC 60 Hz diesel generators, referenced as severe accident management alternative (SAMA) diesel generators, are available to supply the blackout unit battery chargers if AC power cannot be restored to the blackout unit E-bus (i.e., the crosstie is not possible). If both units are blackout, one SAMA diesel generator is available to supply the Unit 1 battery chargers, and one SAMA diesel generator is available to supply the Unit 2 battery chargers. The SAMA diesel generators are a defense-in-depth measure.

BSEP is an Independence Group I 1/2 category site. BSEP is categorized as Extremely Severe Weather Group 5 and Severe Weather Group 2. BSEP is categorized as Offsite AC Power Design Group P3* and Emergency Alternating Current (EAC) Group C.

DG reliability is 0.975 for BSEP. BSEP monitors the DG reliability under the Maintenance Rule Program (i.e., see Section 3.9). Increasing the DG CT will not impact the DG reliability target used in the SBO coping time calculation at BSEP.

Off-site power is delivered to the site via eight individual 230 kV transmission lines. Four of the eight individual lines serve each of the two units. These lines feed a 230 kV switchyard as described in Section 3.1 and in detail in Chapter 8.2 of the updated Final Safety Analysis Report (FSAR) (Reference 7.1.1). The large number of 230 kV transmission lines and the physical separation of the lines and transformer bays minimize the likelihood of power loss due to loss of transmission lines. Additionally, during use of the extended CT, the protection of the switchyard and cooperation with Progress Energy Transmission helps to minimize risk of the SBO event.

While BSEP was not licensed in accordance with the Standard Review Plan (SRP), a review of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," was conducted. NUREG 0800, Section 8.4, III.3.O.iv (Reference 7.2.8) states: "When an SBO occurs at one unit of a multiunit site, the EAC power source(s) and the redundant EAC power source(s) are unavailable. An SBO on one unit does not assume a concurrent single failure; however, the remaining unit(s) should still meet the normal operating single failure criteria. This suggests that BSEP would incur a loss of off-site power coupled with the failure of 3 out of 4 DGs (2 on SBO Unit and 1 on non-SBO Unit). This is consistent with the current SBO licensing basis.

3.4. **Supplemental Diesel Generator (SUPP-DG)**

3.4.1. SUPP-DG System Description

Details of the SUPP-DG are not finalized, but the current descriptions are noted below.

3.4.2. SUPP-DG Sizing, Separation, Connection, Design, Operation and Testing

The supplemental AC power source (SUPP-DG) consists of a 20-cylinder EMD 20-710G4C-T3 diesel engine generator unit manufactured by Electro-Motive Diesel (EMD). It can be aligned and started to power any one of the four (4) emergency buses (E-bus). Each Class 1E DG is rated at 3500 kWe continuous and 3850 kWe (i.e., 2000-hour rating). The SUPP-DG is rated at 4000 kWe (6850 hours/year) and 4300 kWe (i.e., ≤ 2 hours out of any 24 hour period). Accounting for the SUPP-DG house and auxiliary loads (i.e., approximately 125 kWe during the worst case operating scenario), the output at the SUPP-DG output breaker is > 3850 kWe. The capacity of the SUPP-DG exceeds that of a station DG; thus it can substitute for any one of the four DGs under SBO load requirements. The SUPP-DG is sized to accommodate the DG load under SBO conditions. The SUPP-DG has the capacity to bring the affected unit to cold shutdown, if needed (i.e., if the offsite power is not recovered in a timely manner). The cold shutdown loads are:

LOAD IDENTIFICATION	KW
Residual Heat Removal (RHR) Pump	880
Conventional Service Water (CSW) Pump	243
Nuclear Service Water (NSW) Pump	243
Control Rod Drive (CRD) Pump	154
Residual Heat Removal Service Water (RHRSW) Pump	553
Reactor Building Closed Cooling Water (RBCCW) Pumps	96
Fuel Pool Cooling Pump	50
Reactor Building Ventilation Fans	239
Drywell Cooling Fans	119
Other 480V Load	722
Transformer/Cable Losses	83
TOTAL LOAD	**3382**

The SUPP-DG will be a commercial-grade, non-safety related permanently-installed unit.

The SUPP-DG system will be installed inside the plant protected area, in enclosures east of the Switchyard and north of the Transformer yard. The SUPP-DG components will be physically separated from safety-related Class 1E 4.16 kV AC ESF components, physically separated from the DGs, and physically separated from the preferred offsite AC power sources for the BSEP units. Figure 1 (i.e., Enclosure 1A) shows the approximate SUPP-DG location within the plant. The Diesel Enclosure, Electrical Enclosure, Mechanical Enclosure, and 10,000 gallon fuel storage tank will be located in this general area. The SUPP-DG will be separated from each Class 1E power system by two normally open, non-Class 1E circuit breakers in series, which tie the SUPP-DG into any one of four balance-of-plant (BOP) buses located on Unit 1 (i.e., 1C, 1D) and Unit 2 (i.e., 2C, 2D). One breaker is the SUPP-DG output breaker located in the SUPP-DG Electrical Enclosure; the other breaker is the feeder breaker located at each BOP bus. The SUPP-DG output breaker and the BOP Bus feeder breakers are operated from the SUPP-DG electrical enclosure. The existing master-slave circuit breakers from the BOP buses to the associated E-buses will be used to complete the SUPP-DG alignment to power any one of the four E-buses. The master-slave circuit breaker configuration includes a non-Class 1E master circuit breaker supplied from the BOP bus and a Class 1E slave circuit breaker located at the Class 1E E-bus. The master-slave circuit breakers are controlled from the control room. Figure 2 (i.e., Enclosure 1A) shows the SUPP-DG tie-in to the plant electrical system. The normally open circuit breakers between the SUPP-DG and the selected BOP bus will be closed for SUPP-DG load testing, and after a SBO event, in accordance with approved procedures.

The SUPP-DG will be equipped with an engine control system to maintain the steady state voltage and frequency output within prescribed limits. Redundant automatic voltage regulators control the voltage level of the generator. A switch is provided to select which regulator is active. If the active regulator fails the generator will trip offline. Changing the switch position to select the back-up regulator will allow the unit to be restarted and resume automatic operation. The SUPP-DG supplier will be required to demonstrate the capability to maintain voltage and frequency within prescribed limits during factory testing of the assembled Gen-Set. Refer to the factory testing discussion below.

The SUPP-DG and associated outdoor weather enclosures (i.e., Diesel Enclosure, Mechanical Enclosure, and Electrical Enclosure) will be mounted to a seismically-rugged foundation. The foundation will be elevated approximately 10 feet above plant grade to protect the SUPP-DG system from flood and storm surge. The 4.16 kV cable routing, from the SUPP-DG to the Turbine Building, is flood resistant. The cable run originates at the elevated SUPP-DG Electrical Enclosure and drops down into a new cable trench to the Unit 1 Turbine Building. At the Unit 1 Turbine Building, the cable is routed along the western Turbine Building wall and into the Turbine Building at an elevated point approximately 12 feet above plant grade. The cable route is terminated at the new BOP Bus switchgear.

After an SBO, an operator will manually start and stop the SUPP-DG locally. No SUPP-DG control will be available in the Control Room. Operator action will be required to align and tie the SUPP-DG output to the 4.16 kV E-Bus via the associated 4.16 kV BOP Bus circuit path. First, auxiliary operator action is taken to prevent load starts on the 4.16 kV BOP Bus and to control load starts on the 4.16 kV E-bus. Next, the auxiliary operator will start the SUPP-DG and tie it to the 4.16 kV BOP Bus. Next, a control room operator will close from the control room the master-slave circuit breakers from the 4.16 kV BOP Bus to the 4.16 kV E-Bus, energizing the E-Bus. As described in Section 3.3.1, the SUPP-DG alignment can be performed concurrent with and independent from the plant SBO Abnormal Operating Procedure (AOP) cross-tie actions. The SUPP-DG will be aligned and operated according to approved procedures.

Once the de-energized 4.16 kV E-Bus is reenergized by the SUPP-DG, the unit Engineered Safety Feature (ESF) loads can be manually started from the respective unit control room. The time required to enable the SUPP-DG to supply power to any E-bus is less than one hour from the SBO event.

There will be no direct interface between the SUPP-DG and the DGs. The SUPP-DG will be connected to a selected BOP bus during the SUPP-DG load testing. The SUPP-DG electrical system will be provided with metering and protective relaying at the SUPP-DG output breaker and the new BOP Bus switchgears. For its defense-in-depth function, it is intended that the SUPP-DG would be connected to the 4.16 kV E-Bus associated with the DG that is removed from service; however, the SUPP-DG could be connected to any of the four 4.16 kV E-Buses following the licensing basis SBO event. That is, if the DG that was inoperable prior to the SBO is on the non-blackout unit, it would be appropriate to align the SUPP-DG to the 4.16 kV E-Bus on the blackout unit that is not involved in the cross-tie actions per the facility SBO AOP. The SUPP-DG will be connected only to one 4.16 kV E-Bus at a time in accordance with approved procedures.

Protection from common cause failures between the DGs and SUPP-DG is provided by physical separation, difference in DG manufacturer, difference in DG design, difference in environmental conditions, the use of separate fuel oil tanks and fuel oil testing, SUPP-DG use of radiator cooling, and difference in operating and maintenance procedures.

Factory testing will be performed by the manufacturer on the assembled Gen-Set. Factory testing will include load capability, 24-hour, largest single load start, short-time rating and largest single load reject, start and load acceptance, margin, and load sequence tests. A vibration survey will also be performed.

Site acceptance testing will include testing prior to connection to the plant electrical system and load testing to the 4.16 kV BOP Buses. Upon implementation of the modification, the SUPP-DG will be subject to load testing to a 4.16 kV BOP Bus, and ensuring all its auxiliary support systems are available or operational. The test will be performed only during periods when the SUPP-DG is not credited as available during the extended CT.

3.4.3. SUPP-DG Housing, Batteries, Start System, Fuel, Exhaust Emissions, Lubrication Oil, Consumable Spares

The SUPP-DG and associated mechanical and electrical equipment will be primarily housed in three outdoor weather enclosures (i.e., Diesel Enclosure, Mechanical Enclosure, and Electrical Enclosure) and mounted on an elevated foundation to protect the SUPP-DG system from flood and storm surge. The outdoor weather enclosures will withstand wind speed (i.e., 3-second gust) of 155 mph. The SUPP-DG has a closed loop radiator cooling system mounted on the SUPP-DG foundation. The radiator assembly will withstand wind speed (i.e., 3-second gust) of 155 mph. The Diesel Enclosure houses the diesel engine and generator, and its support systems and accessories including Lube Oil, Air Intake, Cooling Water, Fuel Oil, Redundant Dual Turbine Motor Air Start Systems; and Engine Panel with Engine Instrumentation. The Mechanical Enclosure houses required air start accessories, including air receivers, air compressor and dryer. The Electrical Enclosure houses the SUPP-DG output breaker switchgear, engine/generator control panel, 125 vdc battery system with battery charger, 480v motor control center, 480v automatic transfer switch, and 4160:480v auxiliary power transformer. The SUPP-DG output breaker and the feeder breakers to the 4.16 kV BOP Buses are operated from the Electrical Enclosure.

The SUPP-DG system will normally be in a standby configuration and disconnected from the plant 4.16 kV electrical systems. When the plant is not subject to LOOP/SBO, the SUPP-DG house loads (e.g., battery charger, air compressor, heaters) are powered from a plant 480V supply through a transfer switch located at the SUPP-DG. Upon LOOP, the SUPP-DG is capable of starting on its 125 VDC battery system for up to 24 hours, and will power its house loads once running.

The engine starting system uses compressed air for starting the engine. The starting system consists of two (2) air receivers and redundant air start systems. Each system includes two (2) air start motors.

The SUPP-DG has a 10,000 gallon fuel storage tank mounted on the SUPP-DG foundation. The fuel storage tank provides a usable supply sufficient for 24 hours of running time at 100% rated continuous load. The full load fuel consumption is approximately 6,264 gallons/day (i.e., approximately 261 gallons/hour). The fuel storage tank sizing includes approximately 12 hours additional capacity without fuel replenishment. The required action prior to entering the extended CT will include verifying SUPP-DG availability, which includes fuel tank level ≥ 24-hour supply. The fuel storage tank can be replenished via a refill station for the tank. The SUPP-DG will use No. 2 Ultra-Low Sulfur Diesel Fuel (i.e., ASTM Standard D975). The diesel engine is emissions certified to meet Environmental Protection Agency (EPA) Tier 3 regulations in accordance with 40CFR60.

The SUPP-DG full load lube oil consumption is approximately 0.45 gallons/hour. The oil level with the engine stopped should be above the full mark. The usable oil from the full mark to the low mark is 257 gallons. The extra oil capacity permits extended operation (i.e., approximately 570 hours or 23.75 days) without replenishment. Additionally, oil can be added during engine operation. Consumables such as lubrication oil and engine coolant will be available, sufficient for an extended SUPP-DG run.

3.4.4. SUPP-DG Fire Protection

The SUPP-DG will be equipped with fire detection and suppression. The Diesel, Mechanical, and Electrical Enclosures will each be equipped with a fire suppression system for the hazards present. The fire detection will be connected to the plant fire detection system.

The SUPP-DG fuel storage tank will be UL 142 certified, double-wall carbon steel construction, equipped with level indication, vent and outer shell leak alarm. The fuel storage tank design and construction will meet the requirements of NFPA 30. The fuel storage tank will withstand wind speed (i.e., 3-second gust) of 155 mph.

The SUPP-DG will be monitored for fire hazards during Operator Rounds[4].

3.4.5. SUPP-DG Availability

The SUPP-DG will be operated and maintained according to approved procedures.

The SUPP-DG will be subject to load testing to a 4.16 kV BOP Bus, and ensuring all its auxiliary support systems are available or operational. This test will be performed only during periods when the SUPP-DG is not credited as available during the extended CT.

In determining the appropriate frequency for SUPP-DG testing, BSEP will utilize the manufacturer's recommendation for load testing. Verification of SUPP-DG availability includes verification that the load test is performed within 30 days of entry into the extended CT. The proposed TS will require evaluation of SUPP-DG availability within 2 hours of entry into TS 3.8.1, Condition D, for an inoperable DG. This verification includes an administrative verification of this prior testing. Following initial verification of the SUPP-DG availability, the proposed TS will require ongoing verification of availability on a once per 12 hours frequency.

The SUPP-DG will be routinely monitored during Operator Rounds, with monitoring criteria (e.g., fuel tank level, battery state of charge, starting air system pressure) identified in the Operator Rounds. In addition, the SUPP-DG will be protected, as defense-in-depth, during the extended DG CT[5].

The marked-up TS Bases include information for SUPP-DG availability as follows:

1. The load test has been performed within 30 days of entry into the extended Completion Time. The Required Action verification is met with an administrative verification of this prior testing;
2. SUPP-DG fuel tank level is verified locally to be ≥ 24-hour supply; and
3. SUPP-DG supporting system parameters for starting and operating are verified to be within required limits for functional availability (e.g., battery state of charge, starting air system pressure).

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[4] Refer to Enclosure 7, Commitment List.
[5] Refer to Enclosure 7, Commitment List.

3.4.6. SUPP-DG Support

The SUPP-DG is a black-start unit independent of external supports for start, run, and load conditions. The availability of fuel and lubrication oil is discussed in Section 3.4.3. The SUPP-DG will be maintained as directed by plant procedures. When the plant is not subject to LOOP/SBO, the SUPP-DG shut down loads (e.g., battery charger, air compressor, heaters) are powered from a plant 480V supply through a transfer switch located at the SUPP-DG. Upon LOOP, the transfer switch automatically aligns to the SUPP-DG supply once the SUPP-DG is running.

Operator rounds will ensure the availability of fuel oil and the functionality of the SUPP-DG starting batteries (charging status) and starting air system, and provide an additional level of SUPP-DG overall monitoring.

3.4.7. SUPP-DG Staffing

The SUPP-DG alignment can be performed concurrent with and independent from the plant SBO cross-tie actions. The SBO cross-tie actions would be performed by one Auxiliary Operator. The SUPP-DG alignment actions would be performed by a second Auxiliary Operator, with the final actions (i.e., energizing the E-bus) performed by a Reactor Operator from the Control Room.

Licensed Operators and Auxiliary Operators, for the operating crews on-shift when the extended DG CT is in use, will be briefed on the DG work plan, the revised TS 3.8.1, and procedural actions regarding LOOP, SBO, and SUPP-DG alignment and use prior to entering the extended DG CT[6].

3.5. **Fire Hazards**

The SUPP-DG and its associated support equipment (i.e., Diesel Enclosure, Electrical Enclosure, Mechanical Enclosure, and fuel storage tank) are located in an outside area adjacent to the plant switchyard and not in a fire zone within an existing building. A fire in the SUPP-DG zone would not impact systems, structure, or components (SSCs) other than the SUPP-DG itself. Since the SUPP-DG is normally separated from the remainder of the plant with open breakers, a SUPP-DG fire would not cause failures or spurious operations of other SCC's. A fire that fails the E-bus that the SUPP-DG is backing up while the associated DG is in an extended CT would have also failed the applicable DG if it were in-service. However, the SUPP-DG can be aligned to any E-bus.

3.6. **10 CFR 50, Appendix R**

The SUPP-DG is a defense-in-depth measure for SBO. The SUPP-DG is not credited in the 10 CFR 50, Appendix R analysis.

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[6] Refer to Enclosure 7, Commitment List.

3.7. Training

Licensed Operators and Auxiliary Operators will be appropriately trained on the purpose and use of the SUPP-DG and the revised AOP actions[7]. Personnel performing maintenance on the SUPP-DG will be appropriately trained[8].

3.8. Diesel Generator Reliability Program

BSEP maintains a DG Reliability Program per plant procedures. The program monitors and evaluates DG performance and reliability. The program requires remedial actions when one or more established reliability "trigger values" are exceeded, then a root cause evaluation is performed and corrective actions taken. The DG reliability target for Brunswick is 0.975. This value represents the underlying unit DG reliability values for purposes of establishing a coping duration of four hours for a Station Blackout Event. The DG reliability program will not be negatively impacted by the proposed amendment because DG testing frequencies are unaffected.

Overall, the CT extension is expected to improve DG availability. A significant portion of DG maintenance windows are associated with the removal and restoration activities including tagging, system restoration & lineup, and post maintenance testing. The durations for these maintenance support activities are fairly consistent. A longer CT duration will allow more maintenance to be accomplished for a given maintenance window, thereby reducing the number of DG outages for the EDGs. Therefore, the total EDG unavailability is expected to decrease over time with this proposed amendment.

It should be noted that using the full duration of the requested 14-day CT would be infrequent. Other BSEP programs, including the Maintenance Rule Program (i.e., Section 3.9) and Work Control and Scheduling (i.e., Section 3.11) ensure the extended Completion Time would not be abused. Frequent use of the full Completion Time duration would adversely impact DG unavailability, which could result in exceeding Maintenance Rule goals, require corrective actions, and increased management attention to restore the DGs to Maintenance Rule (a)(2) status.

3.9. Maintenance Rule Program (10 CFR 50.65)

The SUPP-DG will be included in the scope of the plant Maintenance Rule Program, and will be classified and implemented in accordance with fleet and plant procedures.

The Maintenance Rule requires that an evaluation be performed when equipment covered by the Maintenance Rule does not meet its performance criteria. The reliability and availability of the DGs are monitored under the Maintenance Rule program. If the pre-established reliability or availability performance criteria are not achieved for the DGs, they are considered for 10 CFR 50.65 (a)(1) actions. These actions would require increased management attention and goal setting to restore their performance to an acceptable level. The actual out of service time for the DGs is minimized to ensure that the reliability and availability performance criteria are met.

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[7] Refer to Enclosure 7, Commitment List.
[8] Refer to Enclosure 7, Commitment List.

3.10. **Configuration Risk Management Program**

Brunswick uses a blended approach to configuration risk management, using both a quantitative and qualitative analysis of work activities prior to work authorization. The configuration risk management program is implemented using plant procedures for integrated scheduling of online processes and outage risk management during shutdown conditions. These procedures, used in conjunction with fleet procedures for the maintenance rule program, work management processes, and online equipment-out-of-service (EOOS) models for risk assessment, control the processes in which risk assessments are performed and integrated into the daily work schedule.

Plant configurations and changes in plant configurations are assessed for risk at BSEP. In accordance with station procedures, when risk significant SSCs, such as DGs, are made unavailable, actions are taken to protect redundant/diverse structures, systems and components. PRA based risk assessments are performed for all planned plant configurations as part of the work planning process. These configurations are pre-planned so as to minimize the risk. If unplanned equipment unavailability occurs during DG maintenance activities, station procedures direct that the risk be re-evaluated, and if found to be unacceptable, compensatory actions are taken until such a time that the risk is reduced to an acceptable level. Specific risk thresholds are procedurally specified for the assessment of the need for compensatory actions. If compensatory actions are insufficient, then procedural direction is to transition to a mode or other specified condition that reduces overall plant risk to an acceptable level.

Configuration Risk Management is also discussed in the Section 4.4, Risk Assessment.

3.11. **Work Control and Scheduling**

BSEP uses a blended approach to risk assessment for work control and scheduling. The blended approach concept uses the best information available to assess and manage risk, including:

1. Quantitative insights from the PSA and the EOOS computer model on-line risk.
2. Expert knowledge of plant operations by licensed Senior Reactor Operators.
3. Qualitative methods of assessing the adequacy of defense-in-depth, potential loss of function, and external factors (e.g., severe weather, offsite power instability due to demand).

Four risk thresholds (i.e., green, yellow, orange, red) are established and include quantitative and qualitative classifications. Risk management actions address configurations that result in elevated risk profiles. These actions are aimed at providing increased risk awareness of appropriate personnel, providing more rigorous planning and control of the activity, and taking measures to control the duration and the magnitude of the increased risk.

Plant procedure 0AP-025, BNP Integrated Scheduling, addresses online risk management. The BNP Integrated Scheduling procedure:

1. Provides the process for assessing and managing on-line risk,
2. Provides guidance for the protected equipment process, methodology, and posting,
3. Ensures maintenance is performed in a manner that enhances the reliability and availability of SSCs that is commensurate with safety pursuant to 10CFR50.65.
4. Protects the offsite AC sources and the other DGs, for a DG outage.

Fleet procedure OMA-NGGC-0203, Shutdown Risk Management, and plant procedure 0AP-022, BNP Outage Risk Management, address shutdown risk management. The BNP Outage Risk Management procedure:

1. Contains the site-specific configurations required for various shutdown conditions.
2. Contains the site-specific configurations required to implement the shutdown risk management program, including key safety functions (e.g., decay heat removal capability, electric power availability, inventory control, reactivity control, secondary containment, fuel pool cooling).
3. Provides the process for assessing shutdown risk.

Protocols are in place for daily communications between the Power System (Grid) Operator and the BSEP Control Room to discuss the status of the plant and the transmission system and review upcoming plans and work activities, and for weekly communications between BSEP Outage and Scheduling and the Power System Operator to coordinate activities and generation planning. All field work activities and switching evolutions are assessed for the risks involved. The BSEP Control Room is responsible for the decision to proceed with activities which involve risks to the plant systems. When it is intended to use the extended DG CT, the Brunswick Control Room will ensure:

1. Component testing or maintenance of safety systems and important nonsafety equipment in the offsite power systems which can increase the likelihood of a plant transient (i.e., unit trip) or LOOP, will be avoided during the extended DG CT. In addition, no discretionary switchyard maintenance will be allowed during the extended DG CT[9].
2. Weather conditions will be evaluated prior to intentionally entering the extended DG CT and will not be entered if official weather forecasts are predicting severe weather conditions (i.e., thunderstorm, tornado, or hurricane warnings). Operators will monitor weather forecasts each shift during the extended DG CT. If severe weather or grid instability is expected after a DG outage begins, station managers will assess the conditions and determine the best course for returning the DG to an operable status[10].

3.12. HPCI, RCIC, and RHR Pumps

The High Pressure Coolant Injection (HPCI) pump, the Reactor Core Isolation Cooling (RCIC) pump, and the Residual Heat Removal (RHR) pump associated with the operable DG will not be removed from service for elective maintenance activities during the extended DG CT[11].

3.13. Current TS Requirements and Limitations

TS LCO 3.8.1 requires, as a minimum, two physically independent AC circuits between the offsite transmission network and the onsite Class 1E distribution system, and four separate and independent DGs. With one DG inoperable, TS 3.8.1, Condition D requires the inoperable DG be restored to operable status within 7 days to avoid entering TS 3.8.1 Condition H, which requires plant shutdown. For BSEP, the Unit 1 TS 3.8.1 LCO statement and the Unit 2 TS 3.8.1 LCO statement each require all four DGs operable. Thus, if an inoperable DG were not restored within the 7 day CT, a dual unit shutdown would be required.

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[9] Refer to Enclosure 7, Commitment List.
[10] Refer to Enclosure 7, Commitment List.
[11] Refer to Enclosure 7, Commitment List.

BSEP intends to perform the voltage regulator and governor work with the associated unit in a refueling outage. For BSEP, with one unit in a refueling outage, the opposite unit must also enter the TS 3.8.1 Required Actions and Associated Completion Times for an inoperable DG, since each unit's TS LCO 3.8.1 requires four operable DGs. Without the extended DG CT, the operating unit would also be required to be shutdown to support the voltage regulator and governor work.

BSEP intends to perform the diesel starting air work with the associated unit online. For BSEP, with both units online, the opposite unit must also enter the TS 3.8.1 Required Actions and Associated Completion Times for an inoperable DG, since each unit's TS LCO 3.8.1 requires four operable DGs. Without the extended DG CT, both units would be required to be shutdown to support the diesel starting air work.

3.14. **Traditional Engineering Considerations**

For an SBO, the redundant DGs would be available to mitigate the accident, and the units would remain within the bounds of the accident analyses. In addition, there would be no adverse impact to the unit, because the Safety Function Determination Program will be utilized to ensure that cross-train checks are performed to determine if a loss of safety function exists if there are concurrent equipment inoperabilities, and ensure the appropriate actions are taken if a loss of safety function is identified. Since the probability of these events occurring concurrently during a planned maintenance window is low, there is minimal safety impact due to the requested extended CTs.

The combination of defense-in-depth and safety margin inherent in the onsite emergency power system ensures an emergency supply of power will be available to perform the required safety function. This supports extension of the CTs to allow a DG to be out-of-service for a longer period of time, as discussed further below.

3.14.1. Defense-in-Depth

The proposed changes to the CTs maintain system redundancy, independence, and diversity commensurate with the expected challenges to system operation. The other DGs, offsite sources of power, and the associated engineered safety equipment will remain operable to mitigate the consequences of any previously analyzed accident. Otherwise, the Safety Function Determination Program will require that a loss of safety function be declared, and the appropriate TS Conditions and Required Actions taken. In addition to the TS Safety Function Determination Program, the Work Management Process, Integrated Scheduling Program, and Maintenance Rule Program provide for controls and assessments to preclude the possibility of simultaneous outages of redundant trains and ensure system reliability. The proposed increase in the CT associated with an inoperable DG while the unit is in Mode 1, 2, or 3, will not alter the assumptions relative to the causes or mitigation of an accident.

With a DG inoperable, a loss of function has not occurred. The remaining offsite power sources and DGs are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure.

As defined by Regulatory Guide 1.174, consistency with the defense-in-depth principle is maintained if the following occurs:

1. A reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation.

The proposed extensions to the CTs, associated with an inoperable DG while the unit is in Mode 1, 2, or 3, have only a small calculated impact on CDF and LERF. The proposed changes are not accomplished by degrading core damage prevention and compensating with improved containment integrity nor does this change degrade containment integrity and compensate with improved core damage prevention. The balance between prevention of core damage and prevention of containment failure is maintained. Consequence mitigation remains unaffected by the proposed changes. Furthermore, no new accident or transients are introduced with the requested change and the likelihood of most accidents or transients is not impacted.

The balance between mitigation of core damage and containment failure are preserved by the implementation of this 14 day allowed outage time of the DGs in that the overall DG reliability is expected to be improved in the near term and over the long term the DG unavailability is expected to be improved with fewer emergent issues. Additionally the SUPP-DG which provides an additional AC power source will add to the overall ability to prevent core damage and also prevent containment challenge or failure. Thus DGs ability to support the mitigation of both core damage and containment failure is preserved and in the long term enhanced.

2. Over-reliance on programmatic activities as compensatory measures associated with the change is avoided.

As prescribed in BTP 8-8, a supplemental power source (i.e., the SUPP-DG) is being installed and will be available as a backup to the inoperable DG to maintain the defense-in-depth design philosophy for the electrical system to meet its intended safety function. The installation of the SUPP-DG (i.e., plant equipment) reduces the reliance on programmatic activities as compensatory measures associated with the change.

Plant safety systems are designed with redundancy so when one train is inoperable, a redundant train can provide the necessary design function. During the timeframe when a DG is inoperable, a redundant source of power will be maintained operable. In the event other equipment becomes inoperable concurrent with the DG inoperability, the Safety Function Determination Program requires cross-division checks to ensure a loss of safety function does not go undetected. If a loss of safety function is identified, TS LCO 3.0.6 will require entry into the applicable Conditions and Required Actions for the system that possesses the loss of safety function. TS 3.8.1, Required Action D.2 (i.e., Required Action D.3 in the markup provided in Enclosure 2) requires declaring supported feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable. Required Action D.2 (i.e., Required Action D.3 in the markup provided in Enclosure 2) is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are designed to be powered from redundant safety related 4.16 kV emergency buses. Redundant required feature failures consist of inoperable features associate with an emergency bus redundant to the emergency bus that has an inoperable DG. In addition, the PRA analysis indicates that there is a small calculated impact on CDF and LERF with the proposed TS changes.

3. System redundancy, independence, and diversity are preserved commensurate with the expected frequency, consequences of challenges to the system, and uncertainties.

The redundancy, independence, and diversity of the onsite emergency power system will be maintained during the extended CTs. There were no identified uncertainties in redundancy, independence or diversity with the introduction of the SUPP-DG or the extended CT. The SUPP-DG is not susceptible to the same common cause failures as the currently installed DGs; thus the proposed configuration improves the independence and diversity of the on-site AC power sources.

4. Defenses against potential common-cause failures are preserved, and the potential for the introduction of new common-cause failure mechanisms is assessed.

Defenses against common cause failures are preserved. New common cause failure mechanisms are not expected to be created by the proposed changes. The operating environment and operating parameters for the DGs remain constant; therefore, new common cause failure modes are not expected. Redundant and backup systems are not impacted by this change and no new common cause links between the primary and backup systems are introduced; therefore, no new potential common cause failure mechanisms have been introduced by the proposed change.

5. Independence of barriers is not degraded.

The barriers protecting the public and the independence of these barriers are maintained. Multiple DGs, systems or electrical distribution systems will not be intentionally taken out of service simultaneously. This could lead to degradation of these barriers and an increase in risk to the public. In the event other equipment becomes inoperable concurrent with the DG inoperability, the Safety Function Determination Program requires cross-division checks to ensure a loss of safety function does not go undetected. If a loss of safety function is identified, TS LCO 3.0.6 will require entry into the applicable Conditions and Required Actions for the system that possesses the loss of safety function. TS 3.8.1, Required Action D.2 (i.e., Required Action D.3 in the markup provided in Enclosure 2) requires declaring supported feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable. Required Action D.2 (i.e., Required Action D.3 in the markup provided in Enclosure 2) is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are designed to be powered from redundant safety related 4.16 kV emergency buses. Redundant required feature failures consist of inoperable features associate with an emergency bus redundant to the emergency bus that has an inoperable DG. In addition, the extended CTs do not provide a mechanism that degrades the independence of the barriers; fuel cladding, reactor coolant system, and containment.

6. Defenses against human errors are preserved.

The proposed extensions to the CT do not introduce any new operator actions for the existing plant equipment. However, operators will be required to align and operate the new SUPP-DG. These actions to align and operate the new SUPP-DG include actions that are the same as or similar to current plant actions, and new actions to operate the SUPP-DG. Licensed Operators and Auxiliary Operators will be appropriately trained on the purpose and use of the SUPP-DG and the revised AOP actions. Licensed Operators and Auxiliary Operators, for the on-shift operating crews, will be briefed on the DG work plan, the revised TS 3.8.1, and procedural actions regarding LOOP, SBO, and SUPP-DG alignment and use prior to entering the extended DG CT. A Human Reliability Analysis (HRA) has been performed of the required actions to start and align the SUPP-DG and it is concluded that these actions are feasible with adequate indications and time to perform. The HRA is discussed in Enclosure 4.

7. The intent of the plant's design criteria is maintained.

The design and operation of the DGs are not altered by the proposed extensions to the CTs. The safety analysis acceptance criteria stated in the UFSAR is not impacted by the change. Redundancy and diversity of the DGs is not altered, because the system design and operation are not altered by the proposed extensions to the CTs. The proposed change will not allow plant operation in a configuration outside the design basis. The requirements credited in the accident analysis regarding the DGs will remain the same.

3.14.2. Safety Margin

For the extended CTs associated with an inoperable DG while the unit is in Mode 1, 2, or 3, the plant remains in a condition for which the plant has already been analyzed; therefore, from a deterministic aspect, these changes are acceptable. The 14-day and 17-day CTs are risk-informed CTs based on a plant specific analysis using the methodology defined in this license amendment request. The Maintenance Rule (i.e., 10 CFR 50.65) requires each licensee to monitor the performance or condition of the DGs to ensure that the DGs are capable of fulfilling its intended functions. If the performance or condition of the DGs do not meet performance criteria, appropriate corrective action is required along with goals to monitor effectiveness of the corrective action. Additionally, BSEP will add a supplemental AC power source (i.e., a supplemental diesel generator) with the capability to power any E-bus within one hour from the SBO event, and with the capacity to bring the affected unit to cold shutdown, to support this request.

As defined in Regulatory Guide 1.174, the overall margin of safety is not decreased due to the extended CTs for the DGs, because:

1. Codes and standards or their alternatives approved for use by the NRC are met.

The design and operation of the DGs are not altered by the proposed CT extension, or the SUPP-DG. Redundancy and diversity of the electrical distribution system will be maintained, because the system design and operation are not altered by the proposed CT extension, or the SUPP-DG. The SUPP-DG provides an additional AC power source as a defense-on-depth measure for SBO.

2. Safety analysis acceptance criteria in the Licensing Basis (e.g., FSAR, supporting analyses) are met or proposed revisions provide sufficient margin to account for analysis and data uncertainty.

The safety analysis acceptance criteria stated in the UFSAR are not impacted by the change. The proposed change will not allow plant operation in a configuration outside the design basis. The requirements regarding the DGs credited in the accident analysis will remain the same.

Given the above, CP&L concludes that safety margins were not impacted by the proposed changes.

4. TECHNICAL ANALYSIS

This section provides the technical analysis of the proposed changes with regard to the principles that adequate defense-in-depth is maintained, sufficient safety margins are maintained, and the calculated increases in CDF and LERF are small and consistent with the guidance of RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Bases," dated May 2011 and RG 1.177, "An Approach for Plant- Specific, Risk-Informed Decision making: Technical Specifications," dated May 2011 (References 7.2.2 and 7.2.1).

4.1. Current Licensing Basis for DG Completion Time

Under the current TS, if a DG is inoperable, the 4.16 kV emergency bus design is sufficient to allow operation to continue in the condition for a period that should not exceed 7 days. In this Condition, the three remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E distribution system. The 7-day CT takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

4.2. Proposed TS 3.8.1 Changes and Benefits

This Technical Specification change is being requested to allow sufficient time to perform planned reliability improvement modifications and adequate preventive maintenance to ensure diesel generator reliability and availability. The proposed change also provides flexibility to resolve DG deficiencies and avoid potential unplanned plant shutdown, along with the potential challenges to safety systems during an unplanned shutdown, should a condition occur requiring DG corrective maintenance.

The proposed changes to Technical Specifications are described in Section 2.2. The purpose of the proposed change is to extend the TS CT for an inoperable DG from 7 days to 14 days. The 14-day CT is needed to (1) provide the necessary time to support planned DG maintenance activities including governor, voltage regulator, and diesel starting air replacements and upgrades, and (2) reduce the likelihood and unnecessary burden of a dual unit shutdown should an unplanned DG outage occur with both units at power by providing additional time to repair and reestablish operability of the inoperable DG. To justify the 7-day CT extension, a supplemental AC source power source (i.e., a supplemental DG) capable of powering any of the four 4.16 kV emergency buses during a SBO is required. BSEP will add a supplemental AC power source (i.e., a supplemental diesel generator) to support this request.

The TS change will provide operational and maintenance flexibility. It will also allow more time for unanticipated DG repairs.

4.3. Deterministic Assessment of Proposed DG Completion Time Extension

The effect of this license amendment request (LAR) would be to allow continued power operation up to an additional 7 days while DG maintenance or testing is performed. The DG is a standby electrical power supply whose safety function is required when both the normal and alternate off-site power supplies are unavailable and there is an event that requires operation of the plant emergency safeguards features.

Independent standby power systems are provided with adequate capacity and testability to supply the required engineered safety features and protection systems. The standby power source is designed with adequate independency, redundancy, capacity, and testability to ensure power is available for the engineered safety features and protection systems required to avoid undue risk to the health and safety of the public. This power source will successfully provide this capacity when a failure of a single active component is assumed.

Each of the four DGs can supply one of the four separate Class 1E emergency buses. Each is started automatically on a LOOP or LOCA. The DG arrangement provides adequate capacity to supply the engineered safety features for the DBA, assuming the failure of a single active component in the system.

Since the standby power systems can accommodate a single failure, extending the CT for an out of service DG has no impact on the system design basis. Safety analyses acceptance criteria as provided in the UFSAR are not impacted by this change. AC power sources credited in the accident analyses will remain the same.

To ensure that the single failure design criterion is met, LCOs are specified in the plant TS requiring all redundant components of the onsite power system to be operable. In the event that a DG is inoperable in Modes 1, 2, and 3, existing TS 3.8.1 Condition D requires that to ensure a highly reliable power source remains with one DG inoperable, it is necessary to verify the operability of the offsite circuits on a more frequent basis. When the required redundancy is not maintained, action is required within the specified CT to initiate a plant shutdown. The CT

provides a limited time to restore equipment to operable status and represents a balance between the risk associated with continued plant operation with less than the required system or component redundancy and the risk associated with initiating a plant transient while transitioning the unit to a shutdown condition. Thus, the acceptability of the maximum length of the extended CT interval relative to the potential occurrences of design basis events is considered. Since extending the CT for a single inoperable DG does not change the design basis for the standby emergency power system (i.e., DGs), extending the CT by 7 days is acceptable and consistent with BTP 8-8 (Reference 7.2.5).

BSEP's coping time during SBO is not affected by the proposed change. The coping time is calculated based on guidance provided in NUMARC 87-00, Rev. 1 (Reference 7.2.4). The assumptions and the results of the SBO analyses are not changed by an extension of the CT, and compliance with 10 CFR 50.63 will be maintained as it does not impact the reliability of the DGs. In addition, DG reliability is maintained at or above the SBO target level of 0.975, and the effectiveness of maintenance on the DGs and support systems is monitored pursuant to the Maintenance Rule.

Based on the above discussion, extending the CT for a single inoperable DG from 7 days to 14 days is acceptable because the proposed change will not impact the plant design basis. The 7-day extension of the CT is consistent with BTP 8-8 (Reference 7.2.5). The impact of extended plant operation is evaluated in a probabilistic framework in the discussions that follow (i.e., see Section 4.4).

To ensure that the risk associated with extending the CT for a DG is minimized, and consistent with the philosophy of maintaining defense-in-depth, compensatory measures will be applied. The availability of the SUPP-DG for extending the DG CT is incorporated into the proposed TS. Other measures are provided in Enclosure 7, Commitment List. These measures will ensure the risks associated with removing a DG from service are managed to minimize the increase in risk during the extended DG CT.

If this LAR is not granted, voltage regulator, governor, and diesel starting air work would require a dual-unit outage (both units shutdown) so that a DG could be removed from service without TS implication. Additionally, if an unplanned DG outage occurs with both units at power, and the DG were not restored to operable status within 7 days, this would require a dual-unit plant shutdown upon expiration of the 7-day CT provided in TS 3.8.1, Condition D. Shutdown of the plant involves many plant operator activities and plant evolutions. These activities and evolutions provide challenges to plant equipment, opportunities for operator errors and increase the possibility of a plant trip. It should also be noted that shutdown of a unit does not remove the desirability of having the DG available to support its associated 1E bus, but rather places additional dependence on the operable Class 1E bus by requiring operation of the residual heat removal system. By granting this LAR and allowing continued steady state operation, additional operator activities and plant operations evolutions associated with plant shutdown could be avoided. The increased possibility for plant trip may also be avoided. This LAR proposes an additional 7 days as a reasonable time for which a regulatory basis exists for CT extension. This additional time period is considered small. Due to the short time period, the probability of a design basis accident occurring during this interval is low.

4.4. **Risk Assessment**

4.4.1. Assumptions

The PRA application assumptions are:

- The SUPP-DG is not susceptible to common cause failure of the installed DGs.
- The use of the SUPP-DG is only credited during entry into the extended CT.
- Operator actions to implement the SUPP-DG occur after failure of installed DG to start and load or the ability to cross tie the 4160 VAC buses (i.e., E1/E3 or E2/E4) fails or is not capable.
- The failure modes and failure rates of the SUPP-DG are the same as the installed DG.
- The SUPP-DG will not be planned to be out of service when the extended CT is exercised.
- Each DG will experience 14 days of extended outage time per year, planned or unplanned. This is in addition to the regular planned outage time.

The proposed changes are evaluated to determine that current regulations and applicable requirements continue to be met, that adequate defense-in-depth and sufficient safety margins are maintained, and that any increase in CDF and LERF is small and consistent with the NRC Safety Goal Policy Statement, USNRC, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement," Federal Register, Volume 60, p.42622, August 16, 1995.

4.4.2. Justification for DG Extended CT

The justification for the use of a DG extended CT is based upon risk informed and deterministic evaluations consisting of three main elements:

4.4.2.1. Tier 1: Assessment of the impact of the proposed TS change using a valid and appropriate PRA model and compare with appropriate acceptance guidelines

The modeling approach is consistent with the NRC guidelines for the calculation on the required risk measures using the Brunswick PRA for interval events, internal floods, high winds, fire hazards as well as a seismic and external flood evaluation. Regulatory Guide 1.177 is followed to calculate the change in risk measures for Incremental Conditional Core Damage Probability (ICCDP) and Incremental Conditional Large Early Release Probability (ICLERP). These conditional probabilities are performed to calculate the risk change while in the DG CT for each DG case. As part of the Tier 1 analysis for the DG CT risk assessment, an integrated assessment of the impact of the CT extension is calculated assigning the worst case diesel generator unavailability to all four diesel generators. This calculation is then used for comparison with the criteria set in Regulatory Guide 1.174. A detailed Tier 1 discussion can be found in Enclosure 4 of this submittal.

4.4.2.2. Tier 2: Evaluate equipment relative to the contribution to risk while the DG is in the extended CT

Examination of out of service combinations can be evaluated for their risk significance to determine if additional measures may be required. The SUPP-DG will be required to be available prior to implementing the extended CT, and in review of the results no additional measures were identified as required to meet the risk metrics.

4.4.2.3. Tier 3: Implementation of the Configuration Risk Management Program while a DG is in an extended AOT

Brunswick uses a blended approach to configuration risk management, using both a quantitative and qualitative analysis of work activities prior to work authorization. The configuration risk

management program is implemented using plant procedures for integrated scheduling of online processes and outage risk management during shutdown conditions. These procedures, used in conjunction with fleet procedures for the maintenance rule program, work management processes, and online equipment-out-of-service (EOOS) models for risk assessment, control the processes in which risk assessments are performed and integrated into the daily work schedule.

Configuration Risk Management is used for scheduling of station maintenance activities and helps ensure that there is no significant increase in plant risk due to severe accidents while any DG maintenance is performed. These elements provide adequate justification for approval of the requested Technical Specification change by providing a high degree of assurance that power can be provided to the ESF buses during the DG extended CT for all Design Basis Accidents (DBAs) (i.e. Loss of Off-site Power, Loss of Coolant Accidents (LOCAs)), Station Blackouts (SBO), or fire during the DG extended CT.

4.4.3. Configuration Risk Management Program

Plant configuration changes for required maintenance of the DGs as well as the maintenance of equipment having risk significance are managed by the CRMP. The CRMP helps ensure that these maintenance activities are carried out with no significant increase in the risk of a severe accident.

Proposed plant configurations before performing maintenance activities and changes in plant configuration during performance of maintenance activities are assessed for risk at BSEP. In accordance with station procedures, when risk significant SSCs, such as DGs are made unavailable, actions are taken to protect redundant/diverse SSCs. The PRA-based risk assessment is performed for planned plant configurations as part of the work planning process. As BSEP is a dual unit plant and some SSCs either are shared such as DGs, or can be shared such as Station Air, the removals of these SSCs have risk assessment performed for both units. These planned plant configurations are pre-planned so as to minimize the risk to both units. If unplanned equipment unavailability occurs during DG maintenance activities, station procedures direct the risk assessment be re-evaluated and if found unacceptable, compensatory actions are taken until such time that the risk is reduced to acceptable level. Specific risk thresholds are procedurally specified for the assessment of the need for compensatory actions. The BSEP configuration risk management program uses a blended approach with a quantitative risk input, based upon PRA model SSCs and a qualitative input based upon those SSCs not modeled in the PRA that have been determined to be high safety significant SSCs.

4.4.4. Compensatory Measures

The SUPP-DG will be verified to be available prior to implementing the extended CT and treated as protected equipment.

4.4.5. Other Considerations

Attendant Shutdown Risk reductions associated with removing DG PMs and overhauls have not been quantified as part of the Enclosure 4 evaluation. The removal of the DG PMs and overhauls from the refueling outages is expected to further reduce the risk associated with the CT extension. One of the drivers for this CT extension request is an overall improvement in DGs reliability with upgrades and modifications to the DG system. This will also result in an overall un-quantified risk reduction to both Brunswick Units.

In addition, the CRMP discussed in Section 4.4.3 will ensure that the plant state is monitored to minimize the risk impact of the change.

4.4.6. Uncertainties

In addition to the assessment of the mean risk metrics which are specified in RG 1.177 and 1.174 for comparison with the acceptance guidelines, it is also prudent to examine whether modeling uncertainties may distort these comparisons.

Therefore, an extensive review of potential modeling uncertainties that may impact the risk metrics is performed. This reviewed used NUREG-1855 and the referenced EPRI guidelines on the treatment of uncertainties were used as well as the review of modeling uncertainties specific identified by Progress Energy PRA practitioners. Enclosure 4 includes an examination of these uncertainties and results of any sensitivity studies.

Uncertainties are minimized by the use of the required compensatory measures listed above.

4.4.7. Conclusion (PSA)

As documented in Enclosure 4, the risk change calculated with the Brunswick PRA for the proposed EDG CT extension for all four DGs is small. The quantitative results of the evaluation are shown in the table below:

Risk Metric	Risk Metric Results	Risk Significant Guideline	Meets Acceptance Guideline
ΔCDF ave(/yr)	3.1E-07	<1.0E-06	Yes
ΔLERF ave(/yr)	<5.7E-09	<1.0E-07	Yes
ICCDP	4.6E-07	<1.0E-06	Yes
ICLERP	8E-09	<1.0E-07	Yes

The ICCDP and ICLERP are the cumulative results for assuming each DG will experience 14 days of extended outage time per year, planned or unplanned. This is in addition to the regular planned outage time.

Thus the ICCDP and ICLERP for any individual DG also meet the acceptance guidelines.

4.5. **Conclusion**

The results of the deterministic evaluation and risk-informed assessment described above provide assurance that the equipment required to safely shut down the plant and mitigate the effects of a design basis accident will remain capable of performing their safety functions when a DG is out-of-service in accordance with the proposed CTs.

The proposed CTs are consistent with NRC policy and will continue to provide protection of the public health and safety. As detailed in Section 2.3, the proposed change advances the objectives of the NRC's PRA Policy Statement, including safety decision-making enhanced by the use of PRA insights, more efficient use of resources, and reduction of unnecessary burden. In addition, the proposed change meets the following principles:

1. It meets the current regulations.
2. It is consistent with the defense-in-depth philosophy.
3. It maintains sufficient safety margins.
4. It results in risk metrics provided above for CDF and LERF consistent with the criteria in Regulatory Guides 1.177 and 1.174 (Reference 7.2.1 and 7.2.2) and is consistent with the NRC's Safety Goal Policy Statement, as implemented via the NRC Standard Review Plan (SRP) (NUREG-0800), RG 1.174, and RG 1.177.

The extended Completion Times, to permit a DG to be removed from service for 14 days to perform maintenance or to trouble shoot and repair an inoperable DG, are acceptable from a risk-based approach due to risk metrics for CDF and LERF consistent with the criteria in Regulatory Guides 1.177 and 1.174 (Reference 7.2.1 and 7.2.2). The results of the risk assessment are provided in Section 4.4.

5. Its impact will be monitored using performance measurement strategies.

Therefore, based on the above evaluations and conclusions, CP&L believes that the proposed change is acceptable and operation in the proposed manner will not present undue risk to public health and safety or be inimical to the common defense and security.

5. REGULATORY SAFETY ANALYSIS

This license amendment request proposes changes to the BSEP TS; specifically, TS 3.8.1, "AC Sources - Operating", Condition D, concerning one inoperable diesel generator (DG). The proposed change would extend the Completion Time (CT) for an inoperable DG from 7 days to 14 days. The proposed CT is based on application of the BSEP Probabilistic Risk Assessment (PRA) in support of a risk-informed extension, and on additional considerations and compensatory actions. The proposed CT of an additional 7 days is a reasonable time for which a regulatory basis exists for CT extension. The risk evaluation and deterministic engineering analysis supporting the proposed change have been developed in accordance with the guidelines established in Regulatory Guide 1.177, "An Approach for Plant-Specific Risk-Informed Decision-making: Technical Specifications" (Reference 7.2.1), and NRC Regulatory Guide 1.174, "An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (Reference 7.2.2).

5.1. No Significant Hazards Consideration

CP&L has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The DGs are safety related components which provide backup electrical power supply to the onsite emergency power distribution system. The proposed changes do not affect the design of the DGs, the operational characteristics or function of the DGs, the interfaces between the DGs and other plant systems, or the reliability of the DGs. The DGs are not accident initiators; the DGs are designed to mitigate the consequences of previously evaluated accidents including a loss of offsite power. Extending the CT for a single DG would not affect the previously evaluated accidents since the remaining DGs supporting the redundant Engineered Safety Features (ESF)

systems would continue to be available to perform the accident mitigation functions. Thus allowing a DG to be inoperable for an additional 7 days for performance of maintenance or testing does not increase the probability of a previously evaluated accident.

Deterministic and probabilistic risk assessments evaluated the effect of the proposed TS changes on the availability of an electrical power supply to the plant emergency safeguards features systems. These assessments concluded that the proposed TS changes do not involve a significant increase in the risk of power supply unavailability.

There is small incremental risk associated with continued operation for an additional 7 days with one DG inoperable; however, the calculated impact on risk provides risk metrics consistent with the acceptance guidelines contained in Regulatory Guides 1.177 and 1.174 (Reference 7.2.1 and 7.2.2). This risk is judged to be reasonably consistent with the risk associated with operations for 7 days with one DG inoperable as allowed by the current TS.

Specifically, the remaining operable DGs and paths are adequate to supply electrical power to the onsite emergency power distribution system. A DG is required to operate only if both offsite power sources fail and there is an event which requires operation of the plant engineered safety features such as a design basis accident. The probability of a design basis accident occurring during this period is low.

The consequences of previously evaluated accidents will remain the same during the proposed 14-day CT as during the current 7-day CT. The ability of the remaining TS required DG to mitigate the consequences of an accident will not be affected since no additional failures are postulated while equipment is inoperable within the TS CT. The standby AC power supply for each of the four safety-related load groups consists of one DG complete with its auxiliaries, which include the cooling water, starting air, lubrication, intake and exhaust, and fuel oil systems. The sizing of the DGs and the loads assigned among them is such that any combination of three out of four of these DGs is capable of shutting down the plant safely, maintaining the plant in a safe shutdown condition, and mitigating the consequences of accident conditions.

Thus this change does not involve a significant increase in the probability or consequences of a previously analyzed accident.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed changes do not involve a change in the plant design, plant configuration, system operation, or procedures involved with the DGs. The proposed changes allow a DG to be inoperable for additional time. Equipment will be operated in the same configuration and manner that is currently allowed and designed for. The functional demands on credited equipment is unchanged. There are no new failure modes or mechanisms created due to plant operation for an extended period to perform DG maintenance or testing. Extended operation with an inoperable DG does not involve any modification in the operational limits or physical design of plant systems. There are no new accident precursors generated due to the extended CT.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

Currently, if an inoperable DG is not restored to operable status within 7 days, TS 3.8.1, Condition H, requires the unit to be in MODE 3 (i.e., HOT SHUTDOWN) within a CT of 12 hours, and to be in MODE 4 (i.e., COLD SHUTDOWN) within a CT of 36 hours. This TS Condition is entered on both units resulting in a dual-unit shutdown. The proposed Technical Specification changes will allow steady state plant operation at 100% power for an additional 7 days for performance of DG planned reliability improvements and preventive and corrective maintenance.

Deterministic and probabilistic risk assessments evaluated the effect of the proposed TS changes on the availability of an electrical power supply to the plant ESF systems. These assessments concluded that the proposed TS changes do not involve a significant increase in the risk of power supply unavailability.

The DGs continue to meet their design requirements; there is no reduction in capability or change in design configuration. The DG response to LOOP, LOCA, SBO, or fire is not changed by this proposed amendment; there is no change to the DG operating parameters. In the extended CT, as in the existing CT, the remaining operable DGs and paths are adequate to supply electrical power to the onsite emergency power distribution system. The proposed change does not alter a design basis or safety limit; therefore it does not significantly reduce the margin of safety. The DGs will continue to operate per the existing design and regulatory requirements.

The proposed TS changes do not alter the plant design nor does it change the assumptions contained in the safety analyses. The standby AC power system is designed with sufficient redundancy such that a DG may be removed from service for maintenance or testing. The remaining DGs are capable of carrying sufficient electrical loads to satisfy the UFSAR requirements for accident mitigation or unit safe shutdown. The proposed changes do not impact the redundancy or availability requirements of offsite power circuits or change the ability of the plant to cope with a SBO. Therefore, based on the considerations given above, the proposed changes do not involve a significant reduction in a margin of safety.

Based on the above, CP&L concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2. **Applicable Regulatory Requirements/Criteria**

Section 50.63 of 10 CFR, "Loss of all alternating current power," requires that light-watercooled nuclear power plants licensed to operate be able to withstand for a specified duration and recover from a station blackout. The proposed change does not affect BSEP's compliance with the intent of 10 CFR 50.36.

Section 50.65 of 10 CFR, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," requires that preventive maintenance activities must not reduce the overall availability of the systems, structures and components. It also requires that before performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. The proposed change does not affect BSEP's compliance with the intent of 10 CFR 50.65.

General Design Criterion (GDC) 17, "Electric power systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 states, in part, that nuclear power plants have onsite and offsite electric power systems to permit the functioning of structures, systems, and components (SSC) that are important to safety. The onsite system is required to have sufficient independence, redundancy, and testability to perform its safety function, assuming a

single failure. The offsite power system is required to be supplied by two physically independent circuits that are designed and located so as to minimize, to the extent practical, the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. The proposed change does not affect BSEP's compliance with the intent of GDC 17.

GDC-18, "Inspection and testing of electric power systems," states that electric power systems that are important to safety must be designed to permit appropriate periodic inspection and testing of important areas and features, such as insulation and connections to assess the continuity of the systems and the condition of their components. The proposed change does not affect BSEP's compliance with the intent of GDC 18.

The BSEP design was reviewed for construction under the "General Design Criteria for Nuclear Power Plant Construction" issued for comment by the AEC in July 1967 and is committed to meet the intent of General Design Criteria (GDC), published in the Federal Register on May 21, 1971, as Appendix A to 10 CFR Part 50.

RG 1.155, "Station Blackout," describes a method acceptable to the NRC staff for complying with the Commission regulation that requires nuclear power plants to be capable of coping with a station blackout (SBO) event for a specified duration. The proposed change does not affect BSEP's compliance with the intent of RG 1.155.

RG 1.174, "An Approach for Using Probabilistic Risk Assessment [PRA] in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," describes a risk-informed approach, acceptable to the NRC, for assessing the nature and impact of proposed licensing basis changes by considering engineering issues and applying risk insights. This RG also provides risk acceptance guidelines for evaluating the results of such assessments. RG 1.174 was used for the evaluation of risk provided with this license amendment request.

RG 1.177 identifies an acceptable risk-informed approach including additional guidance specifically geared toward the assessment of proposed TS CT changes. Specifically, RG 1.177 identifies a three-tiered approach for the evaluation of the risk associated with a proposed CT TS change. RG 1.177 was used for the evaluation of risk provided with this license amendment request.

5.3. Precedent

The NRC has recently approved requests to extend the CT for Diesel Generators including:

- Browns Ferry (October 2011, ADAMS Accession No. ML11227A258)
- Hope Creek (March 2011, ADAMS Accession No. ML110610501)

5.4. Conclusions

In conclusion, based on the considerations discussed above, there is reasonable assurance (1) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, (2) that such activities will be conducted in compliance with Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6. ENVIRONMENTAL CONSIDERATION

BSEP has evaluated the proposed amendment for environmental considerations. The review has determined that the proposed amendment would change requirements with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, and would change an inspection or surveillance requirement.

However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7. REFERENCES

7.1. Brunswick Steam Electric Plant

7.1.1. Brunswick Steam Electric Plant (BSEP), Updated Final Safety Analysis Report (UFSAR), Chapter 8, Electrical Power Systems, Revision 22.

7.2. Applicable Regulatory Requirements/Other Criteria

7.2.1. RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," Revision 1, May 2011.

7.2.2. RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Bases," Revision 2, May 2011.

7.2.3. NRC Safety Goal Policy Statement, USNRC, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement," Federal Register, Volume 60, p.42622, August 16, 1995.

7.2.4. Nuclear Utility Management and Resource Council (NUMARC) 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," Revision 1, August 1991.

7.2.5. Branch Technical Position (BTP) 8-8, "Onsite (Diesel Generators) and Offsite Power Sources Allowed Outage Extensions," Initial Issue May 2011.

7.2.6. Regulatory Guide 1.155, Station Blackout, 8/1988.

7.2.7. Generic Letter 2006-02, "Grid Reliability and the Impact on Plant risk and the Operability of Offsite Power."

7.2.8. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 8.4, III.3.O.iv.

7.2.9. Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities," Revision 2, March 2009.

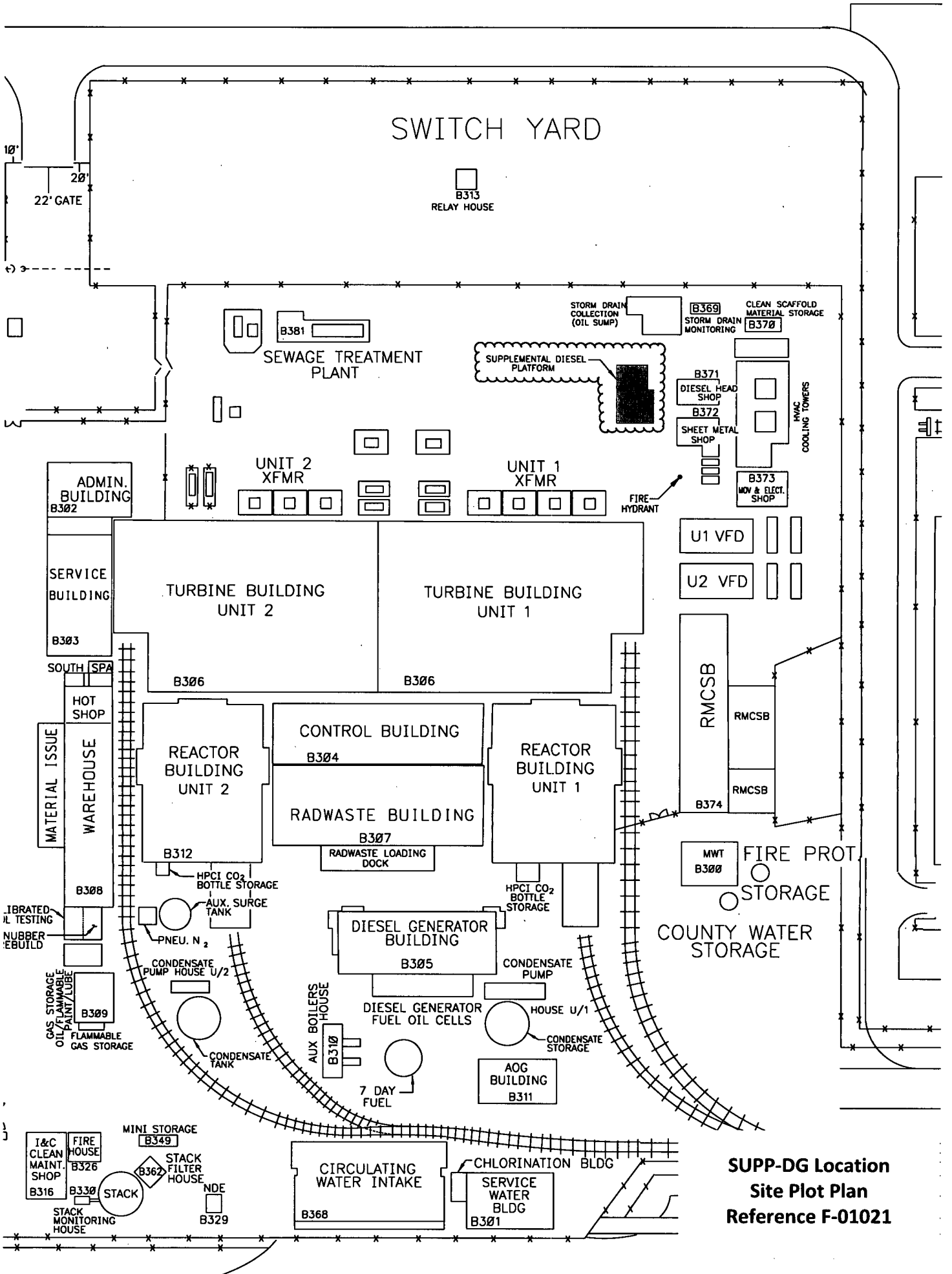
DIESEL GENERATOR COMPLETION TIME EXTENSION

FIGURES

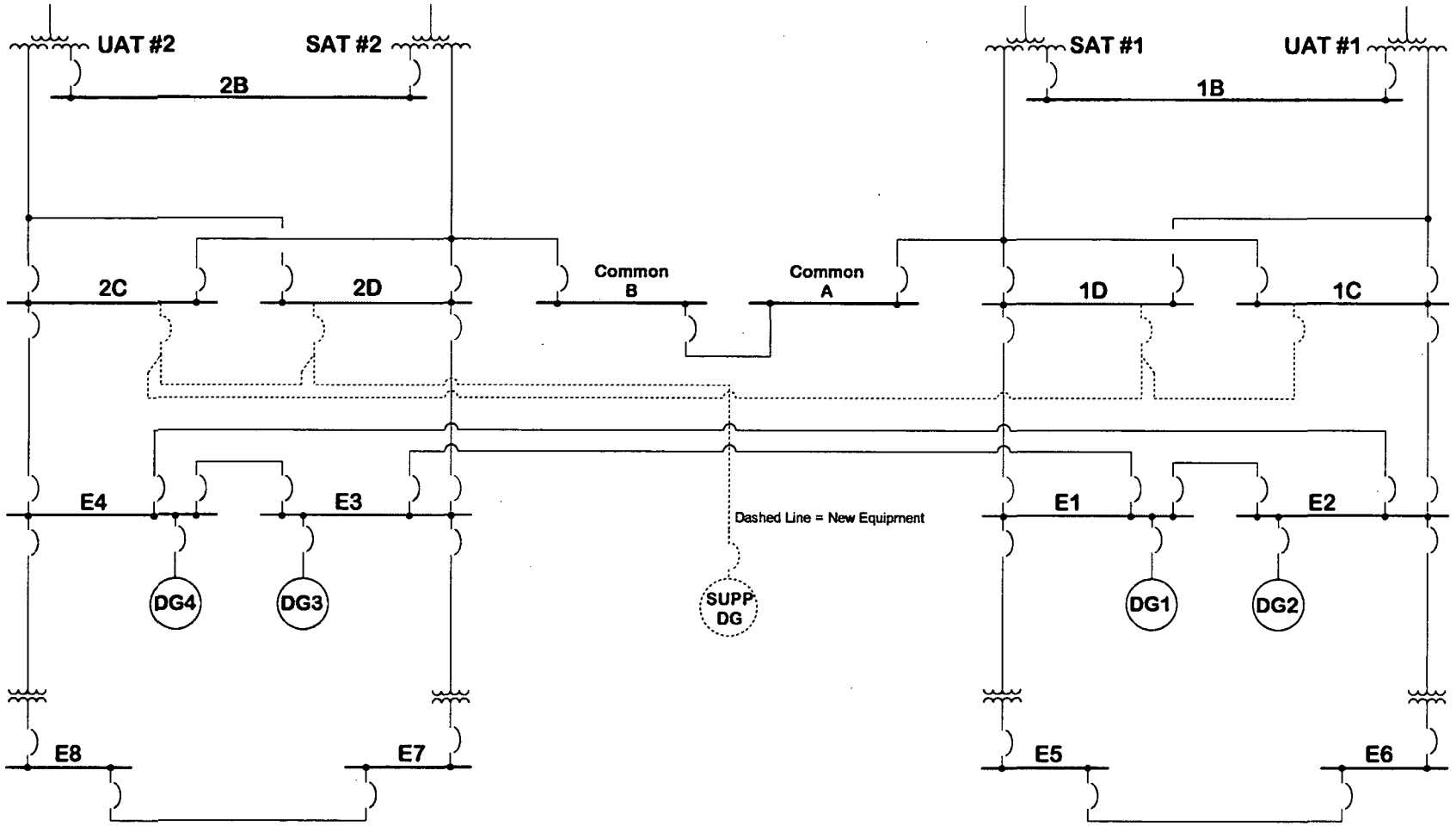
FIGURES

Figure 1, SUPP-DG Location within Plant

Figure 2, SUPP-DG Tie-In to Plant Electrical System



SUPP-DG Location
Site Plot Plan
Reference F-01021



SUPP-DG ONE LINE DIAGRAM
Reference F-03043, F-03044

DIESEL GENERATOR COMPLETION TIME EXTENSION

PROPOSED BSEP TS AND TS BASES (MARK-UP)

PROPOSED BSEP TS AND TS BASES (MARK-UP)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One offsite circuit inoperable for reasons other than Condition A or B.	C.1 Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND	
	C.2 Declare required feature(s) with no offsite power available inoperable when the redundant required feature(s) are inoperable.	24 hours from discovery of no offsite power to one 4.16 kV emergency bus concurrent with inoperability of redundant required feature(s)
	AND	
	C.3 Restore offsite circuit to OPERABLE status.	72 hours AND 17~~10~~ days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One DG inoperable for reasons other than Condition B.	D.1 Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND	
	D.2 Evaluate availability of supplemental diesel generator (SUPP-DG).	2 hours AND Once per 12 hours thereafter
	AND	
	D.~~3~~2 Declare required feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable.	4 hours from discovery of Condition D concurrent with inoperability of redundant required feature(s)
	AND	
	D.~~4~~3.1 Determine OPERABLE DG(s) are not inoperable due to common cause failure.	24 hours
	OR	
	D.~~4~~3.2 Perform SR 3.8.1.2 for OPERABLE DG(s).	24 hours
	AND	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	D.54 Restore DG to OPERABLE status.	7 days from discovery of unavailability of SUPP-DG AND 24 hours from discovery of Condition D entry ≥ 6 days concurrent with unavailability of SUPP-DG AND 14 days AND 1710 days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

BASES

BACKGROUND (continued)

Certain required plant loads are returned to service in a predetermined sequence in order to prevent overloading of the DGs in the process. The starting sequence of all automatically connected loads needed to recover the unit or maintain it in a safe condition is provided in UFSAR, Table 8-7 (Ref. 4).

Ratings for the DGs satisfy the requirements of Safety Guide 9 (Ref. 5). Each DG has the following ratings:

a. 3500 kW—continuous; and

b. 3850 kW—2000 hours.

The capability is provided to connect a supplemental diesel generator (SUPP-DG) to supply power to any of the four 4.16 kV emergency buses via a BOP circuit path. This BOP circuit path consists of the BOP bus and the associated circuit path (master/slave breakers and interconnecting cables) to a 4.16 kV emergency bus. The SUPP-DG is commercial-grade and not designed to meet Class 1E requirements. The SUPP-DG is made available to support extended Completion Times in the event of an inoperable DG. The SUPP-DG is made available as a defense-in-depth alternate source of AC power to one emergency bus to mitigate a station blackout event. The SUPP-DG would remain disconnected from the Class 1E distribution system unless required during a station blackout.

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the UFSAR, Chapter 6 (Ref. 6) and Chapter 15 (Ref. 7), assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, "Power Distribution Limits"; Section 3.5, "Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System"; and Section 3.6, "Containment Systems."

The OPERABILITY of the AC electrical power sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the onsite or offsite AC sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power; and

b. A worst case single failure.

AC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 8).

LCO

Two Unit 1 and two Unit 2 qualified circuits between the offsite transmission network and the onsite Class 1E Distribution System and

four separate and independent DGs (1, 2, 3, and 4) ensure availability of the required power to shut down the reactor and maintain it in a safe

(continued)

BASES

ACTIONS

C.2 (continued)

The remaining OPERABLE offsite circuits and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection may have been lost for the required feature's function; however, function is not lost. The 24 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 24 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

C.3

According to Regulatory Guide 1.93 (Ref. 9), operation may continue in Condition C for a period that should not exceed 72 hours. With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the plant safety systems. In this condition, however, the remaining OPERABLE offsite circuits and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System.

The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action C.3 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet LCO 3.8.1.a or b. If Condition C is entered while, for instance, a DG is inoperable, and that DG is subsequently returned OPERABLE, the LCO may already have been not met for up to 14~~7~~ days. This situation could lead to a total of 17~~10~~ days, since initial failure to meet the LCO, to restore the offsite circuit. At this time, a DG could again become inoperable, the circuit restored OPERABLE, and an additional 14~~7~~ days (for a total of 31~~17~~ days) allowed prior to complete restoration of the LCO. The 17~~10~~ day Completion Time provides a limit on the time allowed

(continued)

BASES

ACTIONS

C.3 (continued)

in a specified condition after discovery of failure to meet LCO 3.8.1.a or b. This limit is considered reasonable for situations in which Conditions C and D are entered concurrently. The "AND" connector between the 72 hours and 17~~10~~ day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action C.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This exception results in establishing the "time zero" at the time LCO 3.8.1.a or b was initially not met, instead of at the time that Condition C was entered.

D.1

To ensure a highly reliable power source remains with one DG inoperable, it is necessary to verify the availability of the offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure to meet SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions must then be entered.

D.2

In order to extend the Required Action D.5 Completion Time for an inoperable DG from 7 days to 14 days inoperable, it is necessary to verify the availability of the SUPP-DG within 2 hours on entry into TS 3.8.1 LCO and every 12 hours thereafter. Since Required Action D.2 only specifies "evaluate," discovering the SUPP-DG unavailable does not result in the Required Action being not met (i.e., the evaluation is performed). However, on discovery of an unavailable SUPP-DG, the Completion Time for Required Action D.5 starts the 7 day and/or 24 hour clock.

SUPP-DG availability requires that:

1) The load test has been performed within 30 days of entry into the extended Completion Time. The Required Action evaluation is met with an administrative verification of this prior testing;

2) SUPP-DG fuel tank level is verified locally to be ≥ 24-hour supply; and

3) SUPP-DG supporting system parameters for starting and operating are verified to be within required limits for functional availability (e.g., battery state of charge, starting air system pressure).

The SUPP-DG is not used to extend the Completion Time for more than one inoperable DG at any one time.

D.3~~2~~

Required Action D.3~~2~~ is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are

designed to be powered from redundant safety related 4.16 kV emergency buses (i.e., single division systems are not included). Redundant required feature failures consist of inoperable features associated with an emergency bus redundant to the emergency bus that has an inoperable DG.

(continued)

BASES

ACTIONS

D.3~~2~~ (continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action the Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. A redundant required feature on another emergency bus is inoperable.

If, at any time during the existence of this Condition (one DG inoperable), a required redundant feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering one DG inoperable coincident with one or more inoperable required support or supported features, or both, that are associated with the OPERABLE DGs results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

The remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES

ACTIONS (continued)

D.~~4~~3.1 and D.~~4~~3.2

Required Action D.~~4~~3.1 provides an allowance to avoid unnecessary testing of OPERABLE DGs. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DGs, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other DG(s), they are declared inoperable upon discovery, and Condition G or I of LCO 3.8.1 is entered, as applicable. Once the failure is repaired, and the common cause failure no longer exists, Required Action D.~~4~~3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG(s), performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of those DGs.

In the event the inoperable DG is restored to OPERABLE status prior to completing either D.~~4~~3.1 or D.~~4~~3.2 (i.e., the inoperable DG has been restored to OPERABLE status but it has not yet been determined if the cause of the inoperability is common to the other OPERABLE DGs), the CP&L Corrective Action Program (CAP) will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer required under the 24 hour constraint imposed while in Condition D.

According to Generic Letter 84-15 (Ref. 10), 24 hours is a reasonable time to confirm that the OPERABLE DGs are not affected by the same problem as the inoperable DG.

D.54

The 4.16 kV emergency bus design is sufficient to allow operation to continue in Condition D for a period that should not exceed 14~~7~~ days if the SUPP-DG is available.

If the SUPP-DG is or becomes unavailable with an inoperable DG, then action is required to restore the SUPP-DG to available status or to restore the DG to OPERABLE status within 7 days from discovery of an unavailable SUPP-DG. However, if the SUPP-DG unavailability occurs sometime after 6 days of continuous DG inoperability, then the remaining time to restore the SUPP-DG to available status or to restore the DG to OPERABLE status is limited to 24 hours.

The 7 day and 24 hour Completion Times allow for an exception to the normal "time zero" for beginning the allowed outage time "clock." The 7 day Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. The SUPP-DG is unavailable.

The 24 hour Completion Time only begins on discovery that:

a. An inoperable DG exists for ≥ 6 days; and

b. The SUPP-DG is unavailable.

Therefore, when one required DG is inoperable due to either preplanned maintenance (preventive or corrective) or unplanned corrective maintenance work, the Completion Time can be extended from 7 days to 14 days if the SUPP-DG is verified available for backup operation.

In Condition D, the remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. The 14~~7~~ day Completion Time takes into account the capacity and capability of the remaining AC sources (including SUPP-DG), a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES

ACTIONS

D.54 (continued)

The fourth~~second~~ Completion Time for Required Action D.54 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet LCO 3.8.1.a or b. If Condition D is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently restored OPERABLE, the LCO may already have been not met for up to 72 hours. This situation could lead to a total of 17~~10~~ days, since initial failure of the LCO, to restore the DG. At this time, an offsite circuit could again become inoperable, the DG restored OPERABLE, and an additional 72 hours (for a total of 20~~13~~ days) allowed prior to complete restoration of the LCO. The 17~~10~~ day Completion Time provides a limit on the time allowed in a specified condition after discovery of failure to meet LCO 3.8.1.a or b. This limit is considered reasonable for situations in which Conditions C and D are entered concurrently. The "AND" connector between the 14~~7~~ day and 17~~10~~ day Completion Times means that both Completion Times apply simultaneously, and the more restrictive must be met.

As in Required Action C.3~~D.2~~, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This exception results in establishing the "time zero" at the time that LCO 3.8.1.a or b was initially not met, instead of the time that Condition D was entered.

E.1 and E.2

Required Action E.1 addresses actions to be taken in the event of inoperability of redundant required features concurrent with inoperability of two or more offsite circuits. Required Action E.1 reduces the vulnerability to a loss of function. The Completion Time for taking these actions is reduced to 12 hours from that allowed with one 4.16 kV emergency bus without offsite power (Required Action C.2). The rationale for the reduction to 12 hours is that Regulatory Guide 1.93 (Ref. 9) allows a Completion Time of 24 hours for two offsite circuits inoperable, based upon the assumption that two complete safety divisions are OPERABLE. While this Action allows more than two circuits

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One offsite circuit inoperable for reasons other than Condition A or B.	C.1 Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND	
	C.2 Declare required feature(s) with no offsite power available inoperable when the redundant required feature(s) are inoperable.	24 hours from discovery of no offsite power to one 4.16 kV emergency bus concurrent with inoperability of redundant required feature(s)
	AND	
	C.3 Restore offsite circuit to OPERABLE status.	72 hours AND 17~~10~~ days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. One DG inoperable for reasons other than Condition B.	D.1	Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND		
	D.2	Evaluate availability of supplemental diesel generator (SUPP-DG).	2 hours AND Once per 12 hours thereafter
	AND		
	D.~~3~~2	Declare required feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable.	4 hours from discovery of Condition D concurrent with inoperability of redundant required feature(s)
	AND		
	D.~~4~~3.1	Determine OPERABLE DG(s) are not inoperable due to common cause failure.	24 hours
	OR		
	D.~~4~~3.2	Perform SR 3.8.1.2 for OPERABLE DG(s).	24 hours
	AND		

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	D.~~5~~4 Restore DG to OPERABLE status.	7 days from discovery of unavailability of SUPP-DG AND 24 hours from discovery of Condition D entry ≥ 6 days concurrent with unavailability of SUPP-DG AND 14 days AND 17~~10~~ days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

BASES

BACKGROUND (continued)

Certain required plant loads are returned to service in a predetermined sequence in order to prevent overloading of the DGs in the process. The starting sequence of all automatically connected loads needed to recover the unit or maintain it in a safe condition is provided in UFSAR, Table 8-7 (Ref. 4).

Ratings for the DGs satisfy the requirements of Safety Guide 9 (Ref. 5). Each DG has the following ratings:

a. 3500 kW—continuous; and

b. 3850 kW—2000 hours.

The capability is provided to connect a supplemental diesel generator (SUPP-DG) to supply power to any of the four 4.16 kV emergency buses via a BOP circuit path. This BOP circuit path consists of the BOP bus and the associated circuit path (master/slave breakers and interconnecting cables) to a 4.16 kV emergency bus. The SUPP-DG is commercial-grade and not designed to meet Class 1E requirements. The SUPP-DG is made available to support extended Completion Times in the event of an inoperable DG. The SUPP-DG is made available as a defense-in-depth alternate source of AC power to one emergency bus to mitigate a station blackout event. The SUPP-DG would remain disconnected from the Class 1E distribution system unless required during a station blackout.

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the UFSAR, Chapter 6 (Ref. 6) and Chapter 15 (Ref. 7), assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, "Power Distribution Limits"; Section 3.5, "Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System"; and Section 3.6, "Containment Systems."

The OPERABILITY of the AC electrical power sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the onsite or offsite AC sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power; and

b. A worst case single failure.

AC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 8).

LCO

Two Unit 1 and two Unit 2 qualified circuits between the offsite transmission network and the onsite Class 1E Distribution System and

four separate and independent DGs (1, 2, 3, and 4) ensure availability of the required power to shut down the reactor and maintain it in a safe

(continued)

BASES

ACTIONS

C.2 (continued)

The remaining OPERABLE offsite circuits and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection may have been lost for the required feature's function; however, function is not lost. The 24 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 24 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

C.3

According to Regulatory Guide 1.93 (Ref. 9), operation may continue in Condition C for a period that should not exceed 72 hours. With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the plant safety systems. In this condition, however, the remaining OPERABLE offsite circuits and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System.

The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action C.3 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet LCO 3.8.1.a or b. If Condition C is entered while, for instance, a DG is inoperable, and that DG is subsequently returned OPERABLE, the LCO may already have been not met for up to 14~~7~~ days. This situation could lead to a total of 17~~10~~ days, since initial failure to meet the LCO, to restore the offsite circuit. At this time, a DG could again become inoperable, the circuit restored OPERABLE, and an additional 14~~7~~ days (for a total of 31~~17~~ days) allowed prior to complete restoration of the LCO. The 17~~10~~ day Completion Time provides a limit on the time allowed

(continued)

BASES

ACTIONS

C.3 (continued)

in a specified condition after discovery of failure to meet LCO 3.8.1.a or b. This limit is considered reasonable for situations in which Conditions C and D are entered concurrently. The "AND" connector between the 72 hours and 17~~10~~ day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action C.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This exception results in establishing the "time zero" at the time LCO 3.8.1.a or b was initially not met, instead of at the time that Condition C was entered.

D.1

To ensure a highly reliable power source remains with one DG inoperable, it is necessary to verify the availability of the offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure to meet SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions must then be entered.

D.2

In order to extend the Required Action D.5 Completion Time for an inoperable DG from 7 days to 14 days inoperable, it is necessary to verify the availability of the SUPP-DG within 2 hours on entry into TS 3.8.1 LCO and every 12 hours thereafter. Since Required Action D.2 only specifies "evaluate," discovering the SUPP-DG unavailable does not result in the Required Action being not met (i.e., the evaluation is performed). However, on discovery of an unavailable SUPP-DG, the Completion Time for Required Action D.5 starts the 7 day and/or 24 hour clock.

SUPP-DG availability requires that:

1) The load test has been performed within 30 days of entry into the extended Completion Time. The Required Action evaluation is met with an administrative verification of this prior testing;

2) SUPP-DG fuel tank level is verified locally to be ≥ 24-hour supply; and

3) SUPP-DG supporting system parameters for starting and operating are verified to be within required limits for functional availability (e.g., battery state of charge, starting air system pressure).

The SUPP-DG is not used to extend the Completion Time for more than one inoperable DG at any one time.

D.3~~2~~

Required Action D.3~~2~~ is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are

designed to be powered from redundant safety related 4.16 kV emergency buses (i.e., single division systems are not included). Redundant required feature failures consist of inoperable features associated with an emergency bus redundant to the emergency bus that has an inoperable DG.

(continued)

BASES

ACTIONS

D.~~32~~ (continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action the Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. A redundant required feature on another emergency bus is inoperable.

If, at any time during the existence of this Condition (one DG inoperable), a required redundant feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering one DG inoperable coincident with one or more inoperable required support or supported features, or both, that are associated with the OPERABLE DGs results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

The remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES

ACTIONS (continued)

D.~~4~~3.1 and D.~~4~~3.2

Required Action D.~~4~~3.1 provides an allowance to avoid unnecessary testing of OPERABLE DGs. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other DG(s), they are declared inoperable upon discovery, and Condition G or I of LCO 3.8.1 is entered, as applicable. Once the failure is repaired, and the common cause failure no longer exists, Required Action D.~~4~~3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG(s), performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of those DGs.

In the event the inoperable DG is restored to OPERABLE status prior to completing either D.~~4~~3.1 or D.~~4~~3.2 (i. e., the inoperable DG has been restored to OPERABLE status but it has not yet been determined if the cause of the inoperability is common to the other OPERABLE DGs), the CP&L Corrective Action Program (CAP) will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer required under the 24 hour constraint imposed while in Condition D.

According to Generic Letter 84-15 (Ref. 10), 24 hours is a reasonable time to confirm that the OPERABLE DGs are not affected by the same problem as the inoperable DG.

D.54

The 4.16 kV emergency bus design is sufficient to allow operation to continue in Condition D for a period that should not exceed 14~~7~~ days if the SUPP-DG is available.

If the SUPP-DG is or becomes unavailable with an inoperable DG, then action is required to restore the SUPP-DG to available status or to restore the DG to OPERABLE status within 7 days from discovery of an unavailable SUPP-DG. However, if the SUPP-DG unavailability occurs sometime after 6 days of continuous DG inoperability, then the remaining time to restore the SUPP-DG to available status or to restore the DG to OPERABLE status is limited to 24 hours.

The 7 day and 24 hour Completion Times allow for an exception to the normal "time zero" for beginning the allowed outage time "clock." The 7 day Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. The SUPP-DG is unavailable.

The 24 hour Completion Time only begins on discovery that:

a. An inoperable DG exists for ≥ 6 days; and

b. The SUPP-DG is unavailable.

Therefore, when one required DG is inoperable due to either preplanned maintenance (preventive or corrective) or unplanned corrective maintenance work, the Completion Time can be extended from 7 days to 14 days if the SUPP-DG is verified available for backup operation.

In Condition D, the remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. The 14~~7~~ day Completion Time takes into account the capacity and capability of the remaining AC sources (including SUPP-DG), a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES

ACTIONS

D.54 (continued)

The fourth~~second~~ Completion Time for Required Action D.54 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet LCO 3.8.1.a or b. If Condition D is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently restored OPERABLE, the LCO may already have been not met for up to 72 hours. This situation could lead to a total of 17~~10~~ days, since initial failure of the LCO, to restore the DG. At this time, an offsite circuit could again become inoperable, the DG restored OPERABLE, and an additional 72 hours (for a total of 20~~13~~ days) allowed prior to complete restoration of the LCO. The 17~~10~~ day Completion Time provides a limit on the time allowed in a specified condition after discovery of failure to meet LCO 3.8.1.a or b. This limit is considered reasonable for situations in which Conditions C and D are entered concurrently. The "AND" connector between the 14~~7~~ day and 17~~10~~ day Completion Times means that both Completion Times apply simultaneously, and the more restrictive must be met.

As in Required Action C.3~~D.2~~, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This exception results in establishing the "time zero" at the time that LCO 3.8.1.a or b was initially not met, instead of the time that Condition D was entered.

E.1 and E.2

Required Action E.1 addresses actions to be taken in the event of inoperability of redundant required features concurrent with inoperability of two or more offsite circuits. Required Action E.1 reduces the vulnerability to a loss of function. The Completion Time for taking these actions is reduced to 12 hours from that allowed with one 4.16 kV emergency bus without offsite power (Required Action C.2). The rationale for the reduction to 12 hours is that Regulatory Guide 1.93 (Ref. 9) allows a Completion Time of 24 hours for two offsite circuits inoperable, based upon the assumption that two complete safety divisions are OPERABLE. While this Action allows more than two circuits

(continued)

DIESEL GENERATOR COMPLETION TIME EXTENSION

PROPOSED BSEP TS (RETYPED PAGES)

PROPOSED BSEP TS
(RETYPED PAGES)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One offsite circuit inoperable for reasons other than Condition A or B.	C.1 Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND	
	C.2 Declare required feature(s) with no offsite power available inoperable when the redundant required feature(s) are inoperable.	24 hours from discovery of no offsite power to one 4.16 kV emergency bus concurrent with inoperability of redundant required feature(s)
	AND	
	C.3 Restore offsite circuit to OPERABLE status.	72 hours AND 17 days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. One DG inoperable for reasons other than Condition B.	D.1	Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND		
	D.2	Evaluate availability of supplemental diesel generator (SUPP-DG).	2 hours AND Once per 12 hours thereafter
	AND		
	D.3	Declare required feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable.	4 hours from discovery of Condition D concurrent with inoperability of redundant required feature(s)
	AND		
	D.4.1	Determine OPERABLE DG(s) are not inoperable due to common cause failure.	24 hours
	OR		
	D.4.2	Perform SR 3.8.1.2 for OPERABLE DG(s).	24 hours
	AND		

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	D.5 Restore DG to OPERABLE status.	7 days from discovery of unavailability of SUPP-DG AND 24 hours from discovery of Condition D entry ≥ 6 days concurrent with unavailability of SUPP-DG AND 14 days AND 17 days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One offsite circuit inoperable for reasons other than Condition A or B.	C.1 Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND	
	C.2 Declare required feature(s) with no offsite power available inoperable when the redundant required feature(s) are inoperable.	24 hours from discovery of no offsite power to one 4.16 kV emergency bus concurrent with inoperability of redundant required feature(s)
	AND	
	C.3 Restore offsite circuit to OPERABLE status.	72 hours AND 17 days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. One DG inoperable for reasons other than Condition B.	D.1	Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	2 hours AND Once per 12 hours thereafter
	AND		
	D.2	Evaluate availability of supplemental diesel generator (SUPP-DG).	2 hours AND Once per 12 hours thereafter
	AND		
	D.3	Declare required feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable.	4 hours from discovery of Condition D concurrent with inoperability of redundant required feature(s)
	AND		
	D.4.1	Determine OPERABLE DG(s) are not inoperable due to common cause failure.	24 hours
	OR		
	D.4.2	Perform SR 3.8.1.2 for OPERABLE DG(s).	24 hours
	AND		

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	D.5 Restore DG to OPERABLE status.	7 days from discovery of unavailability of SUPP-DG AND 24 hours from discovery of Condition D entry ≥ 6 days concurrent with unavailability of SUPP-DG AND 14 days AND 17 days from discovery of failure to meet LCO 3.8.1.a or b

(continued)

PRA EVALUATION OF RISK IMPACT INCLUDING TREATMENT OF UNCERTAINTIES

Enclosure 4: PRA Evaluation of Risk Impact, Including Treatment of Uncertainties

Tier I: Risk Assessment

4.1. Acronyms

AOT	Allowed Outage Time
AOV	Air Operated Valve
BNP	Brunswick Nuclear Plant
BOP	Balance of Plant
BSEP	Brunswick Steam Electric Plant
BWROG	Boiling Water Reactor Owners Group
CCF	Common Cause Failure
CDF	Core Damage Frequency
CET	Containment Event Tree
CRD	Control Rod Drive
CSP	Core Spray Pump
CSW	Conventional Service Water
CT	Completion Time
DG	Diesel Generator
EPRI	Electric Power Research Institute
ET	Event Tree
F&O	Findings and Observations
FTR	Fail to Run
FTS	Fail to Start
FV	Fusel Vesley
HCLPF	High Confidence of Low Probability of Failure
HEP	Human Error Probability
HPCI	High Pressure Coolant Injection
HRA	Human Reliability Analysis
HRR	Heat Release Rate
HVAC	Heating Ventilating and Air Conditioning
ICCDP	Incremental Conditional Core Damage Probability
ICLERP	Incremental Conditional Large Early Release Probability
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination for External Events
LERF	Large Early Release Frequency
LOCA	Loss of Coolant Accident
LOOP	Loss of Offsite Power
LPCI	Low Pressure Coolant Injection
MOR	Model of Record
MOV	Motor Operated Valve
MSO	Multiple Spurious Operations
NSW	Nuclear Service Water
RAW	Risk Achievement Worth
RCIC	Reactor Core Isolation Cooling

RHRSW Residual Heat Removal Service Water
SBO Station Blackout
SR Supporting Requirement
SRV Safety Relief Valve
SSC Structure, System or Component
SUPP-DG Supplemental Diesel Generator
T&M Test and Maintenance
TS Technical Specifications
URI Uncertainty Risk Impact

4.2. PRA Scope

This section documents the Probabilistic Risk Assessment (PRA) conducted in support of the proposed Technical Specifications (TS) change to extend the Completion Time (CT) from 7 days to 14 days associated with an inoperable diesel generator (DG) while a unit is in Mode 1, 2, or 3. The impact of the proposed TS changes for this application on the risk metrics ΔCDF, ICCDP, ΔLERF, and ICLERP were evaluated with four BNP specific PRA models; a Level 1 Internal Events model with external and internal flooding, a Level 1 fire model, a Level 1 high winds model, and a LERF model. Seismic and other external events were qualitatively evaluated using the IPEEE methodologies. The review history and associated quality of these models is presented in the attached PRA Quality Report (Enclosure 5). A discussion of the qualitative risk impact of a dual unit shutdown as currently required to support extended diesel maintenance is discussed in section 4.5 of this enclosure.

The BNP PRA models in detail the DG's, support systems, interactions with the other plant systems and components, unavailability's, and the important human actions needed for success. The model developed to evaluate the conditions for the application includes the same level of detail for the proposed supplemental diesel generator (SUPP-DG).

4.3. PRA Quality

A report documenting the quality of the PRA was developed and is included as Enclosure 5 to this submittal.

4.4. PRA Model Development for Application

The baseline model was modified to enhance portions of the model that might significantly impact the application which involves two changes to risk due to the addition of a SUPP-DG that backs up a DG in an extended outage. The first is adding a new 14 day test and maintenance (T&M) interval for each DG. Since the normal T&M unavailability is represented in the PRA baseline model by a T&M event, the application was modeled by a new T&M unavailability (in addition to the existing T&M event) to represent 14 days of unavailability (consistent with RG 1.177 approach). The second is the addition of a SUPP-DG capable of powering the same loads that any one DG can

power. This SUPP-DG is capable of backing up the DG that is unavailable due to the extended T&M. The SUPP-DG is new and was not credited in the baseline PRA model. It was added to the application model in the same level of detail as the existing DG's. Though the SUPP-DG is intended to backup the DG that is out-of-service, and power that E-Bus under the SBO Licensing Basis event, the SUPP-DG can be aligned to any of the four E-buses under the SBO licensing event in consideration of which single DG is the single AC source of power, and in consideration of the SBO Procedure (0AOP-36.2) to cross-tie E-buses within the division to power battery chargers on the opposite unit. However, it is only modeled in this application as backing up the DG that is in the extended maintenance outage.

The SUPP-DG must be manually started and aligned. The SUPP-DG installation has 5 new tie breakers, one for each Balance of Plant (BOP) bus and one SUPP-DG output breaker. Each of the 4 breakers ties into its respective unit bus (1C, 1D, 2C or 2D). The SUPP-DG and its support equipment are housed in seismically rugged enclosures that are elevated to protect the equipment from flooding caused by storm surges and strong enough to withstand a 3 second wind burst of 155 mph.

To model the application, the baseline BNP PSA 2011 model (including high winds and internal flooding) was modified by AND'ing logic for the SUPP-DG with each DG extended test and maintenance event. The MOR utilizes DG T&M events with unavailability's based on plant experience and limited to 7 days. Therefore, an extended T&M event (14 days) was added to the model for each DG. These new events were made mutually exclusive with each other and with the normal DG T&M events. The logic therefore allows each DG to be placed in an extended outage during the same critical power year, but not at the same time another DG is unavailable. The logic only credits the SUPP-DG for the time that a DG is in an extended outage. It does NOT credit the SUPP-DG at any other time.

The logic for the SUPP-DG includes:

Fail to start
Fail to run
Operator action failure
Bus breaker failure (4 for each line-up; 2 new breakers and 2 existing breakers between the BOP bus and the essential bus)
Failure due to high winds
Failure due to external flooding
DC power for existing breakers

After a scram, the SUPP-DG does not depend on any plant support system other than DC control power for the breakers. The entire SUPP-DG system, excluding the tie breakers to the BOP busses, is considered a super-component and modeled as such. The feeder breakers between the BOP bus and the applicable essential bus are open at the time of the action and need to be closed for SUPP-DG success. Closing these breakers is in the application PRA model and the HRA. The breakers from the Unit

Auxiliary Transformer and the Start-up Transformers to the BOP busses have to open along with the supply feeding the common busses from BOP busses 1C, 1D, 2C, and 2D.

4.4.1. Development of Basic Events

The basic events developed to support the application modeling are presented in Table A4-1 below. Explanations for the evaluation of probabilities for the new events are provided following the table.

Table A4-1: New Basic Events for Application Model

New Basic Event	Description	Probability	EF
SDG1DGN-FS-001	SUPPLEMENTAL DIESEL GENERATOR FAILS TO START	5.38E-03 /D	1.8
SDG1DGN-FR-001	SUPPLEMENTAL DIESEL GENERATOR FAILS TO RUN	5.90E-02 /hr	1.7
OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR	5.20E-03	5.0
%EXTFL_1	Probability of a 23 Foot Storm Surge	5.00E-05 /yr	N/A
%EXTFL_2	Probability of a 20 Foot Flood	7.40E-04 /yr	N/A
FL_EXTFLOOD	Flag to enable external flood evaluation	1.00E+00	N/A
EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)	3.84E-02 /yr	1.0
EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)	3.84E-02 /yr	1.0
EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)	3.84E-02 /yr	1.0
EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)	3.84E-02 /yr	1.0
ACP0BKR-OO-SDG	AC CIRCUIT BREAKER FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-SDG1	AC CIRCUIT BREAKER FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-SDG2	AC CIRCUIT BREAKER FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-SDG3	AC CIRCUIT BREAKER FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-SDG4	AC CIRCUIT BREAKER FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-1AD1	CIRCUIT BREAKER 1-AD1 FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-AE6	CIRCUIT BREAKER AE6 FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-AG4	CIRCUIT BREAKER AG4 FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-1AC8	CIRCUIT BREAKER 1-AC8 FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-AI2	CIRCUIT BREAKER AI2 FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-2AD1	AC CIRCUIT BREAKER FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-AJ9	CIRCUIT BREAKER AJ9 FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
ACP0BKR-OO-2AC8	CIRCUIT BREAKER 2-AC8 FAILS TO CLOSE (1 demand – use type code)	2.55E-03	4.7
HW_SDG_H1_01	FAILURE OF SDG FOR HIGH WIND INTERVAL 1	0.00e+0	N/A
HW_SDG_T1_01	TORNADO-INDUCED FAILURE OF SDG FOR HIGH WIND INTERVAL 1	0.00e+0	N/A
HW_SDG_M1_01	WIND BORN MISSILE STRIKE FAILURE OF SDG FOR HIGH WIND INTERVAL 1	0.00e+0	N/A
HW_SDG_H1_02	FAILURE OF SDG FOR HIGH WIND INTERVAL 2	0.00e+0	N/A
HW_SDG_T1_02	TORNADO-INDUCED FAILURE OF SDG FOR HIGH WIND INTERVAL 2	0.00e+0	N/A
HW_SDG_M1_02	WIND BORN MISSILE STRIKE FAILURE OF SDG FOR HIGH WIND INTERVAL 2	2.09E-04	N/A
HW_SDG_H1_03	FAILURE OF SDG FOR HIGH WIND INTERVAL 3	0.00e+0	N/A
HW_SDG_T1_03	TORNADO-INDUCED FAILURE OF SDG FOR HIGH WIND INTERVAL 3	0.00e+0	N/A
HW_SDG_M1_03	WIND BORN MISSILE STRIKE FAILURE OF SDG FOR HIGH WIND INTERVAL 3	3.68E-04	N/A
HW_SDG_H1_04	FAILURE OF SDG FOR HIGH WIND INTERVAL 4	1.00E+0	N/A
HW_SDG_T1_04	TORNADO-INDUCED FAILURE OF SDG FOR HIGH WIND INTERVAL 4	1.00E+0	N/A
HW_SDG_M1_04	WIND BORN MISSILE STRIKE FAILURE OF SDG FOR HIGH WIND INTERVAL 4	1.00E+0	N/A
HW_SDG_H1_05	FAILURE OF SDG FOR HIGH WIND INTERVAL 5	1.00E+0	N/A
HW_SDG_T1_05	TORNADO-INDUCED FAILURE OF SDG FOR HIGH WIND INTERVAL 5	1.00E+0	N/A
HW_SDG_M1_05	WIND BORN MISSILE STRIKE FAILURE OF SDG FOR HIGH WIND INTERVAL 5	1.00E+0	N/A

HW_SDG_H1_06	FAILURE OF SDG FOR HIGH WIND INTERVAL 6	1.00E+0	N/A
HW_SDG_T1_06	TORNADO-INDUCED FAILURE OF SDG FOR HIGH WIND INTERVAL 6	1.00E+0	N/A
HW_SDG_M1_06	WIND BORN MISSILE STRIKE FAILURE OF SDG FOR HIGH WIND INTERVAL 6	1.00E+0	N/A

Basic Event

OPER-SDSTART is a new operator action added to reflect the assigned operator to perform those actions necessary to start and align the SUPP-DG to the applicable essential bus. The human failure event was developed using the EPRI HRA Calculation tool consistent with the other internal events HRA actions in the BNP Plant Specific Model. It incorporated input from site operations.

%EXTFL_2 is the initiating event for external flooding and utilizes the value of 7.4E-4/yr to represent the frequency of a hurricane that would generate a storm surge sufficient to fail the switchyard. The value and supporting evidence is obtained from the BNP IPEEE discussion of Other External Events.

%EXTFL_1 is the initiating event for external flooding and utilizes the value of 5.0E-5/yr to represent the frequency of a hurricane that would generate a storm surge sufficient to fail the switchyard, flood the diesel fire pumps, and prevent access to the supplemental DG. This frequency was developed from site specific historical hurricane data and associated conditions.

SDG1DGN-FS-001
The Fail-To-Start probability used is the same as for the current model for a DG FTS. This is conservative since the SUPP-DG is newer with digital control systems and does not rely on automatic start circuitry.

SDG1DGN-FR-001
The Fail-To-Run probability used is the same as for the current model DG FTR. This is conservative since the SUPP-DG is newer with digital control systems.

EDG1DGN-EXTTM-D001(2), EDG2DGN-EXTTM-D003(4)
The DG unavailabilities for the extended outage events are calculated on 14 days out of the year. (Freq = 14/365 /yr = 3.84E-2 /yr) This unavailability is in addition to the currently modeled DG unavailabilities.

The circuit breaker open-fail open probabilities used are the same as for the existing modeled AC breaker open-fail open failure mode.

The SUPP-DG is designed for a 3 sec wind gust of 155 mph. Therefore, the failure probability of the SUPP-DG for wind intervals below 135 mph (see Table A4-1 above) is assumed to be 0.0 except for missile strikes at high wind intervals 2 and 3, and the failure probability of the SUPP-DG for wind intervals above 135 mph is assumed to be 1.0.

4.4.2. Baseline Model Changes

The following changes were made to the baseline MOR:

1. Eliminated subtree #V-LP. This entirely deleted event OPER-NPSH, but did not eliminate subtree #V-LP1 for other tops it supported.

2. Under gates HW_DG_EX_001, HW_DG_EX_002, HW_DG_EX_003, and HW_DG_EX_004 deleted all of the sub trees for high wind and tornado failures of the exhausts. That left the model with only failures due to missiles (6 events for each DG). The BNP FSAR [Ref 6] states that the DG exhaust silencers were designed to withstand the effects of high winds and tornados (but not missile strikes).

3. Two external flooding initiating events were added to the baseline model. They both fail the LOOP recovery. The new flooding event %EXTFL_1 also fails the diesel fire pump.

4.4.3. Application Modeling

The following changes were made to the edited (as above) baseline model to form the application model:

1. Added the logic for the SUPP-DG and the new extended outage event to the appropriate power supply gates.

2. A new high winds model for the SUPP-DG was added to the SUPP-DG subtrees. It uses the same wind initiator modeling as for the other high winds impacted systems.

3. The same external flooding events that were added to the baseline model were used in the application model. In addition, the new external flooding event %EXTFL_1 also fails the supplemental DG.

The SUPP-DG does not add any new ignition sources to the Fire PRA, other than at the SUPP-DG itself, and no new targets other than those related to the cables connecting the SUPP-DG to the 4kV switchgears. The SUPP-DG and its associated support equipment, bus and tie breakers are located in an outside area adjacent to the switchyard and not in a fire zone within an existing building. A fire in the Startup Transformer for Unit 1 has the potential to fail the SUPP-DG due to proximity of SUPP-DG cables being routed to the 1C, 1D, 2C, or 2D buses. Similarly a fire in the switchgear room has the potential to fail the SUPP DG due to cable proximity in these areas. A fire in the SUPP-DG zone would not impact any SSC's other than the SUPP-DG itself. The failure frequencies of the SUPP-DG include the effects of fires. Since the SUPP-DG is normally separated from the remainder of the plant with open 4kv breakers, a SUPP-DG fire would not cause failures or spurious operations of other

SCC's associated with the 4kv electrical systems. A fire that fails the E-bus that the SUPP-DG is backing up while the associated DG is in an extended CT would have also failed the applicable DG if it were in-service. The intermediate non-essential 4kv bus the SUPP-DG is tied to is already modeled for the effects of fires. The addition of the SUPP-DG does not change those modeling requirements. The SUPP-DG is connected to a balance of plant 480vac bus that provides power to support auxiliary equipment during standby conditions. The worst effect a fire at the SUPP-DG could have on this 480v supply would be to trip the protective devices between the bus and the SUPP-DG and could not fail the 480v bus itself. Additionally, the above 480v bus is a BOP bus and does not supply critical equipment. The SUPP-DG breakers are connected to an existing 250vdc system for breaker control. These breakers are normally open during power operation.

Human Reliability Analysis changes in the baseline model involved changes that were made to the recovery rule file (A common recovery rule file is used for both baseline and application models):

New HEP (human error probability) combinations were identified after quantifying both the baseline and application models to a truncation level discussed in section 4.6 Only the combinations that were in the delta cutset file were developed. The delta cutset file presents the cutsets remaining after the common cutsets between the associated baseline and application files were removed using the delete term function of CAFTA.

In the dependency analyses, discussed in the PRA Uncertainty Analysis section (section 4.8 of this enclosure), the two actions to cross tie the 4kv and 480v busses before the SUPP-DG start showed up consistently throughout the combinations. The 4kv action was always placed first in consideration when evaluating the combinations. These actions are SBO licensing basis actions (AOP-36.2).

4.4.4. Common Cause Failure Evaluation

Because the SUPP-DG system in connected to the remainder of the plant SSC's through normally open and manually operated breakers, it has no effect on initiator frequencies or non-SUPP-DG system or component failure rates. Also, the SUPP-DG is not susceptible to Common Cause failure due to physical separation, different manufacturers, different design, different fuel oil supply, different environmental and operating conditions, the use of radiator cooling, and different operating and maintenance procedures, thus common cause was not modeled between the SUPP-DG and the DGs

4.5. Qualitative Evaluation of Shutdown Risk

The risk of having a DG unavailable during a plant shutdown is considered to be greater than having it unavailable during power operation. The primary reason for this is the unavailability of non-AC dependent high pressure injection sources such as HPCI and RCIC during shutdown when steam is not available for these systems. This is a significant reduction in core cooling capability and, while not quantified, has a major negative impact on plant risk. Only the diesel fire pump remains available as a non-AC power dependent injection source. Therefore, the almost complete dependency on AC powered injection sources during plant shutdowns makes the diesel generator availabilities more important during shutdown than during power operation.

4.6. Quantitative Evaluation of Application Risk

The baseline and application models for internal events, high winds, and fire were evaluated and cutsets were identified that were unique to the application results (delta cutset file). For each of these analyses, the top 25 cutsets, the RAW rankings above 10, and the FV rankings above 5E-3 are provided in Enclosure 6: PRA Quantification Data Tables. Because the initial quantification resulted in metrics within an order of magnitude of the initial 1E-11 truncation limit, both the baseline and application models were quantified with a truncation limit of 1E-12. The delta cutset file was reviewed and operator action combinations identified that were not yet defined. These combinations were evaluated for dependencies and the new combinations placed in the recovery rule file. A subsequent quantification provided metrics that were more than one order of magnitude from the 1E-11 truncation limit. All subsequent Level 1 quantifications were performed with a truncation limit of 1E-11. The LERF model was truncated at 1E-12. Due to the fact that most of the top 25 Level 1 cutsets were long term non-SBO loss of decay heat removal sequences, it was clear that the application has a very small impact on LERF. Therefore, the LERF models were not quantified at a lower truncation limit.

Four models were used to quantify the metrics specified for consideration in Reg. Guides 1.174 and 1.177, the Internal Events model with both external and internal flooding, the fire PRA model, the high winds PRA model, and the LERF model.

The baseline and application model cutsets and importance rankings for the IE model with internal and external flooding were evaluated. Diesel generator redundancy is not contributing significantly to the delta risk. Except for two external flooding sequences, the failed sequences in the top 25 cutsets are non-SBO, long term loss of decay heat removal sequences. The primary contributor to these sequences is the failure of the operator to cross-tie 4kv and 480v AC emergency busses. This in turn fails one or more valves preventing the success of suppression pool cooling. The top 50 cutsets were scanned for different types of sequences and none were found.

For Unit 1, DG-2 is the most risk significant diesel generator. DG 3 and DG 4 generally serve Unit 2 via 4160V AC emergency buses E3 and E4. DG 1 and DG 2 generally serve Unit 1 via 4160V AC emergency buses E1 and E2. These buses can be cross

connected within a unit (i.e., E1 to E2 and E3 to E4) and in the opposite unit (i.e., E1 to E3 and E2 to E4). On Unit 1 side, 4160V bus E1 supply power to 480V AC substation bus E5. Similarly, 4160V bus E2 supply power to 480V AC substation bus E6. On Unit 2 side, 4160V bus E3 supply power to 480V AC substation bus E7. Similarly, 4160V bus E4 supply power to 480V AC substation bus E8. DG2 and DG 4 are important for the following reasons:

1- 480V AC bus E8 provide power to the Diesel Generator Building Ventilation control logic through MCC 2-DGD. MCC 2-DGD carries most of the Diesel Generator Building loads per 0OI-50.4, "4160 Emergency Bus E-4 Electrical Load List" and Drawing F-03057. This is important because the Diesel Generator Building houses the Emergency Diesel Generators. Loss of HVAC would fail the DGs due to DG cell heat up or require manual recovery action.

2- Two Low Pressure Coolant Injection (LPCI) MOVs, 1-E11-F015A and 1-E11-F015B are supplied power from 480V AC buses E7 and E8 respectively. While their counterparts in Unit 2, 2-E11-F015A and 2-E11-F015B are supplied power from 480V AC buses E5 and E6 respectively..

3- 4160V Emergency bus E4 carries most load which include the following pumps per 0OI-50.4, "4160 Emergency Bus E-4 Electrical Load List" and Drawing F-03003:

- CSP 2B
- RHR 1B
- RHR 2B
- NSW 2B
- CSW 1A
- CSW 2B
- CRD 2B
- RHRSW 1B
- RHRSW 2B
- Fire PP (Alt)

The Electric Fire Pump is powered from one of two buses via a transfer switch. DG 4 is one of the two power supplies. The other is DG 2. Other significant loads on DG 4, as noted above when compared to the other DG loads, are the CSW pumps. DG 4 is one of the two Diesels that can support two different CSW pumps. The other is DG 1.

The results from those model evaluations are delineated in Table A4-2, A4-3, and A4-4 below.

Table A4-2: Internal Events Model w/o External Flooding Evaluation Results	
Evaluation Metric	Result
Unit 1 Baseline CDF	7.9E-06 /yr
Unit 1 ΔCDF	3.9E-08 /yr
Unit 1 ICCDP for DG 1 in extended maintenance	1.3E-08
Unit 1 ICCDP for DG 2 in extended maintenance	2.7E-08
Unit 1 ICCDP for DG 3 in extended maintenance	1.5E-08
Unit 1 ICCDP for DG 4 in extended maintenance	1.8E-08
Unit 2 Baseline CDF	7.5E-06 /yr
Unit 2 ΔCDF	4.1E-08 /yr
Unit 2 ICCDP for DG 1 in extended maintenance	1.6E-08
Unit 2 ICCDP for DG 2 in extended maintenance	1.7E-08
Unit 2 ICCDP for DG 3 in extended maintenance	1.6E-08
Unit 2 ICCDP for DG 4 in extended maintenance	2.6E-08

Table A4-3: Internal Events Model w/ External Flooding Evaluation Results	
Evaluation Metric	Result
Unit 1 Baseline CDF	7.9E-06 /yr
Unit 1 ΔCDF	4.6E-08 /yr
Unit 1 ICCDP for DG 1 in extended maintenance	1.4E-08
Unit 1 ICCDP for DG 2 in extended maintenance	3.1E-08
Unit 1 ICCDP for DG 3 in extended maintenance	1.7E-08
Unit 1 ICCDP for DG 4 in extended maintenance	2.2E-08
Unit 1 ΔLERF	4.6E-12 /yr
Unit 1 ICLERP for DG 1 in extended maintenance	9.2E-12
Unit 1 ICLERP for DG 2 in extended maintenance	1.9E-11
Unit 1 ICLERP for DG 3 in extended maintenance	4.2E-12
Unit 1 ICLERP for DG 4 in extended maintenance	1.5E-11
Unit 2 Baseline CDF	7.6E-06 /yr
Unit 2 ΔCDF	4.8E-08 /yr
Unit 2 ICCDP for DG 1 in extended maintenance	1.9E-08
Unit 2 ICCDP for DG 2 in extended maintenance	2.2E-08
Unit 2 ICCDP for DG 3 in extended maintenance	1.8E-08
Unit 2 ICCDP for DG 4 in extended maintenance	3.0E-08
Unit 2 ΔLERF	4.0E-12 /yr
Unit 2 ICLERP for DG 1 in extended maintenance	2.6E-12
Unit 2 ICLERP for DG 2 in extended maintenance	1.3E-11
Unit 2 ICLERP for DG 3 in extended maintenance	8.2E-12
Unit 2 ICLERP for DG 4 in extended maintenance	2.1E-11

Table A4-4: Internal Events Model w/ Flooding and High Winds Evaluation Results	
Evaluation Metric	Result
Unit 1 Baseline CDF	9.8E-06 /yr
Unit 1 ΔCDF	8.7E-08 /yr
Unit 1 ICCDP for DG 1 in extended maintenance	4.1E-08
Unit 1 ICCDP for DG 2 in extended maintenance	6.2E-08
Unit 1 ICCDP for DG 3 in extended maintenance	2.6E-08
Unit 1 ICCDP for DG 4 in extended maintenance	3.2E-08
Unit 2 Baseline CDF	9.4E-06 /yr
Unit 2 ΔCDF	8.0E-08 /yr
Unit 2 ICCDP for DG 1 in extended maintenance	2.6E-08
Unit 2 ICCDP for DG 2 in extended maintenance	3.0E-08
Unit 2 ICCDP for DG 3 in extended maintenance	4.1E-08

Table A4-4: Internal Events Model w/ Flooding and High Winds Evaluation Results	
Evaluation Metric	Result
Unit 2 ICCDP for DG 4 in extended maintenance	5.6E-08
Unit 1 ΔLERF	<1.0E-09 /yr
Unit 1 ICLERP for DG 1 in extended maintenance	<1.0E-09
Unit 1 ICLERP for DG 2 in extended maintenance	<1.0E-09
Unit 1 ICLERP for DG 3 in extended maintenance	<1.0E-09
Unit 1 ICLERP for DG 4 in extended maintenance	<1.0E-09
Unit 2 ΔLERF	<1.0E-09 /yr
Unit 2 ICLERP for DG 1 in extended maintenance	<1.0E-09
Unit 2 ICLERP for DG 2 in extended maintenance	<1.0E-09
Unit 2 ICLERP for DG 3 in extended maintenance	<1.0E-09
Unit 2 ICLERP for DG 4 in extended maintenance	<1.0E-09

Conclusion for internal events, internal flooding, high winds and external flooding
The risk increase for these hazards shows a small increase in risk when compared to the guidelines in Reg. Guide 1.177 and 1.174 of less than 1E-06/yr ΔCDF and ICCDP of less than 1E-06 as well as ΔLERF of less than 1E-07/yr and ICLERP of less than 1E-07. Thus for these hazards the results are acceptable.

4.6.1. Fire Risk Evaluation

The BNP Fire PRA model used the methodology in NUREG/CR-6850-ERPI TR-1019259, EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities and the approved FAQs 07-035, 08-048 and 08-50. The EPRI document TR-1011986, "Fire PRA Methods enhancements" was applied. The results are still believed to be conservative, but acceptable for this application. The SUPP-DG was assumed failed in those areas where the cables are projected to be routed and are not protected as well as the Fires in the 1C, 2C, 1D and 2D switchgear where the SUPP-DG will connect to the existing plant AC power distribution system. For this case three new fire scenarios were added to fail the SUPP-DG when appropriate. In a number of other fire scenarios the SUPP-DG or the applicable operator action was evaluated for fire impact. If a fire occurs anywhere in the Turbine Building area near the 4Kv Switchgear rooms no credit is given for operator actions to start and connect the SUPP-DG to a 4Kv bus. Segmented Bus duct locations were reviewed against the planned SUPP-DG cable routing locations. When appropriate the SUPP-DG was failed due the high energy arcing fault. The operator action "OPER-SDGSTART" which is the operator action to start the SUPP-DG is increased by a factor of 10 for those fire scenarios where it can be credited. This is consistent with the rest of the fire PRA methodology. The fires in the Main Control Room contribute most of the change in risk as shown below in Table A4-5 below. The important fire sources for ΔCDF are provided below in Table A4-7. As can be seen the resulting increases in CDF/LERF and ICCDP/ICLERP are acceptably small when compared to the guideline values in R.G. 1.177 and 1.174.

Multi-compartment analysis was not included as part of the increase in CDF or LERF because the compartments providing a small overall increase in risk due to multi-compartment analysis. The multi-compartment areas are for Unit 1:

FC 389 (TB1-04)
FC 390 (TB1-05)

Both of these fire areas could expose Fire Area FC 381 (TB1-01A/B) to a fire from these adjacent areas caused by failed fire area walls. FC 390 has a very minor contribution to the overall fire CDF and increase CDF and FC 389 has a negligible contribution, thus for Unit 1 Multi-compartment analysis for the application does not add any additional risk. For Unit 2 the multi-compartment area are:

FC 409 (TB2-04)
FC 410 (TB2-05)

Both of these fire areas could expose Fire Area FC 401 (TB2-01A/B) to a fire from these adjacent areas caused by failed fire area walls. FC 410 has a very minor contribution to the overall fire CDF and increase CDF and FC 409 has a negligible contribution, thus for Unit 2 Multi-compartment analysis for the application does not add any additional risk.

Table A4-5 shows the dominant fire areas and sums them up to show the values less than 1E-06. Further, Table A4-6 exhibits the components the are dominant. Table A4-7 shows the important fire sources and the final model results are encapsulated in Table A4-8.

Table A4-5: Dominant Fire Area CDF and LERF Impact of EDG CT Change

Compartment	Description	Base CDF	Application CDF	Delta CDF
Unit 1 CDF				
FC382	Unit 1 Turbine Building TB1-01 20ft Elevation	6.33E-07	7.33E-07	9.98E-08
FC230	Control Room 49' Elevation	4.60E-05	4.61E-05	5.12E-08
FC423	Transformer Yard	2.85E-07	3.15E-07	2.97E-08
FC210	Unit 1 Cable Spreading Room 23ft Elevation	8.56E-06	8.58E-06	1.60E-08
FC213	Battery Room 1B 23ft Elevation	2.81E-07	2.94E-07	1.22E-08
FC390	Unit 1 TB 1A RFPT Room, 20ft	3.24E-09	4.88E-09	1.64E-09
FC384	Unit 1 TB South 38ft and 45ft Elevation	3.27E-08	3.44E-08	1.63E-09
FC263	Switchyard AND Circwater Yard AND East Yard Open Area AND Northwest Yard Open Area	1.12E-08	1.22E-08	1.05E-09
Total Unt 1 Dominant Increase in Fire CDF				2.13E-07
Unit 2 CDF				
FC230	Control Room 49' Elevation	4.67E-05	4.68E-05	1.11E-07
FC402	Unit 2 Turbine Building TB2-01 20 ft Elevation	5.54E-07	6.30E-07	7.57E-08
FC423	Transformer Yard	2.39E-07	2.56E-07	1.72E-08
FC215	Battery Room 2B 23' Elevation	9.31E-08	1.10E-07	1.66E-08

Table A4-5: Dominant Fire Area CDF and LERF Impact of EDG CT Change				
Compartment	Description	Base CDF	Application CDF	Delta CDF
FC410	Unit 2 TB 2A RFP Room, 20ft	2.25E-08	2.97E-08	7.23E-09
FC211	Unit 2 Cable Spreading Room 23 ft Elevation	9.63E-06	9.64E-06	4.01E-09
FC404	Unit 2 TB North 38ft and 45ft	1.40E-08	1.70E-08	3.03E-09
Total Unt 2 Dominant Increase in Fire CDF				2.4E-07
Unit 1 LERF				
FC230	Control Room 49' Elevation	1.57E-05	1.57E-05	6.84E-09
FC382	Unit 1 Turbine Building TB1-01 20 ft Elevation	3.47E-09	3.82E-09	3.51E-10
FC227	Unit 1 Northwest Back Panel Area	4.46E-06	4.46E-06	3.10E-11
FC242	Diesel Generator Cell 1, 20ft	0.00E+00	1.62E-11	1.62E-11
Total Unt 1 Dominant Increase in Fire LERF				7.24E-09
Unit 2 LERF				
FC230	Control Room 49' Elevation	1.08E-05	1.08E-05	1.62E-09
FC402	Unit 2 Turbine Building TB2-01 20 ft Elevation	5.20E-09	5.79E-09	6.00E-10
FC410	Unit 2 TB 2A RFP Room, 20ft	1.37E-10	2.00E-10	6.30E-11
FC228	Unit 2 Southwest Back Panel Area	6.59E-09	6.62E-09	2.46E-11
Total Unt 2 Dominant Increase in Fire LERF				2.31E-09

Table A4-6: Identification of Important Components for Dominant Delta CDF Fire Scenarios				
Fire Scenario	Fire Zone	Source Description	Delta CDF	Important Components
Unit 1				
FC230_4740 B75	Control Room	1-XU-8 - NODE HJ5, HJ6, HJ7: GENERATOR, UAT & MPT RELAY PANEL	1.09E-08	4.16 KV load breakers for Bus E3, cross tie breakers between E3 and E1, diesel generators
FC230_4837 B98	Control Room	2-XU-8 - NODE HJ5, HJ7: GENERATOR,UAT & MPT RELAY PANEL	2.12E-08	4.16 KV load breakers for Bus E2, cross tie breakers for E2, Diesel generator
FC382_1560 B75	Unit 1 TB1-01	1-1D - 4160V BOP SWGR 1D .	3.21E-08	4.16 KV load breakers for Bus E2, diesel generator
FC382_1560 B98	Unit 1 TB1-01	1-1D - 4160V BOP SWGR 1D .	1.07E-08	4.16 KV load breakers for Bus E2, diesel generator
FC382_1562 B75	Unit 1 TB1-01	1-1C - 4160V BOP SWGR 1C .	1.71E-08	4.16 KV load breakers for Bus E1, diesel generator
FC382_1564 B75	Unit 1 TB1-01	1-COM-A - 4KV BUS COMMON 'A'	1.04E-08	4.16 KV load breakers for Bus E1, diesel generator

Table A4-6: Identification of Important Components for Dominant Delta CDF Fire Scenarios				
Fire Scenario	Fire Zone	Source Description	Delta CDF	Important Components
Unit 2				
FC230_4752 B75	Control Room	1-H12-P614 - NODE JF3, JP5: NSSS TEMP REC & LEAK DET VERTICAL BOARD	4.27E-08	4.16 KV load breakers for Bus E3, cross tie breakers for E3, Diesel generator
FC230_4752 B98	Control Room	1-H12-P614 - NODE JF3, JP5: NSSS TEMP REC & LEAK DET VERTICAL BOARD	1.42E-08	4.16 KV load breakers for Bus E3, cross tie breakers for E3, Diesel generator
FC230_4837 B98	Control Room	2-XU-8 - NODE HJ5, HJ7: GENERATOR,UAT & MPT RELAY PANEL	2.09E-08	4.16 KV load breakers for Bus E2, cross tie breakers for E2, Diesel generator
FC402_2598 B75	Unit 2 TB2-01	2-2D - SWGR Bus 2D	2.95E-08	4.16 KV load breakers for Bus E4, Diesel generator
FC402_2600 B75	Unit 2 TB2-01	2-2C - SWGR Bus 2C	2.93E-08	4.16 KV load breakers for Bus E3, diesel generator

Table A4-7, Important Fire Sources for EDG CT Impact				
Source	Scen	Source Description	Base CDF	Application CDF
Unit 1 CDF				
FC382_1560	B75	1-1D - 4160V BOP SWGR 1D .	9.49E-08	1.27E-07
FC230_4837	B98	2-XU-8 - NODE HJ5, HJ7: GENERATOR,UAT & MPT RELAY PANEL	8.70E-08	1.08E-07
FC382_1562	B75	1-1C - 4160V BOP SWGR 1C .	1.20E-07	1.37E-07
FC230_4740	B75	1-XU-8 - NODE HJ5, HJ6, HJ7: GENERATOR, UAT & MPT RELAY PANEL	3.57E-08	4.66E-08
FC382_1560	B98	1-1D - 4160V BOP SWGR 1D .	3.16E-08	4.23E-08
FC382_1564	B75	1-COM-A - 4KV BUS COMMON 'A' .	7.27E-08	8.31E-08
FC423_9034	B75	1-CASBCH-XFMR-1 - CASWELL BEACH XFMR NO. 1 230KV - 24KV	6.00E-08	6.83E-08
FC423_9043	B75	1-SAT-START-AUX-XFMR - START UP AUX TRANSFORMER 1	6.00E-08	6.83E-08
FC210_4525	B75	1-COM-C - 480V UNIT SUBSTATION COM-C	6.45E-08	7.17E-08
FC230_4741	B75	1-XU-38 - NODE HJ8: CASWELL BEACH LINE RLY PNL & SWYD TERM CAB	1.19E-08	1.85E-08
FC382_1598	B75	1-1TB - 480V MCC 1TB	1.12E-08	1.69E-08
FC382_1599	B75	1-1TC - 480V MCC 1TC	1.12E-08	1.69E-08
FC382_1558	B98	1-1B - 4160V BOP SWGR 1B .	1.45E-08	1.94E-08
FC230_4740	B98	1-XU-8 - NODE HJ5, HJ6, HJ7: GENERATOR, UAT & MPT RELAY PANEL	2.22E-08	2.68E-08
FC382_1558	B75	1-1B - 4160V BOP SWGR 1B.	7.44E-09	1.19E-08
FC210_4528	B75	1-COM-C-FD6-XFMR - UNIT SUB TRANSFORMER 4160-480V	9.94E-09	1.43E-08
FC382_1564	B98	1-COM-A - 4KV BUS COMMON 'A' .	2.42E-08	2.77E-08
FC423_9034	B98	1-CASBCH-XFMR-1 - CASWELL BEACH XFMR NO. 1 230KV - 24KV	2.00E-08	2.28E-08
FC423_9043	B98	1-SAT-START-AUX-XFMR - START UP AUX TRANSFORMER 1	2.00E-08	2.28E-08
FC213_4621	B75	1-1B-2-125VDC-CHRGR - NODE GB7: 125VDC BATTERY 1B-2 CHARGER	6.56E-08	6.82E-08
FC213_4622	B75	1-1B-1-125VDC-CHRGR - NODE GB6: 125VDC BATTERY 1B-1 CHARGER	6.56E-08	6.82E-08
FC423_9033	BOS	1-CASBCH-XFMR-1 - CASWELL BEACH XFMR NO. 1 230KV - 24KV	1.73E-08	1.97E-08
FC423_9042	BOS	1-SAT-START-AUX-XFMR - START UP AUX TRANSFORMER 1	1.73E-08	1.97E-08
FC230_4781	B75	1-C95-P652 - NODE J0J: DATA AQUISITION PANEL	1.34E-08	1.54E-08
FC213_4628	B75	1-1B-250VDC - 125/250VDC SWITCHBOARD 1B	3.43E-08	3.63E-08
FC382_1598	B98	1-1TB - 480V MCC 1TB	3.73E-09	5.62E-09
FC382_1599	B98	1-1TC - 480V MCC 1TC	3.73E-09	5.62E-09

Table A4-7, Important Fire Sources for EDG CT Impact				
Source	Scen	Source Description	Base CDF	Application CDF
FC230_4741	B98	1-XU-38 - NODE HJ8: CASWELL BEACH LINE RLY PNL & SWYD TERM CAB	5.22E-09	6.79E-09
FC210_4528	B98	1-COM-C-FD6-XFMR - UNIT SUB TRANSFORMER 4160-480V	3.31E-09	4.76E-09
FC213_4617	B75	1-1B-1-125VDC-BAT - 125 VDC BATTERY FOR 125/250 VDC.. DISTRIBUTION SWITCHBOARD 1B	3.63E-08	3.77E-08
FC390_1777	BHGL	1-FW-1A-FEED-PMP - RX FEEDWATER PUMP 1A	2.79E-09	4.20E-09
Unit 2 CDF				
FC230_4752	B75	1-H12-P614 - NODE JF3, JP5: NSSS TEMP REC & LEAK DET VERTICAL BOARD	1.68E-07	2.11E-07
FC402_2598	B75	2-2D - SWGR Bus 2D	1.03E-07	1.33E-07
FC402_2600	B75	2-2C - SWGR Bus 2C	9.94E-08	1.29E-07
FC230_4837	B98	2-XU-8 - NODE HJ5, HJ7: GENERATOR,UAT & MPT RELAY PANEL	9.56E-08	1.17E-07
FC230_4752	B98	1-H12-P614 - NODE JF3, JP5: NSSS TEMP REC & LEAK DET VERTICAL BOARD	5.60E-08	7.02E-08
FC402_2598	B98	2-2D - SWGR Bus 2D	3.45E-08	4.43E-08
FC230_4740	B75	1-XU-8 - NODE HJ5, HJ6, HJ7: GENERATOR, UAT & MPT RELAY PANEL	3.56E-08	4.38E-08
FC230_4758	B98	1-H12-P612 - NODE JN5, JG2: FEEDWATER & REACTOR RECIRC INSTR PANEL	2.68E-08	3.40E-08
FC410_2783	BHGL	2-FW-2A-FEED-PMP - RX FEEDWATER PUMP 2A	1.94E-08	2.56E-08
FC230_4741	B75	1-XU-38 - NODE HJ8: CASWELL BEACH LINE RLY PNL & SWYD TERM CAB	1.18E-08	1.77E-08
FC423_9018	B75	2-SAT-START-AUX-XFMR - UNIT 2 START UP AUX XFMR	3.75E-08	4.27E-08
FC423_9028	B75	2-CASBCH-XFMR-2 - CASWELL BEACH XFMR NO. 2 230KV - 24KV	3.75E-08	4.27E-08
FC230_4740	B98	1-XU-8 - NODE HJ5, HJ6, HJ7: GENERATOR, UAT & MPT RELAY PANEL	1.25E-08	1.77E-08
FC215_4648	B75	2-2B-2-125VDC-CHRGR - NODE GB7: 125VDC BATTERY 2B-2 CHARGER	2.09E-08	2.47E-08
FC215_4649	B75	2-2B-1-125VDC-CHRGR - NODE GB6: 125VDC BATTERY 2B-1 CHARGER	2.09E-08	2.47E-08
FC402_2599	B75	2-COM-B - Common B	4.73E-09	7.35E-09
FC211_4571	B75	2-COM-D-FP0-CPT - SUBSTN FANS AND HTRS 5 KVA PWR XFMR	5.93E-09	8.07E-09
FC230_4741	B98	1-XU-38 - NODE HJ8: CASWELL BEACH LINE RLY PNL & SWYD TERM CAB	3.94E-09	5.92E-09
FC423_9018	B98	2-SAT-START-AUX-XFMR - UNIT 2 START UP AUX XFMR	1.25E-08	1.42E-08
FC423_9028	B98	2-CASBCH-XFMR-2 - CASWELL BEACH XFMR NO. 2 230KV - 24KV	1.25E-08	1.42E-08

Table A4-7, Important Fire Sources for EDG CT Impact				
Source	Scen	Source Description	Base CDF	Application CDF
FC215_4655	B75	2-2B-250VDC - 125/250VDC SWITCHBOARD 2B	8.17E-09	9.68E-09
FC423_9017	BOS	2-SAT-START-AUX-XFMR - UNIT 2 START UP AUX XFMR	1.30E-08	1.45E-08
FC423_9027	BOS	2-CASBCH-XFMR-2 - CASWELL BEACH XFMR NO. 2 230KV - 24KV	1.30E-08	1.45E-08
FC215_4644	B75	2-2B-1-125VDC-BAT - 125 VDC BATTERY FOR 125/250 VDC.. DISTRIBUTION SWITCHBOARD 2B	9.63E-09	1.10E-08
FC404_2694	B75	2-HC-HYDROGEN-CONT-PNL - Node: 2HN8 GEN H2 GAS & STATOR .... COOLING CONT PANEL	1.96E-09	3.33E-09
FC215_4650	B98	2-C72-S001B - NODE GG1: HIGH INERTIA AC MOTOR-GENERATOR SET 'B'	7.74E-09	9.03E-09
FC215_4649	B98	2-2B-1-125VDC-CHRGR - NODE GB6: 125VDC BATTERY 2B-1 CHARGER	6.96E-09	8.24E-09
FC215_4648	B98	2-2B-2-125VDC-CHRGR - NODE GB7: 125VDC BATTERY 2B-2 CHARGER	6.96E-09	8.24E-09
FC402_2597	B75	2-2B - SWGR Bus 2B	1.87E-09	3.10E-09
Unit 1 LERF				
FC230_4740	B98	1-XU-8 - NODE HJ5, HJ6, HJ7: GENERATOR, UAT & MPT RELAY PANEL	1.40E-08	1.85E-08
FC230_4741	B98	1-XU-38 - NODE HJ8: CASWELL BEACH LINE RLY PNL & SWYD TERM CAB	2.41E-09	3.91E-09
FC382_1560	B75	1-1D - 4160V BOP SWGR 1D .	5.00E-10	7.36E-10
FC230_4770	B98	1-XU-20 - NODE JJ5: BOP TERM CAB FOR HD, EX, CFD, CW SYSTEMS	3.09E-09	3.27E-09
FC230_4771	B98	1-XU-21 - NODE JJ6: BOP TERMINATION CAB FOR SYSTEM CW & CD	3.09E-09	3.27E-09
FC230_4747	B75	1-H12-P606 - NODE JG5, JH9: RADIATION MONITORING CABINET	2.45E-07	2.45E-07
FC230_4769	B75	1-XU-7 - NODE H58: DG1 ESS LOGIC CAB	2.42E-08	2.43E-08
FC382_1560	B98	1-1D - 4160V BOP SWGR 1D.	1.67E-10	2.45E-10
FC230_4799	B75	1-XU-16 - NODE JJ1: BOP TERMINAL CAB FOR CONDENSATE SYSTEM	7.43E-09	7.48E-09
FC230_4769	B98	1-XU-7 - NODE H58: DG1 ESS LOGIC CAB	7.63E-09	7.67E-09
FC382_1558	B98	1-1B - 4160V BOP SWGR 1B.	7.69E-11	1.13E-10
FC227_4683	B98	1-XU-77 - NODE J1C: TSC/EOF COMPUTER ISOLATOR CABINET	1.25E-08	1.26E-08
FC230_4742	B98	1-XU-35 - NODE JD6: BOP ANNUNCIATOR LOGIC CAB FOR UA-7 TO 11	8.25E-11	1.10E-10
FC230_4781	B75	1-C95-P652 - NODE J0J: DATA AQUISITION PANEL	4.14E-11	6.84E-11
FC230_4740	B75	1-XU-8 - NODE HJ5, HJ6, HJ7: GENERATOR, UAT & MPT RELAY PANEL	5.49E-11	7.67E-11
FC230_4751	B75	1-XU-6 - NODE JF4: DCS ELECTRONIC EQUIPMENT ROOM CONTROLLER CABINET	1.56E-10	1.76E-10

Table A4-7, Important Fire Sources for EDG CT Impact				
Source	Scen	Source Description	Base CDF	Application CDF
FC230_4750	B75	1-XU-56 - NODE JX1: TERMINATING CABINET DIV II	1.29E-10	1.50E-10
FC242_9629	B98	TRANS-DG+23Z05-E - Transient	0.00E+00	1.62E-11
FC230_4741	B75	1-XU-38 - NODE HJ8: CASWELL BEACH LINE RLY PNL & SWYD TERM CAB	1.83E-11	3.28E-11
Unit 2 LERF				
FC230_4752	B75	1-H12-P614 - NODE JF3, JP5: NSSS TEMP REC & LEAK DET VERTICAL BOARD	1.62E-09	2.30E-09
FC230_4837	B98	2-XU-8 - NODE HJ5, HJ7: GENERATOR,UAT & MPT RELAY PANEL	1.46E-09	2.05E-09
FC402_2600	B75	2-2C - SWGR Bus 2C	5.51E-10	8.06E-10
FC402_2598	B75	2-2D - SWGR Bus 2D	5.68E-10	8.22E-10
FC230_4752	B98	1-H12-P614 - NODE JF3, JP5: NSSS TEMP REC & LEAK DET VERTICAL BOARD	5.39E-10	7.68E-10
FC402_2598	B98	2-2D - SWGR Bus 2D	1.89E-10	2.74E-10
FC230_4758	B98	1-H12-P612 - NODE JN5, JG2: FEEDWATER & REACTOR RECIRC INSTR PANEL	1.32E-10	1.99E-10
FC410_2783	BHGL	2-FW-2A-FEED-PMP - RX FEEDWATER PUMP 2A	1.18E-10	1.72E-10
FC228_4693	B75	2-XU-77 - NODE J1C: TSC/EOF COMPUTER ISOLATOR CAB	2.56E-09	2.57E-09
FC230_4741	B75	1-XU-38 - NODE HJ8: CASWELL BEACH LINE RLY PNL & SWYD TERM CAB	1.83E-11	3.28E-11
FC230_4888	B98	2-XU-44 - NODE JE9: DIV 1 ANNUN LOGIC CAB FOR UA-17 & 21	2.75E-09	2.76E-09

Notes on Table A4-6; Under Scenario
B98 is the 98th percentile file
B75 is the 75th percentile fire
BHEAF is High energy arcing fault fire
BOL is an oil fire.
BHGL is a hot gas layer (full room burnup)

Table A4-8: Fire Model Evaluation Results Only	
Evaluation Metric	Result
Unit 1 Baseline Fire CDF	6.27E-05 /yr. [1]
Unit 1 Application Fire CDF- All EDGs using nominal UA for extended maintenance	6.29E-05 /yr.
Unit 1 ΔCDF - All EDGs using nominal UA for extended maintenance	2.1E-07 /yr.
Unit 1 ICCDP - All EDGs using nominal UA for extended maintenance	2.1E-07
Unit 1 Application CCDP – EDG 2 unavailable	6.57E-05
Unit 1 ΔCCDP - EDG 2 unavailable	3.0E-6
Unit 1 ICCDP - EDG 2 unavailable * AOT fraction of 14/365	1.15E-7
Unit 1 ICCDP - EDG 2 * 4 EDG Maintenance Events [2]	4.6E-7
Unit 1 ΔLERF- All EDGs using nominal UA for extended maintenance	7.2E-09 /yr.
Unit 1 ICLERP - All EDGs using nominal UA for extended maintenance	7.2E-09
Unit 2 Baseline Fire CDF	6.18E-05 /yr. [1]
Unit 2 Application Fire CDF- All EDGs using nominal UA for extended maintenance	6.21E-05 /yr.
Unit 2 ΔCDF - All EDGs using nominal UA for extended maintenance	2.4E-07 /yr.
Unit 2 ICCDP - All EDGs using nominal UA for extended maintenance	2.4E-07
Unit 2 Application CCDP – EDG 4 unavailable	6.38E-5
Unit 2 ΔCCDP - EDG 4 unavailable	2.0E-6
Unit 2 ICCDP – EDG 4 unavailable * AOT fraction of 14/365	7.67E-8
Unit 2 ICCDP - EDG 4 UA * 4 EDG Maintenance Events [2]	3.1E-7
Unit 2 ΔLERF- All EDGs using nominal UA for extended maintenance	2.3E-09 /yr.
Unit 2 ICLERP - All EDGs using nominal UA for extended maintenance	2.3E-09

1 - Does not contain multi-compartment or control room evacuation which, when added, total 6.70E-05 for unit 1 and 6.61E-05 for unit 2.

2 - Multiplying the ICCDP of the most significant DG by 4 maintenance events is bounding.

4.6.2. Seismic Evaluation

The seismic hazard is not considered to have a significant impact on this application when considering a seismic event while a DG is in an extended AOT. The four emergency diesel generators are all designed to the same seismic criteria, that being a 0.16g horizontal and 0.1g vertical seismic event. The HCLPF value for the DGs is 0.26g. The HCLPF for the E1, E2, E3 and E4 buses is 0.24. Since the existing DGs are the same equipment and highly coupled, they would all be expected to be failed by the same seismic event. Therefore, the unavailability of one DG during a seismic event would be of little significance since it would be expected to fail if the other DG's failed due to the seismic event. Similarly the buses are expected to withstand up to a static 0.08g seismic event, thus the buses are considered the limiting equipment in a seismic event.

4.7. Application Metrics Analysis

The metrics developed in Reg. Guides 1.174 [Ref. 2] and 1.177 [Ref. 3] assist in determining the overall risk associated with the application. These metrics are Δ CDF, Δ

LERF, ICCDP and ICLERP for the internal events, internal flooding portions, high winds, external flooding and fire of the BNP PRA model. They are calculated for the application model. Key uncertainties are analysis within each hazard evalation. Results of the Unit 1 and Unit 2 model runs to the aforementioned metrics is presented in the Table A4-9 below.

Table A4-9: CDF and LERF Metrics Analysis Summary			
CDF			
Unit 1			
Risk Metric	Risk Metric Results	Risk Significance Guideline	Meets Acceptance Guideline
ΔCDF	9.0E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,1}$	4.1E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,2}$	6.2E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,3}$	3.0E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,4}$	3.2E-08	<1.0E-06 (Region III)	Yes
ICCDP (total non-fire)	1.7E-07	<1.0E-06 (Region III)	Yes
Unit 1Fire			
ΔCDF (fire)	2.1E-07	<1.0E-06 (Region III)	Yes
ICCDP (fire)	4.6E-07	<1.0E-06 (Region III)	Yes
Unit 1 Totals			
ΔCDF	3.0E-07	<1.0E-06 (Region III)	Yes
ICCDP	6.3E-07	<1.0E-06 (Region III)	Yes
Unit 2			
Risk Metric	Risk Metric Results	Risk Significance Guideline	Meets Acceptance Guideline
ΔCDF	8.0E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,1}$	3.0E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,2}$	3.0E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,3}$	4.1E-08	<1.0E-06 (Region III)	Yes
$ICCDP_{DG\,4}$	6.0E-08	<1.0E-06 (Region III)	Yes
ICCDP (total non-fire)	1.6E-07	<1.0E-06 (Region III)	Yes
Unit 2 Fire			
ΔCDF (fire)	2.4E-07	<1.0E-06 (Region III)	Yes
ICCDP (fire)	3.1E-07	<1.0E-06 (Region III)	Yes
Unit 2 Totals			
ΔCDF	3.2E-07	<1.0E-06 (Region III)	Yes
ICCDP	4.7E-07	<1.0E-06 (Region III)	Yes
LERF			
Unit 1			
ΔLERF	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,1}$	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,2}$	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,3}$	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,4}$	<1.0E-09	<1.0E-07 (Region III)	Yes
Unit 1 Fire			
ΔLERF (fire)	7.2E-09	<1.0E-07 (Region III)	Yes
ICLERP (fire)	7.2E-09	<1.0E-07 (Region III)	Yes
Unit 1 Totals			
ΔLERF	<8.2E-09	<1.0E-07 (Region III)	Yes

Table A4-9: CDF and LERF Metrics Analysis Summary			
CDF			
Unit 1			
Risk Metric	Risk Metric Results	Risk Significance Guideline	Meets Acceptance Guideline
ICLERP	<1.1E-08	<1.0E-07 (Region III)	Yes
Unit 2			
ΔLERF	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,1}$	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,2}$	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,3}$	<1.0E-09	<1.0E-07 (Region III)	Yes
$ICLERP_{DG\,4}$	<1.0E-09	<1.0E-07 (Region III)	Yes
Unit 2 Fire			
ΔLERF(fire)	2.3E-09	<1.0E-07 (Region III)	Yes
ICLERP (fire)	2.3E-09	<1.0E-07 (Region III)	Yes
Unit 2 Totals			
ΔLERF	<3.3E-09	<1.0E-07 (Region III)	Yes
ICLERP	<6.3E-09	<1.0E-07 (Region III)	Yes

4.8. PRA Uncertainty Analysis

Reg. Guides 1.174 and 1.177 require that appropriate consideration of uncertainty be given in analysis and interpretation of findings. The impact of uncertainty is characterized and these uncertainties are recognized when assessing whether the principles stated in Reg. Guides 1.174 and 1.177 are being met. The following evaluation demonstrates that, within reasonable assurance, the numerical risk results of this application fall within Region III even when the uncertainties associated with the PRA model are taken into consideration.

Three types of uncertainty are evaluated; parameter uncertainty, model uncertainty, and completeness uncertainty. These are defined extensively in Reg. Guides 1.174 [Ref 2], Reg. Guide 1.177 [Ref 3], NUREG 1855 [Ref 4], and EPRI Report 1016737 [Ref 5].

4.8.1. Parametric Uncertainty

The parametric uncertainty for the BNP 2011 model PRA model before changes were made for this application analysis was evaluated using a Monte Carlo approach to determine the mean, and upper and lower uncertainty bounds [Ref. 4]. This analysis was performed for both the Level 1 and LERF models. The peer review found the ASME Capability Category for the two Level I Supporting Requirements (SR), QU-A3 and QU-E3, and the two LERF SRs, LE-E4 and LE-F3, dealing with parameter uncertainty to meet or exceed capability category II as defined in the ASME standard [Ref 1]. The parameter values for both CDF and LERF for each unit in the base model are provided in Tables A4-10 and A4-11 and Figures A4-1 through A4-4 below. The point estimate CDF calculated by the BNP 2011 model is 7.87E-06 for Unit 1 and 7.86E-6 for Unit 2.

Table A4-10: Calculated Parameters for the CDF Monte Carlo Assessment		
CDF Parameter Value	BNP 1	BNP 2
Mean	7.92E-06	7.96E-06
Median	6.87E-06	6.90E-06
95% Upper Bound	1.46E-05	1.46E-05
5% Lower Bound	4.44E-06	4.43E-06

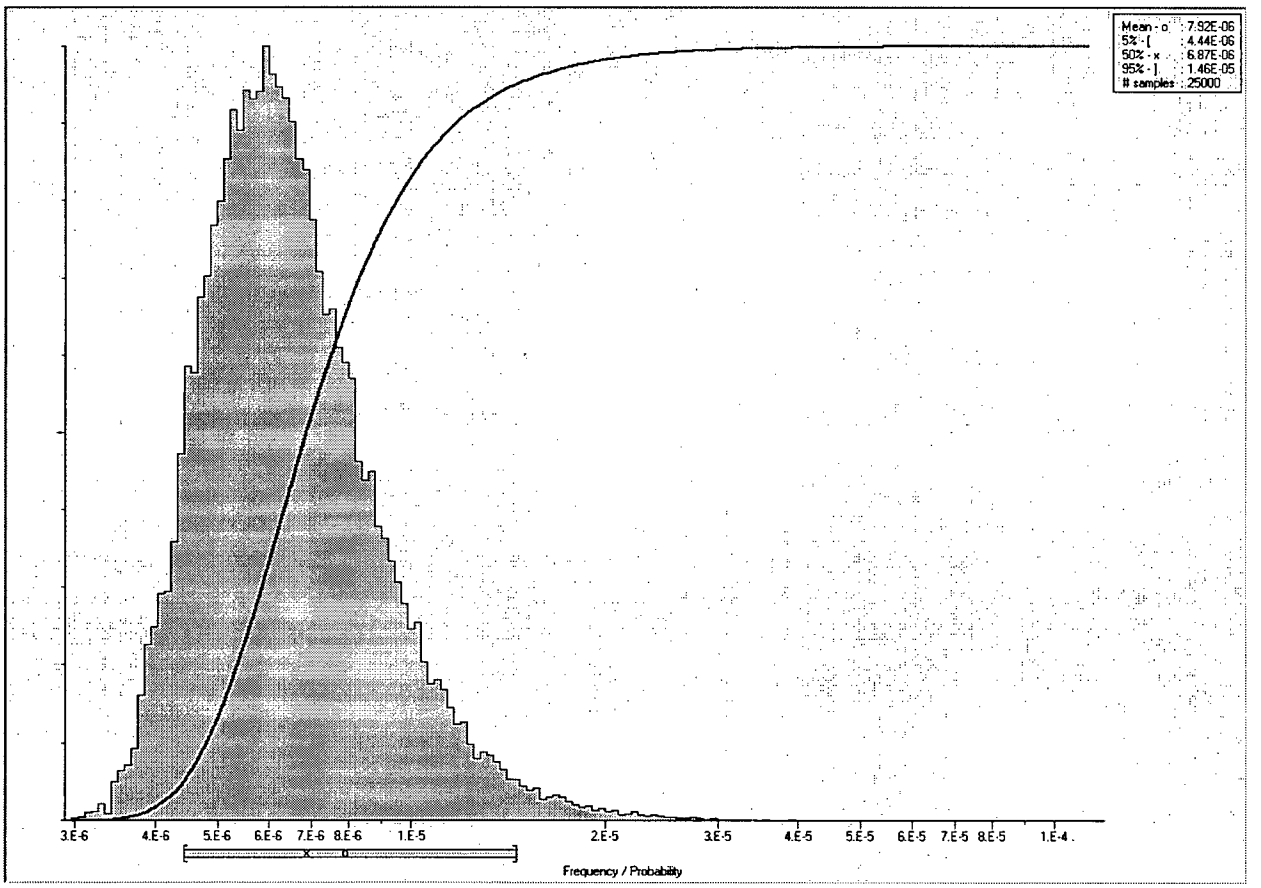


Figure A4-1: Unit 1 CDF Parametric Uncertainty Distribution

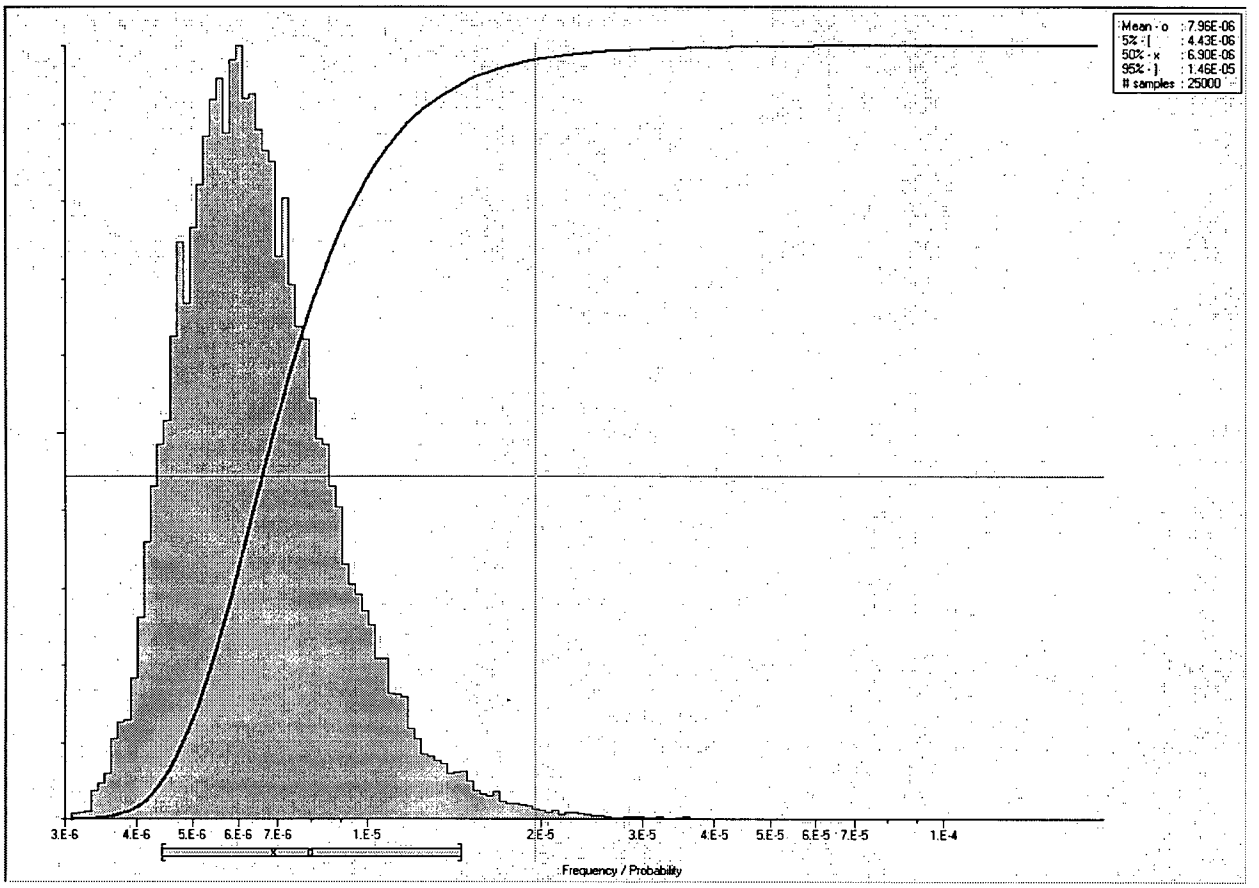


Figure A4-2: Unit 2 CDF Parametric Uncertainty Distribution

The point estimate LERF calculated by the BNP 2011 model is 5.67E-07 for Unit 1 and 5.65E-07 for Unit 2.

Table A4-11: Calculated Parameters for the LERF Monte Carlo Assessment		
LERF Parameter Value	BNP 1	BNP 2
Mean	5.67E-07	5.64E-07
Median	5.36E-07	5.40E-07
95% Upper Bound	7.61E-07	7.34E-07
5% Lower Bound	4.63E-07	4.68E-07

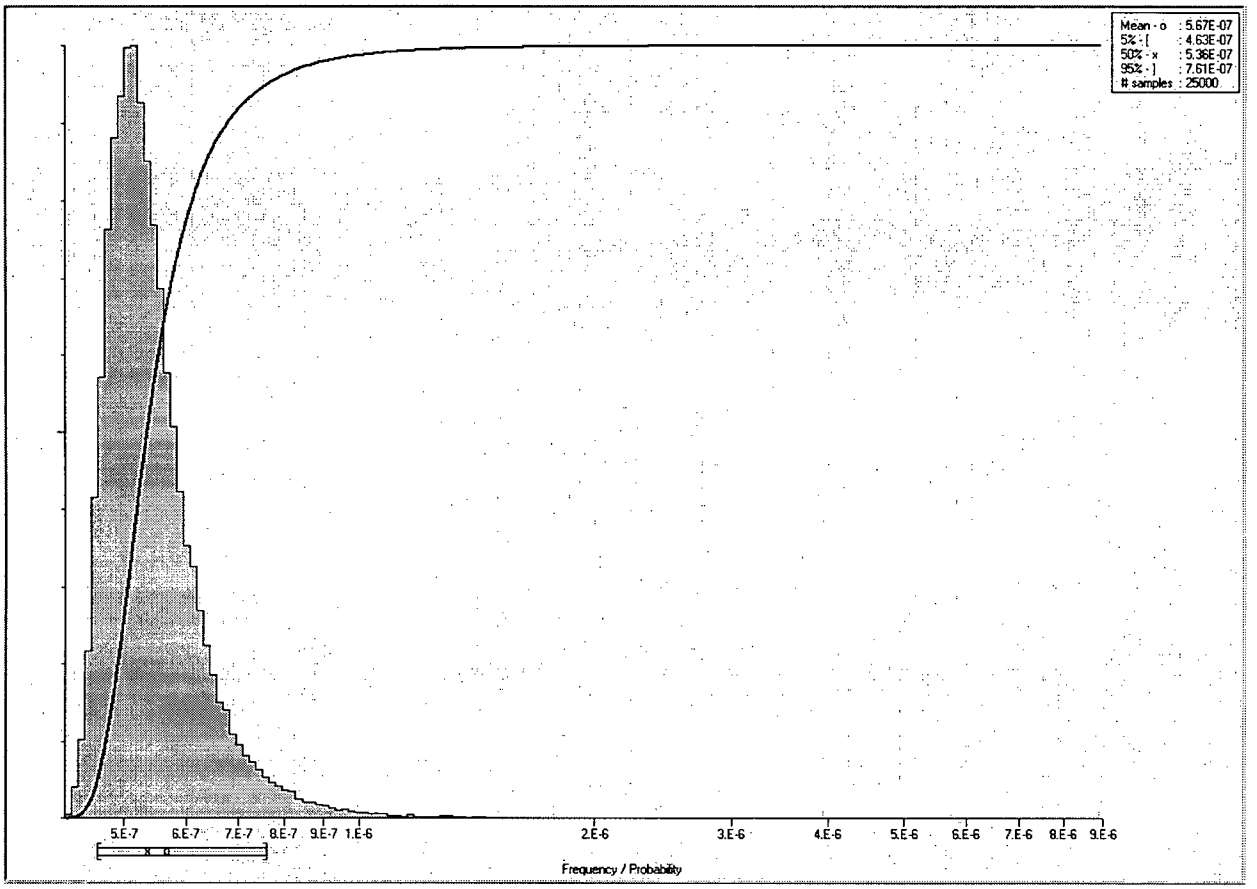


Figure A4-3: Unit 1 LERF Parametric Uncertainty Distribution

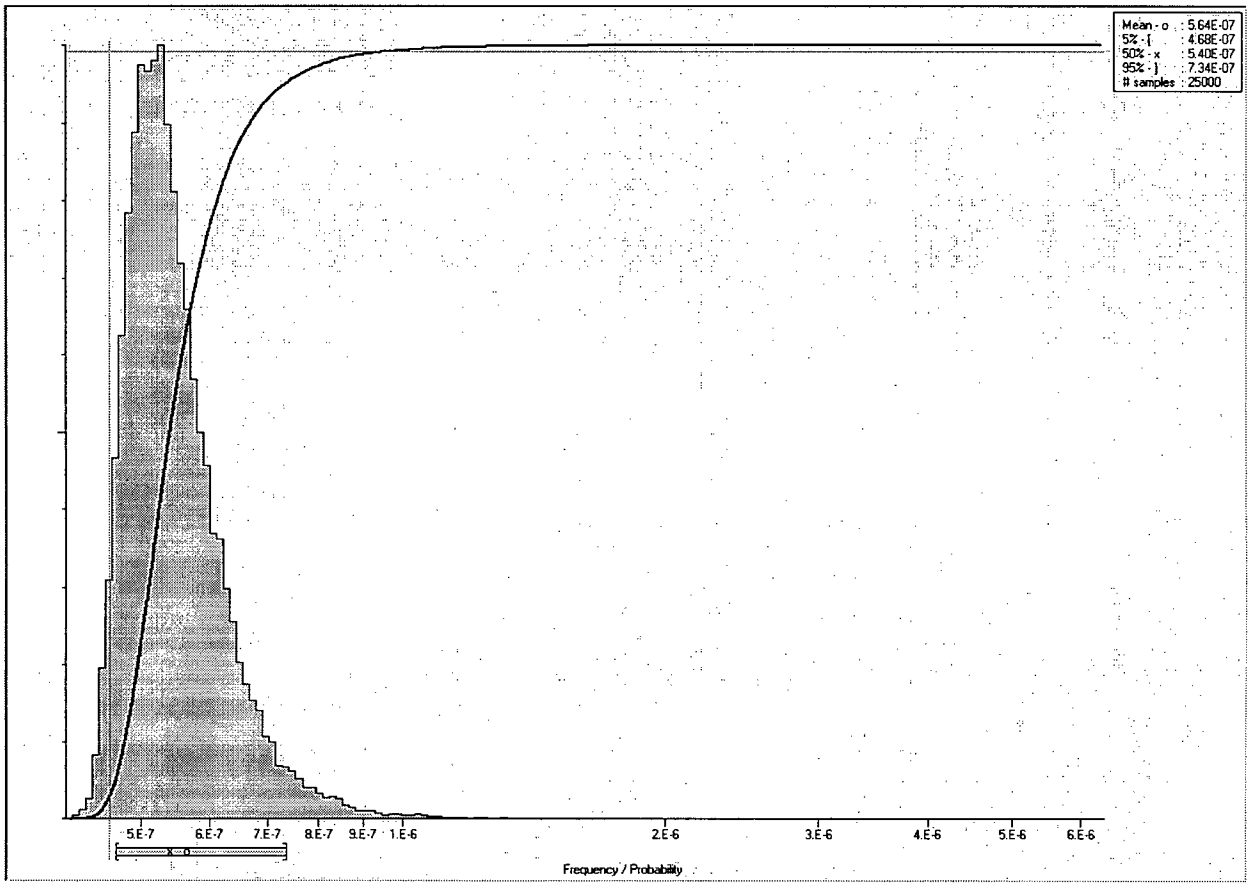


Figure A4-4: Unit 2 LERF Parametric Uncertainty Distribution

The propagation of parametric uncertainty in the CDF equation demonstrated that the point estimate mean and calculated mean are within 10%; therefore, additional uncertainty evaluations are not warranted according to the guidance in Section 3.1.1 of the EPRI report [Ref 5]. The propagation of parametric uncertainty in the LERF equation demonstrated that the point estimate mean is equal to the calculated parametric mean; and according to the guidance in Section 3.1.1 of the EPRI report, additional sensitivity studies are also not warranted. [Ref 5]

The range of the uncertainty interval is not expected to significantly change for the application model. The added DG unavailabilities apply only to the DG extended outage evolutions and are not state-of-knowledge correlated basic events. The SUPP-DG fail to start and run event data are based on the existing DG data. They are state-of-knowledge correlated basic events, but are expected to be conservative and the application model is not very sensitive to this data. The failure events due to high winds (above 135 mph) for the SUPP-DG are conservatively set at 1.0 and are not state-of-knowledge correlated events. The 5 new breaker fail-to-open events are state-of-knowledge correlated basic events because they are based on data for all other AC breaker failure events. The application model is not very sensitive to these new events.

Because only a few events were added to the application model that is state-of-knowledge correlated events, and because the application model results are not very sensitive to these events, their impact on the baseline uncertainty interval is expected to be small. A separate parametric uncertainty analysis for the application model is deemed unnecessary because a bulk of the contributing scenarios do not involve multiple events that are impacted by state-of-knowledge correlation effects.

4.8.2. Model Uncertainty

Model Uncertainty was evaluated in three parts; BNP plant specific uncertainty, BWR generic uncertainty, and application specific uncertainty. This was done to capture all of the sources of model uncertainty that could affect the analysis results. All uncertainties determined to be key uncertainties for the application are evaluated further with sensitivity studies.

4.8.2.1. BNP Plant Specific Uncertainty

The BNP PRA uncertainty analysis classifies each plant specific source of uncertainty as one of three levels (URI); high, medium, and low. One basis for the high classification is the uncertainty contributes to more than 10% of the CDF. These uncertainties with a high classification were further evaluated below as potential key uncertainties. No classifications less than high were found to be high due to the application. Table A4-12 delineates the results of that analysis. No key uncertainties were identified during this evaluation.

Table A4-12: Plant Specific High Level Uncertainty Evaluations

No	URI	Uncertainty Description	Uncertainty Evaluation
1	High	An excessive vessel LOCA initiator, e.g. reactor vessel rupture, is assumed to result in inadequate flow to the vessel from the RHR system.	Not applicable for this application
2	High	If the minimum flow bypass line is not isolated when required, flow will be diverted. However, this diversion flow path is not large enough to fail the associated RHR pump's discharge.	Application is not impacted by RHR
3	High	The RHR system is available during testing and for LPCI during suppression pool cooling	Application is not impacted by RHR
4	High	For the LPCI model, the water level is assumed to be below the LL#1 permissive level.	Application is not impacted by RHR
5	High	The actuation of the ADS is assumed to be uninhibited for all initiating events except ATWS.	Not applicable for this application
6	High	SRV failure to open data is highly uncertain.	SRV failures did not contribute to the delta risk
7	High	BNP Unit 2 digital upgrades are appropriately represented by the analog components that they replaced. The PRA model uses the same analog failure modes; no model changes were made.	Realistically conservative bias
8	High	Use of distribution panel 1A(B) as an alternative power source to the 125V DC distribution panel 2A(B) or the reverse is not modeled.	Realistically conservative bias

Table A4-12: Plant Specific High Level Uncertainty Evaluations			
No	URI	Uncertainty Description	Uncertainty Evaluation
9	High	Following battery failure or during charger maintenance, it is assumed that the associated charger output breaker will trip on overvoltage from motors starting on the bus, such that DC power to the bus will fail.	Realistically conservative bias
10	High	As with any data collection effort, uncertainties arise in evaluating and categorizing the data.	Peer reviewed cat II
11	High	Components located near each other should be included.	Peer reviewed cat II
12	High	There is some uncertainty introduced with the assignment of staggered and non-staggered testing bases for common cause failure rate determination	Peer reviewed cat II
13	High	Failure of five SRVs to lift is assumed to result in vessel overpressure and core damage.	Applicable to ATWS only. Not applicable for this application
14	High	Failure to relieve pressure is postulated to result in a failure of the reactor vessel that cannot be mitigated by injection sources.	Not applicable for this application
15	High	A time constraint on manual scram and ARI during ATWS scenarios is considered conservative.	Not applicable for this application
16	High	Equipment survivability beyond design basis environments is not included.	Realistically conservative bias
17	High	In the event of failed containment cooling or venting, injection after containment failure is not credited prior to core damage.	Realistically conservative bias
18	High	Actions that contributed directly to the occurrence of an initiating event (type B events) were not quantified explicitly. Efforts during the modeling process were primarily directed at identifying interactions of types A and C.	Not applicable for this application
19	High	For all actions except for the short term actions associated with a response to an anticipated transient without scram (ATWS), the median response times and execution times were estimated based on discussions with operations personnel.	Self-reviewed to meet cat II
20	High	For each type Cp interactions, the corresponding failure event was initially assigned a screening probability of 0.1.	Peer reviewed cat II
21	High	To quantify the cognitive portion, the higher of the probabilities suggested by the HCR/ORE model or the cause-based approach was used.	Realistically conservative bias
22	High	Flooding is assumed to occur in all rooms at an equal rate.	Not applicable for this application
23	High	For fixed volume sources, such as the RCC system, all inventory is assumed to be lost from the system at the pump flow rate.	Not applicable for this application
24	High	The very large flow rate is selected as approximately factor of ten greater than the large flow rate.	Not applicable for this application
25	High	Flow rate is estimated assuming a 360 degree through-wall crack with a width equivalent to one-half the wall thickness of the pipe.	Not applicable for this application

Table A4-12: Plant Specific High Level Uncertainty Evaluations			
No	URI	Uncertainty Description	Uncertainty Evaluation
26	High	To simplify the assessment, the flow rate for pipes greater in size than EPRI classification class 1 (> 2 inches) is reduced by a factor of two to conservatively address the likelihood of a lesser break and, therefore, lower flow.	Not applicable for this application
27	High	The EPRI methodology used makes a general assumption that there is an equal likelihood that the pipe failure will result in either maximum possible or any lower flow rate.	Not applicable for this application
28	High	An assumption is made that selects an average break size based on the class size and the frequency is not altered. This simplification results in a somewhat conservative result for the larger break sizes.	Not applicable for this application
29	High	The probability of a flood given a maintenance event is uncertain and human error dominates this type of event.	Not applicable for this application
30	High	Operator isolation is assumed to be ten times more likely for maintenance events than for pipe breaks.	Not applicable for this application
31	High	The starting air accumulators can provide up to five hours of air for engine operation.	Realistically conservative bias
32	High	Common cause failures are assumed to occur simultaneously.	Peer reviewed cat II
33	High	DC battery life is assumed to be 2 to 4 hours.	Realistically conservative bias
34	High	The release may be impacted when the source of fission products is at a very high temperature.	Delta LERF too small for consideration
35	High	For Arrest Core Melt Progress in in-Vessel, the best estimate success criteria used in this evaluation are based on the time available from the initiation of core degradation until just before substantial core relocation occurs. This typically is on the order of 30-40 minutes.	ΔLERF at or below 1E-11 and not significantly impacted by application
36	High	Estimating containment fragility associated with flooded vessel loads, extreme thermal, and shear loads on pipe extensions through the biological shield includes considerable uncertainty.	ΔLERF at or below 1E-11 and not significantly impacted by application
37	High	There are minimal or no credit for recovery of failed equipment and the loss of adequate injection at the time of containment failure.	ΔLERF at or below 1E-11 and not significantly impacted by application
38	High	It is judged that the SRVs may reclose or not be capable of being opened.	ΔLERF at or below 1E-11 and not significantly impacted by application
39	High	Injection flow rate of approximately 1000 gpm is assumed required to overcome the heat of oxidation and to prevent the core melt progression.	ΔLERF at or below 1E-11 and not significantly impacted by application
40	High	The BNP model assumes that the crew will Initiate drywell venting if combustible gases are present in the containment. This results in a high and early release for accidents such as Class IA and IBE when RPV breach occurs. The model assumes that the crew will accomplish the actions defined In the SAMGs.	ΔLERF at or below 1E-11 and not significantly impacted by application

Table A4-12: Plant Specific High Level Uncertainty Evaluations			
No	URI	Uncertainty Description	Uncertainty Evaluation
41	High	The vacuum breaker fail to close (FTC) basic events are quantified based on an estimated number of vacuum breaker cycles assumed to occur during the event.	ΔLERF at or below 1E-11 and not significantly impacted by application
42	High	It is not possible to reach definitive conclusions regarding steam explosion phenomena in the Brunswick Mark I containment.	ΔLERF at or below 1E-11 and not significantly impacted by application
43	High	It is assumed that common cause failures are most often discovered as a result of scheduled testing	The common cause treatment meets ASME Capability Category II

4.8.2.2. BWR Generic Uncertainty

The EPRI uncertainty guideline [Ref 5] provides a generic table of uncertainties. These uncertainties were evaluated to determine if any were key uncertainties for this application. The results of that evaluation are delineated in Table A4-13. No key uncertainties were identified during this evaluation.

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
Initiating Event Analysis (IE)			
1. Grid stability	The LOOP frequency is a function of several factors including switchyard design, the number and independence of offsite power feeds, the local power production and consumption environment and the degree of plant control of the local grid and grid maintenance. Three different aspects relate to this issue: 1a. LOOP initiating event frequency values and recovery probabilities 1b. Conditional LOOP probability 1c. Availability of dc power to perform restoration actions	LOOP sequences	Applicable Not a key uncertainty because consensus model was used to determine LOOP frequencies. Consequential LOOP sequences were added before the last peer review and found to meet capability category II. A consensus model was used for offsite power recovery.
		Consequential LOOP sequences	
		LOOP or consequential LOOP sequences with offsite power recovered.	
2 Support System Initiating Events	Increasing use of plant-specific models for support system initiators (e.g., loss of SW, CCW, or IA, and loss of ac or dc buses) have led to inconsistencies in approaches	Support system event sequences	Not applicable – Only loss of offsite power or AC bus initiators could affect the applicable metrics for this application.

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
	across the industry. A number of challenges exist in modeling of support system initiating events: 2a. Treatment of common cause failures 2b. Potential for recovery		
3 LOCA initiating event frequencies	It is difficult to establish values for events that have never occurred or have rarely occurred with a high level of confidence. The choice of available data sets or use of specific methodologies in the determination of LOCA frequencies could impact base model results and some applications.	LOCA sequences	Not applicable – Only loss of offsite power or AC bus initiators could affect the applicable metrics for this application. NUREG 5750 and NUREG 1420 are the BNP reference documents for LOCAs and excessive LOCA respectively
Accident Sequence Analysis (AS)			
4 Operation of equipment after battery depletion	Station Blackout events are important contributors to baseline CDF at nearly every US NPP. In many cases, battery depletion may be assumed to lead to loss of all system capability. Some PSAs have credited manual operation of systems that normally require dc for successful operation (e.g., turbine-driven systems such as RCIC and AFW).	Credit for continued operation of these systems with batteries depleted (e.g., long-term SBO sequences)	Applicable – addressed adequately for this application in the BNP 2011 model
5 RCP seal LOCA treatment – PWRs	The assumed timing and magnitude of RCP seal LOCAs given a loss of seal cooling can have a substantial influence on the risk profile.	Accident sequences involving loss of seal cooling	Not Applicable for BWR
6 Recirculation pump seal leakage treatment – BWRs w/ Isolation Condensers	Recirculation pump seal leakage can lead to loss of the Isolation Condenser. While recirculation pump seal leakage is generally modeled, there is no consensus approach on the likelihood of such leaks.	Accident sequences with long-term use of isolation condenser	Not Applicable for BWR w/o isolation condenser.

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
Success Criteria (SC)			
7 Impact of containment venting on core cooling system NPSH	Many BWR core cooling systems utilize the suppression pool as a water source. Venting of containment as a decay heat removal mechanism can substantially reduce NPSH, even lead to flashing of the pool. The treatment of such scenarios varies across BWR PSAs.	Loss of containment heat removal scenarios with containment venting successful	Applicable – addressed adequately for this application in the BNP 2011 model. The suppression pool is not credited as a water source after a successful containment vent.
8 Core cooling success following containment failure or venting through non hard pipe vent paths	Loss of containment heat removal leading to long-term containment over-pressurization and failure can be a significant contributor in some PSAs. Consideration of the containment failure mode might result in additional mechanical failures of credited systems. Containment venting through "soft" ducts or containment failure can result in loss of core cooling due to environmental impacts on equipment in the reactor/auxiliary building, loss of NPSH on ECCS pumps, steam binding of ECCS pumps, or damage to injection piping or valves. There is no definitive reference on the proper treatment of these issues.	Long term loss of decay heat removal sequences	Applicable - Vent paths other than the hardened wetwell vent path are not credited for non-ATWS sequences and are considered to be a failure of the venting function.
9 Room heat up calculations	Loss of HVAC can result in room temperatures exceeding equipment qualification limits. Treatment of HVAC requirements varies across the industry and often varies within a PSA. There are two aspects to this issue. One involves whether the SSCs affected by loss of HVAC are assumed to fail (i.e., there is uncertainty in the fragility of the components). The other involves how the rate of room heat up is calculated and the assumed timing of the failure.	Dependency on HVAC for system modeling and timing of accident progressions and associated success criteria.	Applicable – DG HVAC is explicitly modeled. Other HVAC systems do not impact the metrics for this application.

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
10 Battery life calculations	Station Blackout events are important contributors to baseline CDF at nearly every US NPP. Battery life is an important factor in assessing a plant's ability to cope with an SBO. Many plants only have Design Basis calculations for battery life. Other plants have very plant/condition specific calculations of battery life. Failing to fully credit battery capability can overstate risks, and mask other potential contributors and insights. Realistically assessing battery life can be complex.	Determination of battery depletion time(s) and the associated accident sequence timing and related success criteria.	Applicable – The sequences dominating risk metrics for this application are non-SBO sequences or external flooding sequences where AC power recovery is not credited. Higher SBO recovery probabilities would not have a significant impact on the metrics for this application.
11 Number of PORVs required for bleed and feed – PWRs	PWR EOPs direct opening of all PORVs to reduce RCS pressure for initiation of bleed and feed cooling. Some plants have performed plant-specific analysis that demonstrate that less than all PORVs may be sufficient, depending on ECCS characteristics & initiation timing.	System logic modeling representing success criterion and accident sequence timing for performance of bleed and feed and sequences involving success or failure of feed and bleed.	Not Applicable for BWR's
12 Containment sump / strainer performance	All PWRs are improving ECCS sump management practices, including installation of new sump strainers at most plants. All BWRs have improved their suppression pool strainers to reduce the potential for plugging. However, there is not a consistent method for the treatment of suppression pool strainer performance.	Recirculation from sump (PWRs) or from the suppression pool (BWRs) system modeling and sequences involving injection from these sources (Note that the modeling should be relatively straightforward, the uncertainty is related to the methods or references used to determine the likelihood of plugging the sump strainer and common cause failure by blockage of the strainers.)	Not Applicable – This is a LOCA concern and not a LOOP concern.

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
13 Impact of failure of pressure relief	Certain scenarios can lead to RCS/RPV pressure transients requiring pressure relief. Usually, there is sufficient capacity to accommodate the pressure transient. However, in some scenarios, failure of adequate pressure relief can be a consideration. Various assumptions can be taken on the impact of inadequate pressure relief.	Success criterion for prevention of RPV overpressure. (Note that uncertainty exists in both the determination of the global CCF values that may lead to RPV overpressure and what is done with the subsequent RPV overpressure sequence modeling.)	Not Applicable – This is a condition that would occur very soon after scram. The BNP SRV's are either mechanically operated or dependent on drywell nitrogen and DC control power. The SRV's have accumulators that are good for several hours after scram and the DC power is provided by batteries. Short term SRV operation is therefore not dependent on DG operability. The initial pressure transient is determined by operation of the SRVs and this the potential for overpressure is not DG or AC or DC power dependent
Systems Analysis (SY)			
14 Operability of equipment in beyond design basis environments	Due to the scope of PSAs, scenarios may arise where equipment is exposed to beyond design basis environments (w/o room cooling, w/o component cooling, w/ deadheading, in the presence of an un-isolated LOCA in the area, etc.).	System and accident sequence modeling of available systems and required support systems	Applicable – These conditions are modeled in the BNP 2011 model; however, the risk metrics for this application are not sensitivity to these ISLOCA conditions.
Human Reliability Analysis (HR)			
15 Credit For ERO	Most PSAs do not give much, if any credit, for initiation of the Emergency response Organization (ERO), including actions included in plant-specific SAMGs and the new B5b mitigation strategies. The additional resources and capabilities brought to bear via the ERO can be substantial, especially for long-term events.	System or accident sequence modeling with incorporation of HFEs and HEP value determination in both the Level 1 and Level 2 models	Applicable – The sequences dominating the risk metrics are long term accidents driven primarily by the failure to cross tie 4kv and 480v busses. The ERO could have an impact on these sequences. This is addressed in the application specific sensitivity studies involving operator actions.

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
Internal Flooding (IF)			
16 Piping failure mode	One of the most important, and uncertain, inputs to an internal flooding analysis is the frequency of floods of various magnitudes (e.g., small, large, catastrophic) from various sources (e.g., clean water, untreated water, salt water, etc.). EPRI has developed some data, but the NRC has not formally endorsed its use.	Likelihood and characterization of internal flooding sources and internal flood event sequences and the timing associated with human actions involved in flooding mitigation.	Not Applicable – Application is not sensitive to non-LOOP initiators such as pipe breaks.
LERF Analysis (LE)			
17 Core melt arrest in-vessel	Typically, the treatment of core melt arrest in-vessel has been limited. However, recent NRC work has indicated that there may be more potential than previously credited. An example is credit for CRD in BWRs.	LERF / Level 2 containment event tree sequences	Applicable – Impact from Level 2 events on the risk metrics is at or less than 1E-11 for LERF
18 Thermally induced failure of hot leg/SG tubes – PWRs	NRC analytical models and research findings continue to show that a thermally induced steam generator tube rupture (TISGTR) is more probable than predicted by the industry. There is a need to come to agreement with NRC on the thermal hydraulics modeling of TI SGTR.	LERF / Level 2 containment event tree sequences	Not Applicable for BWR
19 Vessel failure mode	The progression of core melt to the point of vessel failure remains uncertain. Some codes (MELCOR) predict that even vessels with lower head penetrations will remain intact until the water has evaporated from above the relocated core debris. Other codes (MAAP), predict that lower head penetrations might fail early. The failure mode of the vessel and associate timing can impact LERF binning, and may influence HPME characteristics (especially for some BWRs and PWR ice condenser plants).	LERF / Level 2 containment event tree sequences	Applicable – Impact from Level 2 events on the risk metrics is at or less than 1E-11 for LERF

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
20 Ex-vessel cooling of lower head	The lower vessel head of some plants may be submerged in water prior to the relocation of core debris to the lower head. This presents the potential for the core debris to be retained in-vessel by ex-vessel cooling. This is a complex analysis impacted by insulation, vessel design and degree of submergence.	LERF / Level 2 containment event tree sequences	Applicable – Impact from Level 2 events on the risk metrics is at or less than 1E-11 for LERF
21 Core debris contact with containment	In some plants, core debris can come in contact with the containment shell (e.g., some BWR Mark Is, some PWRs including free-standing steel containments). Molten core debris can challenge the integrity of the containment boundary. Some analyses have demonstrated that core debris can be cooled by overlying water pools.	LERF / Level 2 containment event tree sequences	Applicable – Impact from Level 2 events on the risk metrics is at or less than 1E-11 for LERF
22 ISLOCA IE Frequency Determination	ISLOCA is often a significant contributor to LERF. One key input to the ISLOCA analysis are the assumptions related to common cause failure of isolation valves between the RCS/RPV and low pressure piping. There is no consensus approach to the data or treatment of this issue. Additionally, given an overpressure condition in low pressure piping, there is uncertainty surrounding the failure mode of the piping.	ISLOCA initiating event sequences	Not Applicable – Application not sensitive to non-LOOP initiators such as ISLOCA's.
23 Treatment of Hydrogen combustion in BWR Mark III and PWR ice condenser plants	The amount of hydrogen burned, the rate at which it is generated and burned, the pressure reduction mitigation credited by the suppression pool, ice condenser, structures, etc. can have a significant impact on the accident sequence progression development.	Level 2 containment event tree sequences	Not Applicable for BNP- no Ice condenser

Table A4-13: Uncertainties Considered from EPRI 1016737			
Issue Description		Issue Characterization	
Topic	Discussion of Issue	Part of Model Affected	Applicability and Resolution for this Application
24 Basis for HEPs	There is not a consistent method for the treatment of pre initiator and post initiator human errors. However, human failures events are typically significant contributors to CDF and LERF.	Entire Model	The HRA treatment meets ASME Capability Category II
25 Treatment of HFE dependencies	There is not a consistent method for the treatment of potentially dependent post-initiator human errors. SPAR models do not generally include dependencies	Entire Model	The HRA treatment meets ASME Capability Category II
26 Intra-system common cause events	Common cause failures have been shown to be important contributors in PRAs. As limited plant specific data is available, generic common cause factors are commonly used. Sometimes, plant specific evidence can indicate that the generic values are inappropriate.	Entire Model	The common cause failure treatment meets ASME Capability Category II

4.8.2.3. Application Specific Uncertainty

The baseline and application models for internal events, high winds, and fire were evaluated and cutsets were identified that were unique to the application results (delta cutset file). For each of these analyses, the top 10 cutsets, the RAW rankings above 10, and the FV rankings above 5E-3 are provided in Enclosure 6: PRA Quantification Data Tables. Using this data, an effort was made to detect any potential uncertainties not previously evaluated that are unique to this application or made more important by the application. These identified uncertainties were evaluated with the following sensitivity studies.

4.8.2.3.1. Unit 1 Sensitivity Studies

The baseline and application models cutsets and importance rankings were evaluated. Diesel generator redundancy is not contributing significantly to the delta risk. Except for two external flooding sequences, the failed sequences are non-SBO, long term loss of decay heat removal sequences. The primary contributor to these sequences is the failure of the operator to cross-tie 4kv and 480v AC emergency busses. This in turn fails one or more valves preventing the success of suppression pool cooling. Therefore, the HEPs assigned to the operator actions to perform those cross-ties are potential key sources of uncertainty that were evaluated by a sensitivity study. Since these and other actions that have the same effect occur in most HFE combinations and have dependencies, the risk significant combinations were evaluated as a family of events by

increasing the operator action combination probabilities by a factor of 5. Diesel generator 2, with a FV (Fusel-Vesley) of 0.37 for its extended maintenance unavailability event, is the most risk significant DG due to the loads that it supplies (see section 4.6 of this enclosure); therefore, the ICCDP was computed for this DG and not the other 3. The results of this analysis are delineated in Table A4-14.

Table A4-14: Unit 1 Sensitivity Study for Operator Action to Cross-tie AC Busses	
Evaluation Metric	Result
Unit 1 ΔCDF	1.9E-07
Unit 1 ICCDP for DG 2 in extended maintenance	9.0E-08

Another family of events considered important to these sequences is the offsite power loss initiators. These are the grid centered, weather centered, and plant centered loss of offsite power initiators. These were evaluated by increasing their probabilities by a factor of 5. The results of this analysis are delineated in Table A4-15.

Table A4-15: Unit 1 Sensitivity Study for Offsite Power Loss Initiators	
Evaluation Metric	Result
Unit 1 ΔCDF	1.7E-07
Unit 1 ICCDP for DG 2 in extended maintenance	9.9E-08

Two external flooding cutsets were in the top 25 cutsets. These are dominated by the 23 ft storm surge external flooding initiator. The probabilities for both of the external flooding initiators were increased by a factor of 5 to assess their sensitivity. The results of this analysis are delineated in Table A4-16.

Table A4-16: Unit 1 Sensitivity Study for External Flooding Initiator	
Evaluation Metric	Result
Unit 1 ΔCDF	7.2E-08
Unit 1 ICCDP for DG 2 in extended maintenance	4.8E-08

Two high wind initiators, %HW_5 and %HW_4, had RAW values greater than 10. These were treated as a family of events and were increased by a factor of 5 to assess their sensitivity. These events were also in combination with the SUPP-DG probability of failure for that respective range of high winds. These latter probabilities were set to a value of 1.0 in the model; therefore, they were not included in the sensitivity analysis. The results of this analysis are delineated in Table A4-17.

Table A4-17: Unit 1 Sensitivity Study for High Wind Initiators	
Evaluation Metric	Result
Unit 1 ΔCDF	1.4E-07
Unit 1 ICCDP for DG 4 in extended maintenance	1.2E-07

The above results show the metrics remain well within the boundary of Region III and the guidelines of Reg. Guide 1.177 even after the sensitivities are applied.

4.8.2.3.2. Unit 2 Sensitivity Studies

The sensitivities of the Unit 2 models to the application specific key uncertainties is judged to be no different than the sensitivities of the Unit 1 models. The Unit 1 and Unit 2 models are known to be almost identical, and the difference between the application metrics were shown to be insignificant. A comparison of the top 25 cutsets also confirmed this as the accident sequences depicted by the cutsets were the same. Therefore, it was determined that Unit 2 sensitivity studies would mimic the Unit 1 sensitivity studies and they were not performed.

Both units will have a new set of breaker buses lined up at the end of the existing BOP switchgear. A sensitivity to fire risk was performed and shown in Table A4-18

Table A4-18: ICCDP Sensitivity to Addition of 4kV Breaker Ignition Sources

Evaluation Metric		Result
Unit 1 Application CCDP – EDG 2 unavailable for 1 year	A	6.572E-5
Unit 1 Application CCDP – EDG 2 unavailable with Increased IGF	B	6.585E-5
Unit 1 ΔCCDP from increased IGF: (B-A)	C	1.3E-7
Unit 1 ICCDP from increased IGF: (C* 14/365 * 4) [1]		2.0E-8
Unit 2 Application CCDP – EDG 4 unavailable for 1 year	A	6.38E-5
Unit 2 Application CCDP – EDG 4 unavailable with Increased IGF	B	6.394E-5
Unit 2 ΔCCDP from increased IGF: (B-A)	C	1.4E-7
Unit 2 ICCDP from increased IGF: (C* 14/365 * 4) [1]		2.2E-8

1 – Multiplying the ICCDP of the most significant DG by 4 DG maintenance events is bounding

4.8.2.3.3. Uncertainties with High Winds and Fire

To supplement the uncertainty discussions provided above, Table A4-19 and Table A4-20 provide additional information in regard to uncertainties associated with High Winds and Fire portions of the PRA model.

Table A4-19: Additional High Winds Uncertainties		
Uncertainty	Evaluation	Impact discussion
Wind damage to DG exhaust which is exposed. It is assumed consistent with the BNP FSAR that these components if damaged the DG function is not compromised.	This is consistent with equipment design.	No impact.
Missile damage to DG exhaust lines, in that no single event can damage more than one.	These exhaust lines are on top of the DG building, greater than 30 feet above ground. Additionally the DG can function with the loss of the DG exhaust muffler, and thus should have no effect on results	Small potential risk increase
Missile or wind damage to Supplemental DG is assumed to be 1.0.	This is a bounding assumption. The SUPP-DG enclosure is designed for 155 mph and thus has significant robustness. Additionally it is a small target for a missile to hit and thus this is a very conservative assumption.	This would make the risk metrics associated with high winds smaller.
The operator cannot start the SUPP DG until after the storm has passed	This is true however based upon the size and strength of the storm, the actual delay could be short compared to time available.	This would make the risk metrics associated with high winds smaller.

Table A4-20: Additional Fire Uncertainties			
#	Uncertainty	Evaluation	Impact Discussion
1	Fire frequency data is uncertain and a collaborative effort between EPRI and NRC to determine an improved component based fire frequency	Industry and NRC agreed upon data is used.	The Fire CDF/LERF would be directly impacted and the change in fire CDF/LERF would be changed by the same fraction of any component fire frequency bins impacted by improved data.
2	Fire Growth curves with the fire growth of 12 minutes and then steady HRR until burnout is not realistic	Fire growth curves for non-high energy events are not realistic and much too fast.	This has a significant impact on fire CDF with a slower fire growth provides significant more time for fire suppression.
3	Fire zones of influence used a cylinder with a radius of the maximum fire plume distance for the individual fire source, around the source vertical to capture all of the potentially impacted sources. This is conservative, since the fire ZOI is smaller at the lower portion and again decreases in size for those sources with no cable trays.	This would reduce the impacted targets	Evaluation is that the actual impact is very small and negligible change in CDF/LERF.
4	Cabinet fires are postulated to exit the cabinet regardless of the amount of ventilation for the cabinet	Many cabinets the fire growth outside of the cabinet is not likely based upon analysis that indicates these fires are suffering from oxygen starvation.	This would reduce the fire CDF and impact of fire with a much small zone of influence.
5	BNP cables in certain locations are protected with a flame retardant; this delays the damage and retards the propagation of the fire to other cable tray. This flame retardant coating is not credited in the current fire PRA.	Fire propagation and time to fire damage would be longer up to 10 minutes and delay ignition for up to 12 minutes based upon NUREG/CR-6850 Table Q-1. This was developed by testing of non-rated cables and BNP has IEEE-383 rated cables.	This would reduce the fire CDF in selected locations and reduce the overall CDF. Would have a minor decrease in ΔCDF/ΔLERF impact on this application due to the locations where the flame retardant coatings are applied.
6	At BNP, Motor Control Center construction is such that the access panel doors are closed with multiple fasteners. These MCC doors also have gaskets around the door. This results in essentially a closed cabinet.	Cabinets are not considered sealed, but are considered reduced capability for fire growth outside of the cabinet. This is a much more realistic evaluation of the affects of a MCC fire.	This is consistent with similar constructed MCCs treatment with other Peer Reviewed Fire PRAs and the treatment discussed in BWR OG report 0000-0125-8912-R0 (Report for BWR Owners Group Fire PRA Projects on Fire Propagation on Electrical Cabinets and DC Hot Shorts- Draft) on MCC fire propagation. The effect of considering the cabinets sealed would reduce CDF/dCDF.

Table A4-20: Additional Fire Uncertainties			
#	Uncertainty	Evaluation	Impact Discussion
7	The BNP isophase buses contain "quick disconnects" which are used to disconnect the main generator from the switchyard. Because there is no guidance in Section 7 of NUREG/CR-6850, Supplement 1 for treating these disconnects, they have been excluded from consideration in determining the end components used to apportion the isophase bus duct ignition frequency.	This is a slight non-conservatism in that if counted would increase the locations for bus ducts fires, but very slightly reduce the fire frequency of each individual bus duct fire source. (due to have more locations)	Based upon the actual location of these quick disconnects and targets no impact would be expected for the EDG CT. The failure of one of these disconnects in the past did not cause any damage to cables.
8	By excluding certain locations containing equipment unimportant to fire risk, the criteria for selection of the Global Plant Analysis Boundary could result in an undercount of components for some bin(s) and thereby the conservative calculation of ignition frequencies for those components that are counted.	Not counting components in areas that have been screened from the global analysis boundary is performed as per the guidance in NUREG/CR-6850. The resultant increase apportionment of Fire Ignition Frequency among the remaining ignition sources is conservative to the base model and the final fire risk.	The effects of changes to the ignition frequency for ignition source bins would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. Thus this is not expected to be a significant source of uncertainty related to delta risk for the application.
9	Bounding values from NUREG/CR-6850 were typically used for the 98%ile files based on the HRR case. For a limited number of sources these values were adjusted based on fire modeling insights.	This bounds 98% of possible HRR scenarios as described in NUREG/CR-6850. The most accurate method would be to use HRR from oxygen restricted cabinets for those cabinets with small ventilation openings. This methodology has not been approved at the time of this analysis.	The effects of changes to the HRR of ignition sources would affect both the base Fire CDF/LERF and LAR Fire delta CDF/LERF similarly. The effect is most apparent in scenarios with large numbers of targets or those which achieve HGL. In these cases masking may contribute to a smaller delta CDF/LERF. Reduction in HRR would reduce masking effects and therefore potentially slightly increase the delta CDF/LERF for the application. The EDG AOT and base fire CDF/LERF are mostly driven by fires in the Main Control Room area. Those sources that contributed most to base fire CDF/LERF were inspected to obtain an accurate 98% HRR. A number of sources were than assigned a significantly lower HRR based upon actual contents of the cabinets.

Table A4-20: Additional Fire Uncertainties			
#	Uncertainty	Evaluation	Impact Discussion
10	Fires involving oil are assumed to instantly spill and instantly ignite to maximum HRR with no fire growth.	This method is conservative, especially for treatment of large quantities of oil.	The effects of instant ignition of oil would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly in scenarios where cables affecting EDGs are damaged. Many areas containing oil also affect the EDGs, electrical distribution (in the TB), or SUPP-DG. Thus no impact on EDG CT LAR
11	Generic ZOIs calculated are based on damage thresholds that do not incorporate heat soak time.	Targets on the edge of the ZOI may require prolonged exposures (up to 30 minutes) prior to damage, but are treated as instantly failed in the Fire PRA after the time delay to damage for each tray in stacked tray configuration	The effects of changes to the time to damage at the edges of the ZOI would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. This is not expected to be a significant source of uncertainty related to delta risk for the application.
12	The vertical and horizontal components of the ZOI were based on bounding assumptions for the size of the fuel package (i.e. 1 ft^2 for the vertical component and 6 ft^2 for the horizontal component).	Using a larger square footage for the fuel package for the vertical component of the ZOI results in a smaller ZOI and consequently fewer targets being impacted. Similarly, using a smaller footprint for the horizontal ZOI results in a smaller horizontal ZOI dimension. This treatment results in an exaggerated ZOI, and therefore, provides for a conservative selection of targets.	This is not expected to impact any results due to more realistic ZOI was determined for the cabinets in the Main Control Room, which is over 50% of the base fire CDF/LERF and the EDG CT LAR delta CDF/ LERF. The Main Control Room cabinet dimensions were used to reduce the ZOI to more realistic sizes.
13	Cable fires due to Cutting and Welding ignition sources (Bins 05, 11, and 31) are given no target sets. Procedures require a fire watch with an extinguisher to be present during hot work activities; therefore it is assumed that fires caused by cutting and welding sources will not spread beyond the original tray.	The impact on CDF/LERF of applying no target sets to cutting and welding ignition sources is considered negligible for the initial quantification input since thermoset cable is assumed. A thermoset cable is expected to self extinguish in the absence of a sustained ignition source.	The effects of cutting and welding sources on cables would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. This is not expected to be a significant source of uncertainty related to delta risk for the application.

Table A4-20: Additional Fire Uncertainties			
#	Uncertainty	Evaluation	Impact Discussion
14	Transient fires due to Cutting and Welding (Bins 06, 24, and 36) involve the same target sets as the general transients (Bins 03, 07, 25, 37). Separate ignition source to target set relationships are not defined in this calculation for transients fires caused by Cutting and Welding.	Placement of transient ignition sources is based on selection of vulnerable targets. These are expected to be the same targets sets for transient fires caused by cutting and welding activities.	The effects of target sets for cutting and welding sources would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. This is not expected to be a significant source of uncertainty related to delta risk for the application.
15	Target sets were collected using heat based zone of influence values or were developed using fire modeling as described in the base analysis. The damaging effects of fire generated smoke are not specifically represented in the target data.	Fires resulting in significant smoke production could cause additional damage beyond the heat based zone of influence target sets collected. However, targets that are susceptible to smoke damage have not been identified and are currently not evaluated in this calculation.	The effects of smoke would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. The components that could be affected by smoke in the Main Control Room also have cables which are damaged in many cases by the various fires and thus achieving the same risk impact as smoke damage. Equipment related to EDGs, SUPP-DG, or electrical distribution is not expected to be susceptible to smoke damage. This is not expected to be a significant source of uncertainty related to delta risk for the application.
16	In some cases field conditions did not allow for raceways to be located. For these, Fixed and Transient ignition source targets were determined through review of controlled drawings.	This method of target identification is not expected to affect the results of this analysis. Where possible, uncertainty has been reduced through determination of ignition sources from which the raceways should be excluded. In the event of a HGL scenario all routing is failed based on what is listed as in the compartment, and is therefore not subject to this uncertainty.	There was very limited use of drawing only for raceway location determination. The use of drawings for target set determination would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. This is not expected to be a significant source of uncertainty related to delta risk for the application.
17	A heat release rate for lubrication oil of 2,000 kW/m^2 is assumed to provide a bounding value over that which is used in all oil applications described in this calculation.	Use of a bounding HRR for oil applications may result in conservative target set determination. No method has been determined for an alternate HRR.	The effects of oil HRR would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly thus no impact is expected.

Table A4-20: Additional Fire Uncertainties			
#	Uncertainty	Evaluation	Impact Discussion
18	A reduction factor of 5 is applied to the heat release rate for unconfined oil fires to account for the fact that the floor slab must be heated up before propagation in an oil spill fire. This is supported through reference which states that the unit heat release rate for unconfined spills is about one fifth that of a deep pool having the same exposed surface area. This reduction is applied only to unconfined oil fires.	This is a referenced value. No uncertainty is identified for this treatment.	None
19	The target set for some ignition sources was assumed to encompass entire compartments regardless of the ability of the ignition source to create a HGL. This was based on the either a lack of information or uncertainty about fire size or heat release of the ignition source.	Loss of all components in the compartment may be proven as not probable by the use of detailed fire modeling. This may be needed to remove the conservatism for these areas.	The effects of sources with assumed HGL would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. These compartments where results were giving significant Fire CDF/LERF were further investigated to reduce the HGL uncertainty. Most of the Fire CDF/LERF and application delta CDF/LERF are from the Main Control Room and this uncertainly does not impact this area.
20	Target Damage time is based on 400F due to Thermoplastic cable	A higher temperature may be more appropriate. Note that the 400F temperature was only used in the time to damage calculation. 625F was used for generating the ZOIs.	A higher damage threshold will provide more time for suppression and potentially reduce CDF and dCDF.
21	Electrical cabinets, relay cabinets, and some sensitive equipment may have damage thresholds below the 625°F utilized for cable failure.	Although direct equipment damage may occur at a point below the HGL threshold temperature, it is expected that the impacts are captured indirectly though the cable failures due to either a ZOI fire or HGL resulting from cable involvement.	The effects of fire on sensitive equipment would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. Additionally cables attached to the electrical cabinets, some of which are in the fire ZOI fail the function giving the same or worse affect. The equipment related to EDGs, SUPP-DG, or electrical distribution functionality is not expected to be sensitive to temperature. This is not expected to be a significant source of uncertainty related to delta risk for the application.

Table A4-20: Additional Fire Uncertainties			
#	Uncertainty	Evaluation	Impact Discussion
22	A manual suppression response time of 2 minutes is utilized for Cutting and Welding ignition sources.	A dedicated fire watch with an extinguisher is required to be stationed at the hot work site. Utilization of manual suppression times based on FAQ-08-0050 during quantification will remove this conservatism.	The effects of manual suppression response time would affect both the base Fire CDF/LERF and LAR Fire CDF/LERF similarly. This is not expected to be a significant source of uncertainty related to delta risk for the application.
23	Credit is given in the Fire PRA for conceptual modifications.	For example, a modification to the CST/ Condenser Hotwell level control valve has been identified as implemented (close valve on loss of air or loss of power). One alternative is to obtain complete circuit routing and failure analysis of the associated circuits to show the modification is not necessary.	Modifications are similarly credited in the base FPRA and the LAR FPRA to reflect the to-be as built plants. As either the modification will be determined to not be required, or will be installed. This is not expected to be a significant source of uncertainty related to delta risk for the application as discussed the majority of the risk increase is from Main Control Room fires.
24	The event trees credit extended RCIC operation without suppression pool cooling if there is a station blackout event. For non-station blackout events, extended operation of HPCI and RCIC is not credited unless RHR supplies suppression pool cooling.	Not crediting extended RCIC operation is somewhat conservative. The impact on CDF/LERF if RCIC was credited for extended operation without suppression pool cooling is an area of uncertainty.	Crediting extended RCIC operation would tend to decrease the impact of having an EDG unavailable for maintenance and reduce the expected CDF.
25	The PSA model includes failure of several piping systems due to water hammer. The possibility of MSO induced water hammer failing RCIC or HPCI due to loss of steam exhaust vacuum breaker is modeled in the PSA as loss of RCIC or HCPI due to water canon seizing the isolation check valve closed.	The probability of damage is considered to be conservatively high. The potential for failure of HPCI or RCIC due to water hammer is an area of uncertainty.	More realistic treatment resulting in reduction of water hammer damage probability would decrease the risk importance of an EDG in maintenance.
26	The power cables running from the SUPPDG along the outside of the turbine are armored cables. The PSA assumes that fire in the adjacent auxiliary and main transformers will damage these cables. No credit is given for their armor shielding.	In the absence of detailed evaluation, this considered to be somewhat conservative. The actual potential degree of damage to the supply cables from transformer fires in an area of uncertainty	Detailed fire modeling of impact of transformer yard fires on SUPP-DG cables may provide results that reduce contribution to CDF and dCDF.

Table A4-20: Additional Fire Uncertainties			
#	Uncertainty	Evaluation	Impact Discussion
27	Operator Action "OPER-SDGSTART" is increased by a factor of ten over the nominal value during fire scenarios that it is credited for.	The action could receive increased credit if a dedicated operator were to be assigned to start the SUPP-DG or if credit were taken for pre-briefing or pre-aligning components.	Reduction in HEP would reduce the LERF and CDF impact of the extended AOT.
28	Human actions performed outside the control room are assumed to be unsuccessful if they require traversing or performing an action in a compartment with a fire.	For large compartments, small fire scenarios, and actions with long performance time available, the environmental affect of a fire are limited and some credit could be given.	For fires in the turbine building areas near the 4kV bus, some credit could be given for aligning the SUPP-DG. A more realistic HRA assessment would reduce the CDF contribution of fires in these areas.

4.8.3. Tier 2 Evaluation

To address Tier 2 concerns, the delta cutset file for the Unit 1 IE model with internal and external flooding was used to determine the ranking of the T&M events. Based on that ranking, an assessment was made as to the impact of having that component out for maintenance at the same time a DG was in extended maintenance. The component T&M events and their ranking are shown in Table A4-21 below.

Table A4-21: Tier 2 Sensitivity Study (DG 2 in extended maintenance)		
T&M Event	Component	RAW
EDG1DGN-TM-D001	DG1	3.5
EDG1DGN-TM-D003	DG3	6.0
EDG2DGN-TM-D004	DG4	3.5
FPS2EDP-TM-P-1	Diesel Fire Pump	1.0
RHR1PTF-TM-LOOPA	RHR Loop A	44.0
RHR1PTF-TM-LOOPB	RHR Loop B	Not listed
DCP1BAT-TM1A1	DC Batteries A1	7.0
DCP1BAT-TM1A2	DC Batteries A2	7.0
DCP1BAT-TM1B2	DC Batteries B2	Not Listed

Based on the RAW values, it is recommended that a battery or an RHR loop not be in T&M at the same time a DG is in extended maintenance.

4.8.4. Completeness Uncertainty

With the exception of seismic, the BNP PRA model is constructed according to ASME standards. The PRA Quality Report provided in Enclosure 5 report discusses in detail the level in which the model meets the ASME requirements for the internal events model, the flooding model, the high winds model, and the fire model. Other external events, including seismic, are addressed by the IPEEE report and are not deemed to be significant with respect to this application due to their low contribution to CDF and their

low frequency of occurrence. The IPEEE treated the Transportation and Nearby Facility Accidents in the following manner:

- Aircraft Impact – The IPEEE determined the CDF due to an aircraft impact to be less than 1E-6/yr
- Industrial Accidents – The IPEEE determined that no credible risk to the safe operation of BSEP is considered to be posed from the operation of nearby facilities.
- Military Accidents – The IPEEE determined that the worst military accident would be an explosion of a cargo load of TNT. The blast pressure from this explosion is bounded by tornado loads.
- Pipeline Accidents – The IPEEE determined that a nearby natural gas pipeline fire would be less than a flat surface receives in the midday sun.
- Hydrogen Storage Failures – The IPEEE determined that no credible threat existed based on hydrogen detonation.
- Transportation Accidents – The IPEEE determined that transportation accidents were bounded by the worst case explosion as discussed in Military Accidents above.

Seismic is not considered to have a significant impact on this application. See section 4.6.2 of this enclosure for the discussion on seismic.

The most likely external flooding threat comes from a storm surge. The plant would have advance warning of this event, during which time preparations could be implemented to protect vital equipment against the anticipated flooding. If the flood magnitude was such that it could overwhelm the protective measures taken by the plant and damage the DG's, it would affect all 4 DG's the same and having one out for maintenance would be of little significance. The external storm surge generated flood was evaluated with the BNP IE model to assess the impact of failure of offsite power recovery, failure of the diesel driven fire pump, and failure to gain access to the SUPP-DG. These results are included in the evaluation of the baseline and application IE (with flooding) models in section 4.6 of this enclosure.

4.9. Key Uncertainty Sensitivity Studies

Section 4.8.2.3 for the Unit 1 and Unit 2 sensitivites contain the dominate sensitivities that made an impact on the DG model. There were four major areas that dominated the results:

- In review of the results, and based upon Brunswick electrical system, the Human Failure Events (HFEs) dominate the results. The operator actions to cross-tie either the 480 vac buses (E5/E6, or E7/E8) or the 4160 Essential Bus tie actions (E1/E3 or E2/E4) were increased by a factor of 5.
- A second area of effect with a DG in maintenance is the potential increase in Loss of off-site power. In this case the LOOP initiators (Grid, Plant, Switchyard and Weather) were increased by a factor of 5.

- A third area of effect with a DG in maintenance is the potential increase in the external flooding initiator. In this case, the external flooding initiators were increased by a factor of 5.
- A fourth area of effect with a DG in maintenance is the potential increase in two of the high winds initiators. In this case, these initiators were increased by a factor of 5..

Each case is documented in Table A2-14 through A2-17. Conclusions derived from the sensitivities are that these four factors were the individual events that were the most important to this risk informed application and that with the postulated increase in failure frequency the resulting metrics are small as defined by Reg. Guide1.174 and Reg. Guide 1.177.

4.10. Responses to Requirements of Reg. Guide 1.177

The following Table A4-22 presents responses to requirements put forth in various sections of Reg. Guide 1.177 pertaining to aspects of the model alterations made for the application. The specific section, requirement, and associated response are all indicated.

Table A4-22: Reg. Guide 1.177 Requirements	
Requirement	Response
The following address the requirements of Reg. Guide 1.177 Section 2.3.3.1, Details Needed for Technical Specification Changes	
To evaluate a TS change, specific systems or components involved in the change should be modeled in the PRA.	The Brunswick PRA for Unit 1 and Unit 2 include detailed system and component modeling. The modeling largely meets the Capability Category 2 with F&Os associated with gaps being addressed in the PRA Quality Report, attached. The added Supplemental Diesel Generator is modeled as a super-component with some exceptions such as output breaker, which is consistent with industry failure data and it's stand alone design.
The model should also be able to treat the alignments of components during periods when testing and maintenance are being carried out	The alignments of components with testing and maintenance are implemented in the Brunswick U1 and U2 PRA using mutually exclusive logic to constrain the configuration of DG maintenance outages. No more than one DG is allowed to be out of service at a time and remain at power for a significant amount of time, which is consistent with BNP Technical Specifications.
System fault trees should be sufficiently detailed to specifically include all the components for which surveillance tests and maintenance are performed and are to be evaluated	The BNP PRA fault trees specifically address maintenance and testing on the diesel generator and support systems. This is done on either the component or train level as appropriate to match the way testing and maintenance is conducted.

Table A4-22: Reg. Guide 1.177 Requirements	
Requirement	Response
Component unavailability models should include contributions from random failure, CCF, test downtime, and maintenance downtime.	The changes to the component unavailability model for test downtime and maintenance downtime are both based on plant specific test and maintenance experience. This includes the near term extended AOT realistic projections of maintenance practices after the TS change is approved and implemented. For the emergency diesel generators random failure and CCF is included in the fault tree. The Supplemental Diesel Generator has a random failure probability as part of its fault tree. No common cause is assigned to the Supplemental Diesel generator due to large number of factors that make this new machine unique, as previously discussed in this report.
Change in the component unavailability model for test downtime and maintenance downtime should be based upon a realistic estimate of expected surveillance and maintenance practices after the TS change is approved and implemented (e.g. how often the extended CT is expected to be entered for maintenance or surveillance).	The BNP PRA model as modified for the change in risk includes the realistic estimate for DG pre-planned unavailability during the DG reliability improvement project. There is no planned change in the DG surveillance testing frequency postulated for this risk evaluation.
The component unavailability model for test downtime and maintenance downtime should be based upon plant specific or industry wide operating experience, or both, as appropriate.	The BNP PRA is based upon plant actual operating experience for downtime due to either testing or maintenance.
The component unavailability model should have the flexibility to separate contributions from test and maintenance downtime. For evaluating CT, the contribution from maintenance can be equated to zero to delete maintenance activities, if desired.	The BNP PRA component unavailability model could have the flexibility of separate testing and maintenance downtime. However for this risk application the existing test and maintenance contributions were not separated since it would provide no benefit to the results. The testing associated with the extended maintenance is integral to the maintenance and thus is no value in separating it into separate contributions from test and maintenance downtime.
Additional details in terms of separating the failure rate contributions into cyclic demand-related and standby time-related contributions can be incorporated, if justifiable, for evaluating surveillance requirements.	The BNP PRA did not take this approach for the DGs AOT as this was not justified.
The CCF contributions should be modeled so that they can be modified to reflect the condition in which one or more of the components are unavailable.	The BNP DG model does include CCF contributions and they could be modified if required. In this case modify the CCF for having on DG in the extended AOT was not performed as the risk results were not CCF sensitive
The following address the requirements of Reg. Guide 1.177 Section 2.3.3.2, Modeling of Initiating Events	
The effect of TS changes on these initiating event frequencies should be considered.	The application does not impact initiating event frequencies. Placing a single DG in maintenance unavailability is not an initiating event.

Table A4-22: Reg. Guide 1.177 Requirements	
Requirement	Response
Some test and maintenance activities can contribute to some transients.	The DG's are normally standby components and as such are started in response to a transient, thus the extended maintenance activity cannot contribute to any transient initiator.
The following address the requirements of Reg. Guide 1.177 Section 2.3.3.3, Screening Criteria	
The main qualitative considerations regarding the screening of sequences in TS change evaluations in the inclusion of sequences directly affected by the TS change that would have been truncated by the frequency-based screening criteria alone.	The BNP PRA results did not use any screening criteria of sequences.
The following address the requirements of Reg. Guide 1.177 Section 2.3.3.4, Truncation Limits	
Truncation limits should be used appropriately to ensure significant underestimation, caused by truncation of cutsets, does not occur.	The delta CDF, R1 and R2 values computed during the risk Level 1 metric analysis were greater than one order of magnitude higher than the 1E-11 truncation limit.

4.11. References

1. ASME/ANS RA-Sa-2009, Addenda to ASME/ANS RA-S-2008 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications
2. USNRC Regulatory Guide 1.174, An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis, Rev. 2
3. USNRC Regulatory Guide 1.177, An Approach for Plant-Specific, Risk-Informed Decision Making: Technical Specifications, Rev. 1
4. USNRC NUREG 1855, Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making, Vol. 1, March 2009
5. EPRI Report 1016737, Treatment of Parameter and Modeling Uncertainty for Probabilistic Risk Assessments, December 2008
6. Updated FSAR Brunswick Steam Electric Plant, Units 1 and 2, Revision 22

PRA QUALITY REPORT

Enclosure 5: Technical Adequacy of the Probabilistic Risk Assessment Analysis for BNP DG AOT Extension

5.1. Identification

The PRA supports the extension of the BNP Emergency Diesel Generator Allowed Outage Time to 14 days. This is achieved by demonstrating that the impact of the proposed extension on plant risk remains within the guidelines of Regulatory Guide 1.174 [Ref. 2] and Regulatory Guide 1.177 [Ref. 3].

5.2. Determination of Required Capability Categories

The BNP internal events PRA model, including internal flooding, fire and high winds, is utilized to calculate CDF/LERF given the proposed DG AOT extension. Any elements of the supporting requirements detailed in ASME/ANS RA-Sa-2009 that could be significantly affected by the proposed extension are required to meet capability category II requirements.

Although a Peer Review has not been conducted on the High Winds and Fire portions of the risk model, a Self Assessment was performed to evaluate the performance of these portions with regard to the ASME/ANS RA-Sa-2009 standard [Ref 1]. An additional Peer Review for the BNP PRA Fire portion of the model has been scheduled. External events were initially assessed in the IPEEE. These included seismic events which were evaluated using the Seismic Margin Analysis method. Seismic was assessed as a single train IPEEE update.

The tables A5-1, A5-2, A5-3, and A5-4 below present a summary of the High Level Requirements specified in ASME/ANS RA-Sa-2009 [Ref. 1], the capability category required for the application and the F&O's documented with Level of Significance "Finding". These findings and their resolution or application impact for Internal Events and Internal Flooding PRA are addressed further in Table A5-6.

Table A5-1: High Level Requirements for Internal Events

Requirement	Capability Category Required	F&O's
Initiating Event Analysis (IE)	II	1-3 4-2, 6-1, 6-2, 6-4, 6-5
Accident Sequence Analysis (AS)	II	1-15
Success Criteria (SC)	II	1-11, 6-8
Systems Analysis (SY)	II	4-5
Human Reliability Analysis (HR)	II	2-3, 3-3, 3-4, 3-6, 3-8

Table A5-1: High Level Requirements for Internal Events		
Requirement	Capability Category Required	F&O's
Data Analysis (DA)	II	1-2, 2-2
Quantification (QU)	II	2-7, 2-11, 3-9, 4-7, 5-6
LERF Analysis (LE)	I	1-19, 3-11, 3-12, 3-13, 6-12

Capability Category (CC) I are acceptable for LE, because the current results are acceptable and CCII those supporting requirements (SR) would further reduce the LERF and ΔLERF values. The SRs that do not meet the CC II criteria are generally those with not crediting scrubbing or using a realistic release analysis to allow equipment repair or to function in adverse environment. See Table A5-6 for details.

Table A5-2: High Level Requirements for Internal Floods		
Requirement	Capability Category Required	F&O's
Internal Flood Plant Partitioning (IFPP)	II	None
Internal Flood Source Identification and Characterization (IFSO)	II	1-21, 1-22, 1-23, 1-24, 1-31
Internal Flood Scenarios (IFSN)	II	1-20, 1-24, 1-25, 1-26, 1-27, 1-28, 1-31, 6-16, 6-18
Internal Flood Induced Initiating Events (IFEV)	II	1-27, 1-31, 3-14, 6-15
Internal Flood Accident Sequences and Quantification (IFQU)	II	1-31, 1-32, 1-33, 2-9, 2-10, 6-13, 6-14, 6-17, 6-20, 6-21

5.3. Self Assessment

To ensure PRA quality was upheld throughout the model a Self Assessment was conducted to evaluate the High Wind and Fire Portions of the BNP PRA model. These results are presented in Tables A5-7 and A5-8 in the following sections "BNP High Wind External Events PRA Capability Categories" and "BNP Fire External Events PRA

Capability Categories". Furthermore, an additional Peer Review for the Fire PRA which will address these parts of the model has been scheduled.

Table A5-3: High Level Requirements for High Winds (Self-Assessment)		
Requirement	Capability Category Required	F&O's
High Wind Hazard Analysis (WHA)	II	N/A (Self-Assessment)
High Wind Fragility Evaluation (WFR)	II	N/A (Self-Assessment)
High Wind Plant Response Model (WPR)	II	N/A (Self-Assessment)

Table A5-4: High Level Requirements for Fire (Self-Assessment)		
Requirement	Capability Category Required	F&O's
Plant Boundary Definition and Partitioning (PP)	II	N/A (Self-Assessment)
Fire PRA Equipment Selection (ES)	II	N/A (Self-Assessment)
Fire PRA Cable Selection (CS)	II	N/A (Self-Assessment)
Qualitative Screening (QLS)	II	N/A (Self-Assessment)
Fire PRA Plant Response Model (PRM)	II	N/A (Self-Assessment)
Fire Scenario Selection and Analysis (FSS)	II	N/A (Self-Assessment)
Fire Ignition Frequency (IGN)	II	N/A (Self-Assessment)
Quantitative Screening (QNS)	N/A	N/A (Self-Assessment)
Circuit Failure Analysis (CF)	II	N/A (Self-Assessment)
Post-fire Human Reliability Analysis (HRA)	II	N/A (Self-Assessment)
Fire Risk Quantification (FQ)	II	N/A (Self-Assessment)
Seismic/Fire Interactions (SF)	I	N/A (Self-Assessment)
Uncertainty and Sensitivity Analyses (UNC)	II	N/A (Self-Assessment)

Sesimic/ Fire interaction is acceptable as CC I because the EDGs are not in the turbine building where most of the Seismic Fire interaction would occur and many of the power cable that connect the emergency diesel generators and off-site sources are run through the electrical tunnel underneath the turbine building. Thus damage due to fire and failure of fire suppression in the turbine building is not important for this application.

5.4. Necessary Scope and Results

The BNP Internal Events PRA consists of a full scope Level 1 model to measure CDF that includes modeling of fire, high winds, internal flooding, external flooding, and station blackout (SBO). Furthermore, Level 2 risks are evaluated with an additional LERF model. Note that seismic and additional external events were evaluated with the IPEEE and are not integrated into the current BNP PRA models.

5.5. Peer Review

In accordance with RG 1.200 Rev. 2 and ASME/ANS RA-Sa-2009 [Ref. 1], a Peer Review of the BNP PRA was conducted in 2010 by eight PRA experts. The review provided findings and suggestions regarding the model and identified 38 supporting requirements within the internal events and internal flood portions of the model that did not meet capability category II. The significance of any possible effects associated with these requirements in the scope of the application for the proposed extension were analyzed and addressed prior to proceeding with the use of the model. The section BNP Internal Events PRA Capability Categories includes a summary of the findings of the Peer Review and how these are addressed. The requirements discussed and their resolutions are presented in Table A5-6 in the same section, located in this enclosure.

5.6. Update and Review History

The BNP PRA model has undergone numerous updates and reviews in an attempt to maintain a representation of the as built, as operated plant in response to improvements in technology, methods, and state of knowledge. This section presents summaries of both the BNP PRA Model of Record updates as well as comprehensive reviews performed. Table A5-5 provides a summary of the BNP Model of Record updates.

Table A5-5: BNP Model of Record Update Summary				
MOR	REV	Unit	CDF (freq/yr)	LERF (freq/yr)
MOR 92*	NA	Unit 1	2.7E-05	NA
		Unit 2	2.7E-05	NA
MOR 96*	NA	Unit 1	9.1E-06	NA
		Unit 2	9.1E-06	NA
MOR 98*	NA	Unit 1	2.54E-05	4.27E-06
		Unit 2	2.54E-05	4.27E-06
MOR 98R1*	1	Unit 1	4.92E-05	4.78E-06
		Unit 2	4.92E-05	4.78E-06
MOR 02*	2	Unit 1	4.97E-05	Not updated
		Unit 2	4.97E-05	Not updated
MOR 03*	3	Unit 1	4.19E-05	2.13E-06
		Unit 2	4.19E-05	2.13E-06
MOR04	4	Unit 1	4.11E-05	Not updated
		Unit 2	4.04E-05	Not updated
MOR05	5	Unit 1	3.59E-05	Not updated
		Unit 2	3.32E-05	Not Updated
MOR06	6	Unit 1	3.34E-05	Not updated
		Unit 2	3.07E-05	Not Updated
MOR07	7	Unit 1	1.22E-05	Not updated
		Unit 2	1.17E-05	Not Updated
MOR08	8	Unit 1	1.09E-05	Not updated
		Unit 2	1.10E-05	Not Updated
BNP 2010 Model	9	Unit 1	8.91E-06	1.08E-07
		Unit 2	7.79E-06	1.11E-07
BNP 2011 Model	10	Unit 1	7.87E-06	5.67E-07
		Unit 2	7.86E-06	5.65E-07

**Unitized model for Units 1 and 2, thus no delta in CDF between Units*

MOR04 addresses findings and observations from 2001 Peer Review along with failure and unavailability data and success criteria update.

MOR05 updated HRAs and answered findings and observations from 2001 Peer Review to support Mitigating System Performance Index (MSPI), this included some revisions to the Human Reliability Analysis.

MOR06 revision used the on-line EOOS-06 model as its starting point. The major enhancement associated with the EOOS-06 model was the incorporation of the ability to cross-tie service air between units, which also required extensive addition of cross unit service water support and AC power. Changed MOV and AOV data from time based failure to demand based failure.

MOR07 changes includes several items: implemented a new diesel room heat analysis, additionally added two independent generators to support DC power; removal of safety Bus initiators; updated HRA events for post initiators and included consideration of improved battery life analysis; addition of new initiating event for loss of intake structure; update of DG data to 2007; update LOSP to 2007; air operated valve data update; incorporated a conversion from calendar years to reactor years per the PRA standard; added additional water source for circulation water pump seals; provided logic to credit swing turbine building closed cooling water system for both units.

MOR08 involved improved logic for the instrument air system modification and improved ATWS logic.

BNP 2010 Model incorporates updates to the common cause failure analysis for batteries and other equipment with major revisions to meet Reg. Guide 1.200 improvements, including revisions to accident sequences, data (NUREG 6928 for generic data) and initiating event updates, and plant configuration through 2009. Resolves remaining items identified in 2007 Reg. Guide 1.200 Self Assessment.

BNP 2011 Model addressed a majority of Facts and Observations (F&Os) from the 2010 peer review. Many of the F&Os resolved were on the flooding model, which this effort resolved technical issues and improved the documentation. As part of this effort the significant flooding scenarios were examined for realism and some adjustments were made based upon material of piping and design attributes. Additionally external events such as simplified seismic and high winds were implemented into the CAFTA fault tree with applicable documentation from the vendor that performed the effort. A change to the Station Blackout tree was implemented to address concerns over the conservatism of the model. Finally some HRAs were revised to address F&O comments.

5.6.1. BNP Review Summary

1988: The original Brunswick PRA, docketed in May 1988, included a Level 1 PRA and external events PRA. The PRA was reviewed by INEL under contract to NRC and the results documented in November 1989 (NUREG/CR-5465). Many of the insights provided by this review were incorporated into the IPE PRA submittal to the NRC.

1990-1992: Results from the IPE analysis were reviewed by Progress Energy's Nuclear Fuels section; BNP plant personnel (operations, training, engineering); as well as other external organizations. External consultants performed a comprehensive external review of the major elements within the Level 1 PRA and Level 2 analysis.

1994-1995: A variety of peer reviews were performed, as documented in the IPEEE. These reviews included analyses for seismic, fire, and external events. Corporate and BNP plant personnel within operations, training, fire protection, licensing, and nuclear engineering formed an independent review team to assess the results of the IPEEE analysis. The evaluation was performed by referencing NEI 91-04 closure guidelines for potential plant vulnerabilities, identifying alternative solutions, and recommending actions to resolve severe accident issues.

2000: An independent peer review was performed by an individual outside expert.

2001: The BWROG Peer Certification Review consisted of a comprehensive review of the BNP Level 1 and Level 2 (LERF) models based on the NEI 00-02 quality process.

2007: A gap assessment of the PRA model and associated documentation was conducted to provide BNP plant management and Progress Energy input for decision making regarding the viability of the PRA and its use for applications. The review was performed in accordance with the ASME PRA Standard Addendum B.

2010: A full-scope peer review of the PRA model and documentation was conducted under the guidance of NEI 05-04, ASME/ANS RA-Sa-2009, and NRC clarifications provided in Regulatory Guide 1.200, Rev. 2. The review included models for internal flooding and LERF.

5.7. BNP Model Update Process

The BNP PRA model update process may be initiated by a number of factors, ultimately governed by the necessity to maintain a model that represents the as built, as operated plant, as specified in Regulatory Guide 1.200. Possible reasons for a model update include changes in risk significance of systems or components, plant data, procedures, analysis methods, operating experience and state of knowledge regarding the subject. Progress Energy maintains procedures in addition to industry standards that specify when model updates are necessary. Progress Energy procedures require engineering changes to be evaluated for applicability to the PRA model and further estimation of the CDF/LERF impact, which determines the timing of the incorporation into the site specific PRA model.

5.8. BNP Quality Control

Quality Control for the BNP PRA is ensured through the use of Peer Reviews and subsequent resolution of F&Os, self assessments, periodic model updates, staff training and qualification requirements, as well as procedure controls. Procedures are in place to mandate adequate model control, documentation of model development and changes, and specification of corrective actions to be used if errors are discovered.

5.9. BNP Internal Events PRA Capability Categories

The 2010 Peer Review of the BNP PRA identified 38 supporting requirements (SR's) from ASME/ANS RA-Sa-2009 that did not meet capability category II. All other SR's met or exceeded capability category II. The 38 SR's identified, as well as SR's with F&O's Level of Significance "Finding", are listed in table A5-6 below and cite the appropriate F&O number, the applicable SR, and the finding. The majority of the issues raised were addressed in the response to the F&O's and documentation is provided. A description of the impact to the DG AOT extension application is given for any items that were not included in the response to the F&O's. The Self Assessment findings are discussed in the next section and are presented in Tables A5-7 and A5-8 for the High Wind and Fire portions of the BNP PRA model. Note that documents cited in Table A5-6 are primarily BNP PRA calculations that document the development of the current model but do not impact this submittal beyond the information already presented in the submittal report and documentation. As such these documents are not referenced or included as a part of this submittal.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
4-2	IE-A5	Cat 1 not met	Only evaluations provided were for systems used as mitigating systems. No evidence of other system reviews provided.	Resolved with system evaluation completed and documented in BNP 2011 MODEL.
1-3 6-5	IE-C1	Cat 1-3 met	The use of a single pipe section as the basis for IE frequency for breaks outside of containment could be nonconservative by a factor of 100 to 1000 compared to latest EPRI pipe failure frequency methodology.	A sensitivity analysis was performed and no impact was determined with regard to the application.
6-1	IE-C5	Cat 1-2 met, Cat 3 not assessed	Plant availability factor not updated	Resolved, updated in BNP 2011 MODEL
6-2 6-4	IE-C6	Cat 1-3 not met	Controlled plant shutdowns are screened from being considered plant specific initiating events if there is a greater than 12 hour LCO time, per IE calc BNP-PSA-032 sec.2.7. Reference leg breaks outside containment are screened from consideration based on negligible contribution (BNP-PSA-032) but there is no documented value for frequency to support this decision. There are questionable assumptions on Breaks Outside Containment, particularly the use of a non-conservatively small pipe break frequency for Main Steam and Main Feedwater piping through use of old EPRI pipe section methodology vice consideration of piping length (see also IE-C1; however the issue here is screening of potential initiators as opposed to a too low IE frequency for a modeled event).	Addressed in BNP 2011 MODEL. The pipe rupture frequencies for Break Outside Containment have been revised to incorporate the latest Pipe Rupture Frequencies from EPRI's Pipe Rupture Frequencies for Internal Flooding Probabilistic Risk Assessments, Revision 2 Report 1021086. The analysis assesses piping systems that can contribute to high energy line breaks outside containment and includes Main Steam Lines, Feedwater Lines, High Pressure Coolant Injection Lines, Reactor Core Isolation Cooling Lines, Reactor Water Clean Up Lines and Scram Discharge Volume. The analysis, using the new method resulted in un-isolated pipe break frequencies that were near the values of the old EPRI pipe break analysis values and thus the high energy Break Outside Containment initiators are still screened from the model.
1-15	AS-A2	Cat 1-3 met	For SBO, the event tree model does not guarantee that a safe stable state has been achieved. The LOSP convolution analysis (BNP-PSA-036) includes recovery AC power implicitly. However, the accident sequence analysis does not consider the possibility of failure of suppression pool cooling following AC power recovery.	Resolved in BNP 2011 MODEL, the event tree was expanded to address required questions for a safe stable state.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
1-11	SC-B3	Cat 1-3 met	For small break LOCA, the high end of water break is approximately 1" dia., RCIC is credited for HPI for success, but no MAAP run was performed to demonstrate the success.	For the majority of small breaks it was determined that RCIC would be acceptable. All other BWRs referenced for the Success Criteria Notebook developed for the BNP PRA model credit RCIC. The RCIC system was designed to deliver 460gpm for transient events with MSIV closure rather than LOCA. A review of the LOCA cases in the GE NEDO-24708A study, case 26 (Figures 3.1.1.1-26.1 through 26.8) always pairs RCIC with CRD to satisfy makeup requirements for the upper limit small liquid LOCA. MAAP analysis Case BR0039 supports use of RCIC and a single CRD pump for a SORV which is at the lower end of the medium steam line LOCA range. However, it assumed that the large majority (>95%) of the small break LOCA contribution is from the CRD withdraw (3/4" diameter) and insert (1" diameter) lines which would result in limited break flow due to flow restrictions from these lines that would result in break flow well below the RCIC capacity. As such, RCIC is credited as a viable injection method for small break LOCAs consistent with other PRAs. The ability of RCIC to mitigate small liquid breaks is addressed as an area of uncertainty.
6-8	SC-C2	Cat 1-3 met	There does not appear to be a centralized discussion of computer code limitations. Codes used in generic references and SAR (and associated limitations) are not discussed. System level success criteria for meeting Top Event gate success criteria are not as well documented in BNP-PSA-033 but appear to be documented on a distributed basis in Heatup Calculations and in System Notebooks.	This is a documentation issue and has no impact on the DG importance.
4-5	SY-A13	Cat 1-3 met	Failures of the F032A and F032B outboard feedwater check valves are not modeled. The system notebooks state that such failure is considered "improbable". However, the model does include the failure of inboard check valve F010A to reopen.	Resolved in BNP 2011 MODEL.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
3-3	HR-E3	Cat 1 met Cat 2-3 not assessed	Operator interview insights are documented in the HRA Calculator. The information contained in the HRA Calculator was sufficient to demonstrate the Capability Category I was met. However, the information in the HRA did not demonstrate that detailed interviews with Operations and Training Personnel were conducted for the purpose of confirming procedure interpretations. For example, many of the calculations referred only to an interview conducted with a single operator on 9/16-17/2008. A few calculations referred a "talk through" in January 2008, an operator interview on 3/11/2010, or simulator runs conducted on 1/19/2010. A few calculations (OPER-BLACKSTART, OPER-CNS, OPER-CWSIE) did not have any input on operator interviews. The purpose and content of these interviews is not evident. Based on the information provided, Capability II/III was not demonstrated.	This is a documentation concern. Detailed operator interviews were conducted for the purpose of confirming procedure interpretations. PRA documents have been updated to improve their clarity in this area. The HFE's mentioned are no longer used in the PRA.
3-4	HR-E4	Cat 1 met Cat 2-3 not assessed	While it was documented that simulator observations and operator interviews were performed in most HRA calculations, there is no evidence that these observations or interviews were used to confirm the response models for the scenarios modeled in the PRA. For example, there was no interview checklist, simulator/scenario checklist, or other documentation to demonstrate that the HRA analyst confirmed the response models.	Resolved in BNP 2011 MODEL with added documentation of both simulator interviews and checklists.
N/A	HR-F2	Cat 1-2 met, Cat 3 not assessed	Problems were noted with the HRA calculation for OPER-DCDG. Specifically, no execution failure probabilities were assigned to the tasks of starting and connecting the DG. Additionally, the calculation may not have considered all of the necessary breaker manipulations.	Resolved in BNP 2011 MODEL with execution evaluation revised.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
3-6 3-8	HR-G3	Cat 1-3 met	In general, the HRA calculator file was reviewed and found to provide an assessment of the performance shaping factors listed in the SR for the HEP calculations. Some detail in the calculations could be enhanced. For example, the operator action OPER-LDSHD calculation does not have the cognitive procedure listed and does not address the training requirements. Calculations for OPERMSIVCBP and OPER-DEPRESS1 state that simulator and classroom training are provided but does not provide a frequency. The calculations for OPER-DCDG and OPER-N2SUPPLY do not address training, the cognitive procedure or the staffing requirements.	Resolved in BNP 2011 MODEL with missing information added to HRA Calculator
2-3	HR-I2	Cat 1-3 met	In BNP-PSA-034, Attachment 3 describes the Type A human error screening methodology employed for the Brunswick PRA model. The methodology follows the screening methodology suggested in NUREG 1792. The screening values used in Tables 1 and 2 contradict the values said to be employed in Section E.3.1 (i.e. 0.008 applied to Type A human errors affecting a single train and 0.0008 for common cause human failure events). Nonetheless, Tables 1 & 2 in Attachment 3 utilize screening values of 0.01 for single train Type A human errors and 5E-03 for common cause errors. When these screening values were used for the HEPs and the model subsequently quantified, all cross-train Type A HEPs using screening values of 5E-03 having a Fussell-Vesely Importance < 5E-03 are stated to be screened.	Documentation only, the ambiguity in the documentation will be addressed at a later point. No impact to DG AOT application.
2-2	DA-C8	Cat 1 met Cat 2-3 not met	Based on the information presented in the system notebooks (BNP-PSA-062), the PRA estimates the standby time for components based on the number of trains available vs. the number of running trains (e.g., 50% for a 1 of 2 system). Actual plant specific data concerning standby time is not collected and evaluated in the BNP PRA. However, may be available from OSI PI to support this.	Issues were investigated and based on the investigation it was determined the results are realistic and in turn documented.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
1-2	DA-C13	Cat 1-3 met	Unavailability data was taken from MR databases, and outage periods were excluded from the UA calculations (as documented in the BNPUnavail spreadsheet that is part of the BNP-PSA-004 notebook). In the case of the shared DGs, the BNPUnavail spreadsheet is incorrectly deleting all DG OOSs that occur when either unit is in an outage. Based on the modeling of the shared DGs, the correct treatment would be to NOT exclude any DG outage (regardless of unit outage condition). This error results in an DG unavailability that is too low. It should be noted, that based on current data, the impact of this error appears to not be too significant on the results.	Resolved in BNP 2011 MODEL, DG unavailability was corrected.
3-9	QU-C2	Cat 1-3 met	Dependency analysis was performed on the identified HFE combinations (see BNP-PSA-034 and associated spreadsheets). The dependency assessment approach used appears to be appropriate. In developing recovery rules to be applied to the cutsets, maximum combinations of 3 HFEs were included. Any cutsets with greater than three HFEs that meet the recovery rule criteria are recovered to a minimum joint HFE of 1E-6 (and often higher). As a result, there are cutsets that contain more than three HFEs that are being recovered to a higher frequency than may be warranted (either because one or more of the additional HFEs may be independent of the others, or because the joint HFE probability is still above the floor value of 1E-6 (and often higher). As a result, there are cutsets that contain more than three HFEs that are being recovered to a higher frequency than may be warranted (either because one or more of the additional HFEs may be independent of the others, or because the joint HFE probability is still above the floor value of 1E-6 and hence could be reduced further). This conservatism appears to increase the calculated CDF/LERF by at least a modest amount.	Resolved in BNP 2011 MODEL, combinations of operator actions and dependencies were analyzed to ensure a correct value.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
2-11 2-7 5-6	QU-D1	Cat 1-3 not met	It is stated in BNP-PSA-030 that the top 200 cutsets have been reviewed. However, to determine if there are logic problems buried deeper down in the cutsets, a sample should be taken of significant cutsets. The correct definition of significance is stated in the quantification notebook. The review should include a sampling of cutsets over the full range of significance (i.e., top 95% of cutsets contributing to CDF/LERF). In addition, the QU notebook attachments (cutset tables) for CDF and LERF Cutsets, discusses only the top 20 CDF cutsets. No discussion of the top 20 LERF cutsets was found. The discussion should be expanded.	Resolved in BNP 2011 MODEL, cutsets and accident sequences were reviewed and documentation of review improved.
4-7	QU-D4	Cat 1 met Cat 2-3 not met	Section 3.9 of BNP-PSA-030 compares BNP PSA results against other units. However, there is no analysis of contributors as required for Cat II. In addition, no references are provided for the other PRAs that are compared to (e.g., are these IPE results, or current results, etc.)	Resolved in BNP 2011 MODEL, BNP Quantification calculation was revised to include an enhanced similar plant review.
3-12	LE-C3	Cat 1 met Cat 2-3 not met	As discussed in BNP-PSA-049, Appendix D, Section D.1, the CET structure allows for the identification of recovery and repair actions that can terminate or mitigate the progression of a severe accident. This process was incorporated into the original analysis, rather than performing a review of significant accident progression sequences and then incorporating repair, as would be inferred from the standard. However, it does not appear that significant accident progression sequences were reviewed.	Capability category I provides reasonable results for LERF. Any credit of repair would reduce LERF.
3-11	LE-C10	Cat 1 met Cat 2 not met Cat 3 not assessed	There is no evidence that significant accident sequences were reviewed to determine if engineering analyses could support continued equipment operation or operator actions to reduce LERF. It was noted that this conservative approach with respect to equipment survivability was documented in the uncertainty analysis (BNP-PSA-075, Table 1, Item 236)	Capability category I provides reasonable results for LERF. Any credit for equipment survivability would reduce LERF.
3-11	LE-C12	Cat 1 met Cat 2 not met Cat 3 not assessed	There is no evidence that significant accident sequences were reviewed to determine if engineering analyses could support continued equipment operation or operator actions to reduce LERF.	Capability category I provides reasonable results for LERF. Any analysis supporting equipment or operators would reduce LERF.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
3-13	LE-C13	Cat 1 met Cat 2-3 not met	BNP-PSA-049, Section 3.1.2 notes that the treatment of scrubbing by the reactor building is treated in a conservative method. This conservative approach was noted in the uncertainty analysis (BNP-PSA-075, Table 1, Item 217).	Capability category I provides reasonable results for LERF. Any additional treatment of scrubbing would reduce LERF.
1-19	LE-E1	Cat 1-3 met	Parameter values were selected with regards to the PRA Standard's requirements for HR and DA. Consideration of severe accident conditions upon these parameters is provided in Appendix M, or in some instances Appendix C, of the BNP-PSA-049 notebook. Section G of LE notebook captures the human error modeling, and incorporated the general methodology approach used in Level 1 HRA. However, the data values documented in BNP-PSA-049 were developed during a previous PRA update. It appears that some values may need to be updated to be consistent with changes in the Level 1 data. For example, OSP recovery values (such as ACP1XHE-MN-OFFE) are not consistent with the current OSP recovery curve (and LOSP is now categorized by type of OSP failure as opposed to a composite value). On the other hand, changes in component failure data appear to have been updated in the Level 2 trees. However, the documentation does not indicate that the values shown in BNP-PSA-049 have been superseded.	Resolved in BNP 2011 MODEL, LOSP curves and component failures were updated.
6-12	LE-G5	Cat 1-3 not met	There is very limited discussion of the impact of variability / sensitivity in time to core damage amongst different methodologies upon potential applications in Appendix C of BNP-PSA-049. While limitations of the quantification process are discussed in BNP-PSA-030 Sec.3.6, that discussion is not pertinent to SR LE-G-5. It is concluded there is not sufficient discussion of the limitations of the LERF analysis that could impact different applications, thus this documentation requirement is NOT MET.	Resolved in BNP 2011 MODEL, discussed uncertainties and limitations of use.
1-21	IFSO-A1	Cat 1-3 not met	Table F.5 of RSC 10-05 lists all of the potential flooding sources; however one of the major assumptions is that all fire protection sprinkler systems are dry-type systems. SD-41 contains a listing of fire protection systems and most are wet type systems. Since the inclusion of fire protection could significantly alter the screening and scenario development, this is considered to be not met.	Resolved in BNP 2011 MODEL, information corrected and flooding analysis updated.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
1-22	IFSO-A4	Cat 1-3 not met	Pipe breaks and valve body failures were the only failure mechanisms identified. Although plant experience includes a gasket failure, failures of gaskets, expansion joints, etc. are not discussed. Therefore, SR is not met as all required mechanisms are not considered.	Resolved in BNP 2011 MODEL, gasket and expansion joint caused flooding and human induced mechanisms are now covered.
1-23	IFSO-A5	Cat 1-3 not met	The temperatures and pressures of condensate, feedwater, and nuclear service piping are not considered. The flow rates for circulating water piping are based on one pump instead of all four. This SR is judged to be not met.	Resolved in BNP 2011 MODEL, characteristics of flood sources are described.
1-24 1-31	IFSO-B1	Cat 1-3 not met	Most of the level of detail required to relate the flood sources to actual rooms and piping is located in a vendor database that is not part of the documentation file. Therefore this SR is not met.	Resolved in BNP 2011 MODEL, maps are provided for flood sources, initiating events, and propagation.
1-25	IFSN-A2	Cat 1-3 not met	The flooding analysis (as documented in RSC 10-05) discusses sumps and drains, curbs, spray shields, and watertight doors. No mention is made of flood alarms (or other information that would alert operators of the flood), blowout panels or HVAC dampers. As flood screening is performed based on assumed operator intervention, the lack of information concerning alarms impacts the ability to accurately assess the probability of successful flood termination.	Resolved in BNP 2011 MODEL, flooding analysis in the HRA Calculator implements alarms to tell operators there is a flood occurring in the system.
1-20	IFSN-A3	Cat 1-3 not met	RSC 10-05 does not identify any automatic flood isolation features. No operator indications are discussed. However, the qualitative screening of flood areas evaluates successful operator action to isolate any flood assuming that the flood is immediately detected. The flood documentation needs to indicate how each flood would be detected and the time to identify the occurrence of the flood needs to be factored into the HEP calculation. As the current evaluation is non-conservative, this SR is assessed as not met	Resolved in BNP 2011 MODEL, alarms are documented in the HRA calculator.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
1-24	IFSN-A5	Cat 1-3 not met	The flooding documentation in RSC 10-05 does not provide a comprehensive listing of PRA-modeled equipment in each area. Similarly the walk down notebook (RSC 10-03) does not contain this information. It appears that additional component location information is contained in the flooding database tool; however this database was not available for review. Flooding mitigating features (e.g.,berms, spray shields, etc.) are described for some components, but it is not clear if all such features are documented in either RSC 10-03 and RSC 10-05. Using the database, the specific PRA equipment impacted by floods in each area (due to direct flooding or propagation) are supposed to be automatically identified. While major components are discussed in the documentation, smaller electrical items that might be impacted by a flood in an area are not discussed (e.g., any non-watertight junction boxes). Based on the information available, it cannot be verified that this SR is met.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
6-16	IFSN-A6	Cat 1-2 not met Cat 3 not assessed	The methodology is considered sufficient and robust for identifying flood damage due to submergence. EPRI TR-1019194 recommends that at least a 10 foot radius from a pipe be considered for impact of spray due to pipe failure. Many industry PRAs assume up to 30 feet for spray impact. While spray due to water falling down propagation pathways has been assessed for impact (or lack thereof) on SSCs, there is no evidence that this was done for any equipment. Equipment in flood zones such as upper levels of the reactor building would likely be subject to this failure mechanism. Equipment in zones where submergence occurs (e.g., lower level of Reactor Building) could be damaged by spray prior to being damaged by submergence, which could change the timing associated with equipment failures in scenario development. The R.G. 1.200 qualification for this SR requires that a qualitative assessment of pipe whip, jet impingement, humidity, condensation and temperature concerns in the flooding analysis. The current flooding documentation does not provide this assessment.	Resolved in BNP 2011 MODEL, impacts of spray and effects of high energy line break are discussed.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
1-26	IFSN-A8	Cat 1 met Cat 2 not met Cat 3 not assessed	Section F.1.3 of RSC10-05 states that flows through drains were considered, but there is no discussion concerning drain paths as a possible propagation path between rooms in the Auxiliary Building basement nor the basis for not considering such paths. Discussion of drain paths not included. Propagation through wall penetrations, cable trays, and HVAC ducts do not appear to be considered. As only propagation through doors, stairwells, and gratings are considered, the requirements for Cat II are not met.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
1-27	IFSN-A11	Cat 1-3 not met	While multi-unit flooding was considered, all scenarios were screened out on the basis of physical barriers that are assumed to prevent flood propagation between units. However, the turbine building has complete communication between unit 1 and unit 2. Therefore, water can spread from one unit to the other and vice versa. The flood scenario is described more detail in Section F.2.1.2 of the notebook. In addition, turbine building roll-up doors on elevation 20' do not appear to have been considered as a propagation path between units. So, it appears that the screening of all inter-unit turbine building floods may not be correct.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
6-18	IFSN-A13	Cat 1-3 not met	Brunswick Flooding PRA credits operation of drains for mitigating flooding events. Per EPRI TR-1019194, there is wide variability in modeling on this issue, with widespread industry practice of not crediting the functioning of drains due to the high probability of sump pump failures and clogging of drains. There is no discussion in RSC 10-05 concerning the reliability of the drains as a mitigating system for flooding. As there is not a definitive basis for crediting the drains, this SR is considered not met.	Resolved in BNP 2011 MODEL, drains are not credited for mitigation paths.
1-28	IFSN-A16	Cat 1 not met Cat 2-3 not assessed	Flood sources were screened if more than 8 hours is required to reach a one foot depth in an area. However, there is no discussion of whether indication is available to identify the flood or if isolation can be performed given the flooding is occurring.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
1-31	IFSN-B1	Cat 1-3 not met	While RSC 10-05 provides some of the documentation of the scenario development process, it is not believed to be adequate to support future PRA maintenance and applications. Discussion of propagation pathways could have been at a greater level of detail. (Also see IFSN-B2.)	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
1-31	IFSN-B2	Cat 1-3 not met	As noted in IFSN-B1, the flood scenario development documentation does not provide all of the information needed to fully describe the scenario development process. In addition to other items noted in the IFSN-A SRs, items (c),(d),(e), and (f) need to be included as part of the documentation. Also, a listing of the specific components assumed to be failed in each flood area needs to be provided.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
1-27	IFEV-A4	Cat 1-3 not met	An older EPRI pipe break method based upon piping segments is used. This methodology had been the subject of previous F&O IF-D5a-1. The latest EPRI methodology is based upon piping length, and differentiates between whether the Service Water is sea water, lake water, or river water. The Brunswick Service Water System is considered a salt water system and thus would be in the category with the highest failure frequencies. Note, using as an example 6' Service Water piping, the segment-based methodology (Section F.8.1) corresponds to a frequency of 5.8E-06/year, which would correspond to about 2 1/2 feet of piping based on the 'spray' failure frequency (100 gpm or less) of sea water service water pipe per EPRI TR-1013141. (It is noted these are not a direct comparison and this probably underestimates the pipe length corresponding to one section) Thus, use of the segment-based approach is questioned since it results in underestimating the pipe failure frequency, particularly for the Service Water system which is an important contributor to Internal Flooding scenarios. It is recommended, as it was by the previous F&O, that the pipe failure frequency methodology be updated. A sampling of frequency calculations were reviewed which concludes that the flood IE frequencies were calculated as described.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
6-15	IFEV-A5	Cat 1-3 not met	Basis: An older EPRI pipe break method based upon piping segments is used. This methodology had been the subject of previous F&O IF-D5a-1. The latest EPRI methodology is based upon piping length, and differentiates between whether the Service Water is sea water, lake water, or river water. The Brunswick Service Water System is considered a salt water system and thus would be in the category with the highest failure frequencies. Note, using as an example 6' Service Water piping, the segment-based methodology (Section F.8.1) corresponds to a frequency of 5.8E-06/year, which would correspond to about 2 1/2 feet of piping based on the 'spray' failure frequency (100 gpm or less) of sea water service water pipe per EPRI TR-1013141. (It is noted these are not a direct comparison and this probably underestimates the pipe length corresponding to one section) Thus, use of the segment-based approach is questioned since it results in underestimating the pipe failure frequency, particularly for the Service Water system which is an important contributor to Internal Flooding scenarios. It is recommended, as it was by the previous F&O, that the pipe failure frequency methodology be updated. A sampling of frequency calculations were reviewed which concludes that the flood IE frequencies were calculated as described.	Resolved in BNP 2011 MODEL, the pipe break frequency methodology has been updated.
3-14	IFEV-A6	Cat 1 met Cat 2-3 not met	RS 10-03, Section F.5.1 and F.5., discuss the use of plant specific piping configuration and walk downs to determine flood initiating event frequency. Additionally, generic failure rates were used for pipe break frequency. It did not appear that plant-specific information was gathered with respect to the flood LIKELIHOOD. Specifically, there was no operating experience related to water hammer or material condition of fluid systems at Brunswick.	Resolved in BNP 2011 MODEL, plant specific nature of potential plant systems impacts on flooding frequency evaluated.
1-31	IFEV-B1	Cat 1-3 not met	The review of the flooding-induced initiating events was not conducive to a peer review as the raw data used in the flood database was not available for review.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
1-31	IFEV-B2	Cat 1-3 not met	The flooding documentation was not clear in identifying the HEPs that potentially mitigate floods. Operating experience is not documented.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
2-9	IFQU-A1	Cat 1-3 not met	There is no evidence of documentation of review or modification of accident sequences. Discussions with the PRA Staff state that IF IEs are evaluated using the Transient ET. Specific flood impacted equipment is taken out of service in conjunction with the specific flooding IE. All sequences were added to the general transient event sequence. No new event trees were generated. The quantification section of the flooding report does not discuss how it was determined that there were no special flooding sequences that warranted special handling. The Flooding Analysis document RSC 10-05 does not provide information concerning modeling of system/component failures due to pipe failures in that system, as opposed to failure due to flooding and flood propagation. Detailed discussions were necessary to establish the logic by which, for example, Fire Protection Water and Service Water systems can still be credited for injection to the vessel after piping failures in the respective systems. Sequence modifications are not documented. Some fire protection and service water pipe breaks will fail the system as a LPI source by failing the injection path, including consideration of flow diversion effects; this may not be fully accounted for.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
1-32	IFQU-A2	Cat 1-3 not met	Documentation of SR IFQU-A2 does not provide a link between the flooding IE and the equipment failed for that specific flooding initiator. By inspection of the model, equipment and system fault trees have been modified to include flood-induced failures. No documentation of the events or systems impacted is included in the flooding analysis (maintained as a separate spreadsheet, see IFQU-B1). Thus, it is not possible to fully verify if the modifications were done correctly.	Resolved in BNP 2011 MODEL, maps provided for flood initiating events, components to flood zones, and flood propagation.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
2-10	IFQU-A5	Cat 1-3 not met	The analyses of all HRA are documented in the HRA Calculator and were not readily available for review. Based on the time available for HRA Calculator review, the following issues and comments are provided. This should not be considered an all inclusive list given the time restraints on the review. While the HRA analyses did include many important factors used to determine a human error probabilities (HEPs) associated with isolating flood events, the following issues were judged to potentially impact the calculated HEPs: • The methodology used for calculating the HEPs for the flooding termination was the annunciator response methodology. There was no discussion in the flooding documentation regarding the use of, or acceptability of the use of, this methodology. Flooding HRA documentation should be enhanced to include a discussion of the methodology, and the justification thereof, for calculating HEPs. • The use of the annunciator response methodology did not appear to account for all expected annunciators. For example, for large turbine building floods, it does not appear reasonable that only one annunciator would be received. Under the large turbine building flood conditions, it would be expected that the loss of circulating water pumps and the plant transient would cause multiple alarms. Therefore, this HEP could be significantly under-estimated as the annunciator response methodology modeling only assumed that one alarm would be received. • Since the detection and diagnosis of a flooding situation is critical to flood mitigate, a detailed discussion of the detection systems and alarms available for diagnosis is necessary to ensure a realistic HRA. Neither the flooding documentation, nor the HRA calculator files, contains a complete description of the cues available to the operator for flood detection. Therefore, the accuracy of the HEP for flood termination is questionable.	Resolved in BNP 2011 MODEL, the flooding HRAs now use a CBDTM method, alarms implemented, operator discussion implemented and documented.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
2-10 (Cont.)	IFQU-A5	Cat 1-3 not met	• It does not appear that operator interviews or walk-throughs were used to determine the flooding HEPs. Interviews with operators and their response to various alarms would provide invaluable insights into the flood response and would provide for a more realistic approach. • It is not clear that the "time available" value used in the HEP was appropriate for some scenarios. The time available used was the time to which the flood would reach the height of critical equipment. However, the time of the flood to reach the flood isolation valves, in some scenarios, may be time limiting. Additionally, the impact on timing if damage is due to spray, vice submergence, must be considered. The analysis should be more specific regarding which valves need to be isolation, their locations, and the ability to isolate before the flood scenarios cause them to be un-isolable., vice submergence, must be considered. The analysis should be more specific regarding which valves need to be isolation, their locations, and the ability to isolate before the flood scenarios cause them to be un-isolable.	Resolved in BNP 2011 MODEL, the flooding HRAs now use a CBDTM method, alarms implemented, operator discussion implemented and documented.
6-13	IFQU-A6	Cat 1-3 not met	No consideration is documented for the impact of flooding on operator actions modeled in the HRA which require operator actions in areas subject to flooding. There is no discussion in the documentation of how the flood would be discovered and thus no discussion of the time it would take plant personnel to start to respond. There is no documentation or discussion of this in Section F.11. No discussion of whether or not the mitigating equipment listed in table F.20 would be affected by the flood itself.	Resolved in BNP 2011 MODEL, discussed impact of flooding on internal events, flooding alarms associated with credited operator actions, and affects of the flood on mitigation equipment.
1-33	IFQU-A9	Cat 1-3 not met	Direct effects were included. The only indirect effect included was submergence.	Resolved in BNP 2011 MODEL, discusses impacts of spray and effects of high energy line break.
6-14	IFQU-A10	Cat 1-3 not met	There is no evidence that this requirement was addressed. The flooding analysis did not appear to analyze any impact on the LERF model due to the flooding initiators.	Resolved in BNP 2011 MODEL, the impacts of internal flooding on LERF were evaluated using cutset reviews.

Table A5-6: 2010 Peer Review F&Os (Findings only included)				
F&O Number	Applicable SR	Peer Review Capability Category	Finding	DG AOT Impact
6-17 6-21 1-31	IFQU-B1	Cat 1-3 not met	The methods of incorporating the flooding results into the model are not discussed in the flooding documentation. Due to weak level of detail and missing information documentation does not facilitate peer review, PRA maintenance and upgrades, or application support.	The flooding findings have been resolved by improved documentation and PRA model analysis. Flooding events do not have a significant impact on this application.
6-20 1-31	IFQU-B2	Cat 1-3 met	The report RSC 10-05 does not contain the information that lists what equipment is damaged for each pipe failure scenario, thus there is no documentation available for review for this aspect of defining the plant equipment subject to damage from each flooding initiator. This information may be contained in the database used in performing the flooding analysis, but it could not be confirmed.	Resolved in BNP 2011 MODEL, maps provided for flood initiating events, components to flood zones, and flood propagation.

5.10. BNP Self Assessment PRA Capability Categories

The 2010 Peer Review included internal flooding as part of the Peer Review evaluation discussed above. The High Winds and Fire PRA have had a self assessment performed against the PRA standards to identify any gaps. These gap SRs identified in the self assessments for high winds and fire that did not meet capability category II are listed in Tables A5-7 and A5-8 below. Additionally, external flooding was evaluated and determined to have low significance due to similarities to a loss of offsite power event as well as the fact it is a low frequency event as it could only occur during hurricane season. Note that documents cited in Tables A5-7 and A5-8 are primarily BNP PRA calculations that document the development of the current model but do not impact this submittal beyond the information already presented in the submittal report and documentation. As such these documents are not referenced or included as a part of this submittal.

5.11. BNP High Wind External Events PRA Capability Categories

The Self Assessment Review of the BNP PRA was performed to evaluate the High Wind and Fire portions of the PRA. The review identified 9 SR's for High Winds that did not meet capability category II. All other SR's met or exceeded capability category II. The 9 SR's identified are listed in Table A5-7 below and cite the applicable SR, the finding, and a description of the impact to the DG AOT application.

Table A5-7: Self Assessment Review of High Winds

Applicable SR	Finding	DG AOT Impact
WHA-B3	Sources of model uncertainty and related assumptions are scattered in the documentation and not summarized in one location in the documentation.	Improvement in documentation is needed as does the listing of sources of assumptions and uncertainty. Does not affect the application.
WFR-B3	Sources of model uncertainty and related assumptions are scattered in the documentation and not summarized in one location in the documentation.	Improvement in documentation is needed as does the listing of sources of assumptions and uncertainty. Does not affect the application.
WPR-A4	(a) Initiating events developed (documented in Attachment 3 of BNP-PSA-088). (b) No new accident sequence analysis performed. (c) No new success criteria developed. (d) No new systems analysis developed. (e) No new equipment failure/unavailability events added to the model. (f) Human Reliability events altered in the model to account for changed performance shaping factors. (g) No expert judgment used. Need to expand the discussion of these aspects.	This is a documentation issue and does not impact the application. The documentation lacks discussion of these attributes and how the high wind model was adjusted.

Table A5-7: Self Assessment Review of High Winds		
Applicable SR	Finding	DG AOT Impact
WPR-A5	Section 3.3.3 of attachment 3 of BNP-PSA-088 describes the methodology used to adjust HRA events for the performance shaping factors of a high wind event. Need better description of what was done and why only some of the HRAs were adjusted.	Documentation of HRA analysis needs to be improved. Does not affect the application.
WPR-A10	Need more (detailed) discussion of human action viability following an event.	Documentation of HRA analysis needs to be improved. Does not affect the application.
WPR-A11	Need documentation (and review) of evaluation of post high wind event system recovery viability.	Documentation of HRA analysis needs to be improved. Does not affect the application.
WPR-B2	The current splitting of the initiator frequency does not allow for effective accounting of uncertainties. Assumptions on the fragilities also do not lend themselves to effective accounting of uncertainties.	Documentation of HRA analysis needs to be improved. Does not affect the application.
WPR-C2	(a) The adaptation of the internal events model and the motivation are described in the documentation. (b) The model is not sufficiently refined to produce reasonable results. DG exhaust vent wind fragilities need additional analysis - they currently appear to mask other risk information	Based upon review of FSAR the EDG exhaust lines are capable of withstanding wind loading and are designed to not result in loss of EDG function. The masking effect is removed.
WPR-C3	Sources of uncertainty and assumptions are currently not easily identified.	Improvement in documentation is needed as does the listing of sources of assumptions and uncertainty. Does not affect the application.

5.12. BNP Fire External Events PRA Capability Categories

The BNP Fire model was developed using the guidance provided in NUREG/CR-6850 and incorporates the risk due to fire sources. An internal review process was held to compare and contrast the BNP Fire work against the ASME/ANS RA-S-2008 standard (incorporating the ASME/ANS RA-Sa-2009 addenda). Since the initial modeling is ongoing, the findings that are presented are preliminary and may incorporate anticipated findings for the BNP Fire PRA based on similar Fire PRAs that have been reviewed for other sites. The preliminary findings of the Self Assessment are presented in this document. The review identified SR's for Fire that did not meet capability category II or were addressed with a Finding. All other SR's evaluated met or exceeded capability category II. The SR's identified are listed in Table A5-8 below and cite the applicable SR, the finding, and a description of the impact to the DG Extended AOT application. A Peer Review of the BNP PRA which will include evaluation of the Fire portion of the model has been scheduled.

Table A5-8: Self Assessment Review of Fire		
Applicable SR	Finding	DG AOT Impact
CS-B1	Overcurrent coordination and protection has been reviewed in Change Package BNP-0157. The change package documents cables credited for overcurrent protective device coordination whose failure could challenge power supply availability. Analysis of the identified cables in BNP-0157 to determine the susceptibility to failure of coordination has not been performed and is not incorporated into the FPRA documentation.	Circuit coordination was addressed under BNP-0157. However, the circuit coordination needs to be updated and any coordination issue will be addresses such that the PRA results are not impacted.
PRM-A3	Need further analysis of CDF contributors of concern including accident sequences, equipment failures, and operator errors for the Fire PRA model.	Primarily a documentation issue seeking more insight into the model.
PRM-B4	Document non-applicability of requirements in Section 2 of the PRA standard for those IE requirements that do not apply	Documentation, where statement of no-applicability is weak or not made.
PRM-B9	Document changes to PRM consistent with requirements in Section 2 of the PRA standard.	System Notebooks have not been updated to reflect changes in Fire PRA PRM.
PRM-B12	The incorporation of instrumentation for Containment Isolation signal to replace the point estimate in the Level 2 model did not include the modeling of common cause failure or related unavailability due to test/maintenance.	No impact on results, as common cause failures of these instruments in a very low probability event, and most likely below the level of truncation. Removal of an instrument string from service during maintenance and testing is also a negligible impact on results.
PRM-B13	Documentation of non applicability was not found for components added to PRA to support Fire PRA PRM.	Documentation only, no new components were added which were not already with the PRA data analysis.
FSS-B2	The screening value applied to MCR abandonment scenarios for abandonment success is not a developed HEP. SR requirements for CAT I includes a bounding estimate of MCR abandonment risk. SR for CAT II needs realistic characterization, which cannot be justified with an undeveloped screening value.	No impact would be expected. The Supp-DG is connected via outside control room action, and breaker manipulation would also be governed by AO action outside control room.
FSS-C2	Damage to all targets within the ignition source ZOI is assumed at time zero. A time dependent fire growth/decay profile is used out of NUREG/CR-6850 for determination of fire propagation and HGL capability.	This is conservative and provides a slight increase in CDF, due to the non-credited 5 minutes (to first tray damage) that could allow suppression to prevent cable tray damage. Impact would be very target specific on cable tray and source interaction.
FSS-D7	Detection and suppression use generic estimates of system unavailability based on NURE/CR-6850. A review of system unavailability data is not performed to	Data is not available and it is expected the BNP is with the generic estimate, No impact on EDG AOT delta CDF is expected

Table A5-8: Self Assessment Review of Fire		
Applicable SR	Finding	DG AOT Impact
	determine if the system has experienced any outlier behavior relative to the generic data.	
FSS-D9	No evaluation has been performed to determine the effect of smoke on FPRA equipment or qualify its significance.	Failing all control cabinets in the fire location would be overly conservative since most cabinets would not experience smoke damage until the area was full of smoke and past the point where applicable cable would be postulated to be damaged. Thus the equipment that is potentially effected by smoke will also be generally lost due to cable damage and so no impact on EDG AOT is expected.
FSS-G4	Probability of fire spread to adjacent compartments is calculated based on rated and non-rated barriers between compartments. Rated fire barriers are confirmed and evaluated with a screening value for failure which bounds availability, reliability, and effectiveness data. No evaluation of random failure is performed.	Random failure is considered a very low probability particularly beyond fire barriers in the plant. However, during Hot Gas Layer scenarios, the barrier is given a 0.1 or 0.2 estimate for failure to include random effects.
FSS-H2	Target damage thresholds are developed in NUREG/CR-6850 and damage mechanisms are mainly described in the Hughes Report.	Target damage thresholds are based upon NUREG/CR 6850 for IEEE 383 qualified Thermoset cables, vice any plant specific testing. No impact or change in CDF/LERF would be expected.
CF-A1	Circuit probability analysis is not performed for all risk significant contributors.	No effect in EDG AOT analysis. This is a question about "all". A large number of CF failures were performed and if the CDF value would decrease significantly additional CF would have been analyzed. Important EDG fire failures have been specifically included.
HRA-C1	The HEP uncertainties estimates were not documented consistent with the quantification approach	Documentation of uncertainty only
FQ-A2	The BNP Fire PRA uses plant trip/ Loss of Feed Water or loss of off-site power as the initiator. No other PRM initiators were used beyond those.	No effect on CDF or LERF. The BNP model is constructed such that the actual initiating transient does not change the results as long as the correct fire damage effects are included.
FQ-A4	The CDF is a mean estimate with no correlation for the state of knowledge.	The use of FRANC does not allow this correlation to be performed. No direct impact on CDF or LERF results. The state of knowledge correlation does not allow evaluating the large and important uncertainties for issues such as HRR and fire growth.

Table A5-8: Self Assessment Review of Fire		
Applicable SR	Finding	DG AOT Impact
	No documentation of comparison to other plants has been made. There has been some comparison but the results are generally much higher CDF and of little value.	Documentation only, no impact on results
FQ-D1	Determine LERF for Fire PRA response model: This was performed; however the results are higher than expected.	LERF results are not the driver for the acceptance of the EDG CT and thus no impact on application.
UNC-A1	The assumptions and uncertainties are identified and the sources of uncertainty and whether the affect on the model is expected to be conservative. However, there was no estimate of the uncertainty interval of the CDF and LERF results. Also, there was no estimate of uncertainty intervals associated with significant basic events, pre-initiators HEPs, post-initiator HEPs and initiating events which would take into account the state-of-knowledge correlation.	No impact on CDF or LERF results as the HRR, fire growth and fire cabinet response are the largest uncertainties. The uncertainties with BE, pre-initiators HEPs, post initiator HEPs and initiating events are small compared to the impact of the HRR etc.
UNC-A2	The BNP Fire PRA documentation describes the sources of uncertainty. However, there is no discussion of the uncertainty distribution of total CDF, uncertainty analysis for LERF, and no sensitivity analysis. Also, the results provided for significant fire scenarios only include mean CDF and no statistical representation of the associated uncertainty interval.	No impact on CDF or LERF results as the HRR, fire growth and fire cabinet response are the largest uncertainties. The uncertainties with BE, pre-initiators HEPs, post initiator HEPs and initiating events as small compared to the impact of the HRR etc.

5.13. BNP External Events PRA for Nearby Facility Accidents

In order to account for human errors outside the normal operation of BNP, the IPEEE identified the hazards below for analysis. The threats listed were analyzed and determined to be dominated by fire and high winds events that have been previously discussed, therefore eliminating the need for further investigation at this point. A summary of the reviews performed for each hazard is provided for completeness.

5.13.1. Aircraft Impact

When the IPEEE was performed available information regarding military, commercial, and general aviation traffic was used to estimate a core damage frequency due to aircraft impact. Given the information available at the time of the analysis, the increase in CDF was determined to be less than 1E-6/yr. Therefore further analysis was not considered to be warranted.

Progress Energy recognizes that the credible threat to nuclear facilities by aircraft has changed since the IPEEE was published and is following industry efforts to address this issue in conjunction with other forms of sabotage. Yet at this point in time, the impact of such analysis is not within the scope of this application.

5.13.2. Industrial Accidents

The BNP IPEEE reviewed industries close to the site to determine if any of the facilities posed a hazard to the safe operation of the plant. The following facilities were identified as potential hazards:

- Archer Daniels Midland (ADM) Company
- A natural gas pipeline
- Cogentrix Southport Cogeneration Plant

Further investigation revealed that ADM only produces citric acid and has no known explosive materials on-site. Any threat posed by ADM is considered to be bounded by Military Ocean Terminal Sunny Point (included in Military Accidents).

The natural gas pipeline is addressed in the Pipeline Accidents subsection below.

Southport Cogeneration Plant, owned and operated by Cogentrix Energy, Inc., is a coal-fired power plant that provides steam to ADM and electric power to Progress Energy. The worst postulated accident at the Cogentrix facility is a turbine missile ejection or a high-energy steam line break. However, similar hazards are considered to be design base accidents at BNP itself and are addressed in the plant's PRA. Therefore, given the space between the sites and smaller size of the Cogentrix facilities, further review of Southport Cogeneration Plant initiators is not warranted.

The assumptions and analysis originally put forth in the IPEEE is still considered to be valid. Therefore the operation of nearby facilities results in no credible risk to the safe operation of BNP.

5.13.3. Military Accidents

Military Ocean Terminal Sunny Point's cargo load was analyzed for the BNP IPEEE. The largest explosives concentration at the site was identified as two fully loaded barges equivalent to 19.2 million pounds of TNT. The blast pressure experienced at BNP resulting from the detonation of this explosive source was determined to be 0.5 psi overpressure and 1 psi reflected overpressure. This pressure load is less than the tornado loads that were used for design basis at BNP. Therefore postulated military accidents result in no credible risk to the safe operation of BNP.

5.13.4. Pipeline Accidents

A 12-inch natural gas pipeline runs immediately beyond the 3000 foot BNP exclusion zone. The impact on the BNP site due to the worst case failure of the pipeline, assumed to be a guillotine rupture, was examined. The resulting radiant heat experienced at the nearest safety structure due to a potential fire would be less than that received by a flat surface from the sun. Control room habitability analysis revealed that for a postulated un-ignited gas leak the control room ventilation system would continue to meet the requirements set forth in Regulatory Guide 1.78. Therefore postulated pipeline accidents result in no credible risk to the safe operation of BNP.

5.13.5. Hydrogen Storage Failures

Detonation of the BNP hydrogen storage tanks was investigated to determine the impact of such an explosion. Industry guidance specifies the minimum separation distance between plant structures and hydrogen storage units to be 200 feet. Due to the fact that this distance is less than the distance between the hydrogen tanks and buildings containing safe shutdown equipment, no credible threat was determined to exist based on hydrogen detonation.

5.13.6. Transportation Accidents

Transportation accidents were assessed to include accidents on the roadways around the plant (river traffic was addressed in "Military Accidents"). The highest concentration of explosives on Highway 87, one mile from the plant, was determined to be 50,000 pounds of TNT. The impact on the plant from an explosive load from this source was bounded by the worst case explosion at Military Ocean Terminal Sunny Point. All chemical and hazardous materials accidents that could occur on the highway were also considered to be bounded by the worst case explosion at Military Ocean Terminal Sunny Point. Therefore postulated transportation accidents result in no credible risk to the safe operation of BNP.

5.14. References

References listed in Enclosure 4, section 4.11 of this submittal.

PRA QUANTIFICATION TABLES

Enclosure 6: PRA Quantification Data Tables

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
1	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
2	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
3	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
4	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
5	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
6	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
7	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.62E-01	X-AC-C01S_WC	
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
8	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-08	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
9	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
10	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
11	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
12	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
13	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		7.06E-01	X-AC-C01U1_WC	
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
14	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-08	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
15	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
16	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
17	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
18	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG4	Failure to restore EDG #4 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
19	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG3	Failure to restore EDG #3 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
20	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		8.00E-03	EDG1XHE-MN-DG1	Failure to restore EDG #1 or subsystem following test or maintenance
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
21	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		8.00E-03	EDG1XHE-MN-DG2	Failure to restore EDG #2 or subsystem following test or maintenance
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
22	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG4	Failure to restore EDG #4 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
23	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG3	Failure to restore EDG #3 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery

Table A6-1: Unit 1 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
24	1.97E-10	2.92E-04	%1T_DC1B	LOSS OF DC SWITCHBOARD 1B
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-DCPALTDC1	FAILURE TO ALIGN DC BUS TO STANDBY DC POWER SUPPLY - UNIT 1
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.90E-05	XOP-COM3-16	OPER-4160X+OPER-DCPALTDC1+OPER-SWRHR-C
25	1.84E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		7.15E-03	EDG2DGN-TM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
1	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
2	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
3	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
4	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
5	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
6	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
7	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
8	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
9	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
10	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
11	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
12	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
13	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
14	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
15	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
16	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
17	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
18	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
19	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
20	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG1XHE-MN-DG2	Failure to restore EDG #2 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
21	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG4	Failure to restore EDG #4 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
22	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG1XHE-MN-DG1	Failure to restore EDG #1 or subsystem following test or maintenance

Table A6-2 Unit 2 Top 25 Cutsets for the IE w/internal Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
23	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG3	Failure to restore EDG #3 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
24	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		8.00E-03	EDG1XHE-MN-DG1	Failure to restore EDG #1 or subsystem following test or maintenance
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
25	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		8.00E-03	EDG1XHE-MN-DG2	Failure to restore EDG #2 or subsystem following test or maintenance
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
1	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR1PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
2	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR1PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
3	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
4	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
5	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
6	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
7	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
8	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
9	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
10	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-08	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
11	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
12	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
13	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
14	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
15	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
16	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-08	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
17	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
18	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
19	2.35E-10	9.38E-03	%1TE_U1_WC	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		7.06E-01	X-AC-C01U1_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
20	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG4	Failure to restore EDG #4 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.62E-01	X-AC-C01S_WC	
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
21	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG3	Failure to restore EDG #3 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
22	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG4	Failure to restore EDG #4 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
23	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG3	Failure to restore EDG #3 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
24	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		8.00E-03	EDG1XHE-MN-DG1	Failure to restore EDG #1 or subsystem following test or maintenance
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6

Table A6-3 Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
25	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		8.00E-03	EDG1XHE-MN-DG2	Failure to restore EDG #2 or subsystem following test or maintenance
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
1	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR2PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
2	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR2PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
3	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
4	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
5	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
6	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
7	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
8	3.36E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
9	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
10	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
11	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
12	2.77E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
13	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.62E-01	X-AC-C01S_WC	
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
14	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
15	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
16	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
17	2.72E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
18	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
19	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
20	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
21	2.08E-10	5.85E-03	%2TE_U2_PC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
22	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG1XHE-MN-DG2	Failure to restore EDG #2 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
23	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG4	Failure to restore EDG #4 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG

Table A6-4: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
24	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG1XHE-MN-DG1	Failure to restore EDG #1 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
25	2.06E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		8.00E-03	EDG2XHE-MN-DG3	Failure to restore EDG #3 or subsystem following test or maintenance
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
1	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR1PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
2	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR1PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
3	3.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
4	3.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
5	3.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
6	3.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
7	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
8	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
9	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
10	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
11	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
12	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
13	3.24E-10	5.43E-02	%HWM_2	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
14	3.24E-10	5.43E-02	%HWM_2	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
15	3.24E-10	5.43E-02	%HWM_2	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
16	3.24E-10	5.43E-02	%HWM_2	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
17	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
18	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-DFPFUEL	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
		1.00E+00	OPER-FPXFER	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-08	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
19	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
20	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
21	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
22	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
23	2.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION

Table A6-5: Unit 1 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		6.80E-04	XOP-COM2-56WH	OPER-4160X-WH+OPER-SWRHR-O
24	2.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		6.80E-04	XOP-COM2-56WH	OPER-4160X-WH+OPER-SWRHR-O
25	2.45E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		6.60E-04	XOP-COM2-57WH	OPER-4160X-WH+OPER-SWRHR-C

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
1	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR2PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
2	3.66E-10	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		3.50E-03	RHR2PTF-TM-LOOPA	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
3	3.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
4	3.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
5	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
6	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
7	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
8	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		3.84E-02	EDG1DGN-EXTTM-D001	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
9	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG1DGN-FR-001	DIESEL GENERATOR 1 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
10	3.35E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		2.12E-01	X-AC-C05_S_WC	WC SITE LOSP CASE 5
		9.50E-05	XOP-COM2-39	OPER-4160X+OPER-SDGSTART
11	3.24E-10	5.43E-02	%HWM_2	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
12	3.24E-10	5.43E-02	%HWM_2	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-FPS1	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.50E-04	XOP-COM2-40WH	OPER-4160X-WH+OPER-SDGSTART
13	2.76E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
14	2.76E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
15	2.76E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
16	2.76E-10	7.80E-03	%2TE_U2_SC	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
17	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
18	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ALT120V	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM4-01	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
19	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-ISOSWAP	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
		1.00E+00	OPER-N2SUPPLY	FAILURE TO ALIGN NITROGEN SUPPLY
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM3-12	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
20	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
21	2.71E-10	7.96E-03	%TE_S_WC	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-480X	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SPCE	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
		1.00E+00	OPER-SPCL	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		9.62E-01	X-AC-C01S_WC	Offsite Power Recovery
		1.00E-06	XOP-COM2-12	OPER-4160X+OPER-SPCL
22	2.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		6.80E-04	XOP-COM2-56WH	OPER-4160X-WH+OPER-SWRHR-O
23	2.53E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT

Table A6-6: Unit 2 Top 25 Cutsets for the IE w/internal and external Flooding and High Winds Models				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-O	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		6.80E-04	XOP-COM2-56WH	OPER-4160X-WH+OPER-SWRHR-O
24	2.45E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D003	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		6.60E-04	XOP-COM2-57WH	OPER-4160X-WH+OPER-SWRHR-C
25	2.45E-10	5.92E-02	%HW_2	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-003	DIESEL GENERATOR 3 FAILS TO RUN
		1.00E+00	FL-CSTMU	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
		1.00E+00	FL-HIGHWINDS	FLAG TO ENABLE HIGH WINDS EVALUATION
		1.00E+00	FL-SBO	STATION BLACKOUT FLAG
		1.00E+00	OPER-4160X-WH	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
		1.00E+00	OPER-CSTMU	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
		1.00E+00	OPER-HWLVLCV	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
		1.00E+00	OPER-SDGSTART	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
		1.00E+00	OPER-SWRHR-C	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
		3.00E-03	TRAN-LOOP	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
		9.24E-01	X-POWEROP1	Fraction of annual year at power
		6.60E-04	XOP-COM2-57WH	OPER-4160X-WH+OPER-SWRHR-C

Table A6-7: Units 1 and 2 Top Cutsets for the IE w/internal and external flooding LERF Model (Same cutsets for both unit models)				
Cutset Number	Cutset Probability	Basic Event Probability	Basic Event Name	Basic Event Description
1	2.32E-12	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		3.84E-02	EDG1DGN-EXTTM-D002	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		5.90E-02	EDG2DGN-FR-004	DIESEL GENERATOR 4 FAILS TO RUN
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-LPISTART-120	FLAG TO ACTIVATE OPERATOR ACTION TO START LPI IN 120 MIN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		2.22E-05	PCI1AOV-CF22-001[1]	CCF - VALVES G16-F003 & G16-F004 FAIL TO CLOSE ON DEMAND
		1.00E+00	X-ID1-43	LERF-No cool MU w/low RPV press: Isolation fails
		9.24E-01	X-POWEROP1	Fraction of annual year at power
2	2.32E-12	5.00E-05	%EXTFL_1	PROBABILITY OF A 23 FOOT STORM SURGE
		5.90E-02	EDG1DGN-FR-002	DIESEL GENERATOR 2 FAILS TO RUN
		3.84E-02	EDG2DGN-EXTTM-D004	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
		1.00E+00	FL-EXTFLOOD	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
		1.00E+00	FL-LPISTART-120	FLAG TO ACTIVATE OPERATOR ACTION TO START LPI IN 120 MIN
		1.00E+00	FL-NSBO	NO STATION BLACKOUT FLAG
		2.22E-05	PCI1AOV-CF22-001[1]	CCF - VALVES G16-F003 & G16-F004 FAIL TO CLOSE ON DEMAND
		1.00E+00	X-ID1-43	LERF-No cool MU w/low RPV press: Isolation fails
		9.24E-01	X-POWEROP1	Fraction of annual year at power

1. PCI2AOV-CF22-001 for unit 2

Table A6-8: Unit 1 RAW Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Ach W	Description
XOP-COM2-12	1.00E-06	1.21E+05	OPER-4160X+OPER-SPCL
XOP-COM3-12	1.00E-06	4.12E+04	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	4.09E+04	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
XOP-COM3-08	1.00E-06	3.34E+04	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
XOP-COM2-14	1.00E-06	2.30E+04	OPER-4160X+OPER-DEPRESS1
XOP-COM2-39	9.50E-05	5.48E+03	OPER-4160X+OPER-SDGSTART
XOP-COM2-10	1.00E-06	5.18E+03	OPER-SPCE+OPER-WVDHR
XOP-COM2-36	3.85E-05	1.68E+03	OPER-4160X+OPER-SWRHR-O
XOP-COM2-35	1.00E-06	1.31E+03	OPER-4160X+OPER-FPS1
XOP-COM2-22	1.00E-06	784.11	OPER-DCPALTDC1+OPER-MANSW-120
XOP-COM2-19	1.00E-06	523.07	OPER-DCPALTDC1+OPER-N2SUPPLY
XOP-COM2-26	1.00E-06	523.07	OPER-4160X+OPER-WVDHR
XOP-COM2-41	1.00E-06	523.07	OPER-4160X+OPER-DCPALTDC1
XOP-COM3-06	1.00E-06	523.07	OPER-4160X+OPER-DCPALTDC1+OPER-FPXFER

Table A6-8: Unit 1 RAW Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Ach W	Description
XOP-COM3-16	1.90E-05	323.64	OPER-4160X+OPER-DCPALTDC1+OPER-SWRHR-C
XOP-COM3-09	1.00E-06	262.04	OPER-DCPALTDC1+OPER-SWRHR-O+OPER-SPCL
XOP-COM3-10	1.00E-06	262.04	OPER-DCPALTDC1+OPER-SWRHR-C+OPER-SPCL
%TE_S_WC	7.96E-03	54.29	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
XOP-COM2-13	9.59E-05	46.48	OPER-4160X+OPER-480X
XOP-4160X	1.90E-04	46.36	OPER-4160X
%TE_S_SC	5.55E-03	30.67	SITE LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
%TE_S_GC	6.79E-03	29.81	SITE LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
%1T_DC1B	2.92E-04	25.35	LOSS OF DC SWITCHBOARD 1B
RHR1PTF-TM-LOOPA	3.50E-03	21.62	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
XOP-DCDG	2.80E-04	19.28	OPER-DCDG
%1T_DC1B2	2.92E-04	19.09	LOSS OF 125V DC PANEL 1B2
XOP-SPCL	8.10E-05	17.96	OPER-SPCL
XOP-FPS1	4.10E-03	11.37	OPER-FPS1
XOP-SDGSTART	5.20E-03	10.77	Operator fails to start Supp-DG
EDG1DGN-EXTTM-D002	3.84E-02	10.39	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
ACP0BKR-CC-1AC5	2.55E-03	10.07	CIRCUIT BREAKER FROM UAT #1 TO 1C (1AC5) FAILS TO OPEN
ACP0BKR-OO-1AC7	2.55E-03	10.07	CIRCUIT BREAKER FROM SAT #1 TO 1C (1-AC7) FAILS TO CLOSE

Table A6-9: Unit 1 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
X-POWEROP1	9.24E-01	1.00E+00	Fraction of annual year at power
FL-NSBO	1.00E+00	9.86E-01	NO STATION BLACKOUT FLAG
OPER-SDGSTART	1.00E+00	9.43E-01	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
OPER-4160X	1.00E+00	8.73E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
OPER-480X	1.00E+00	7.48E-01	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
XOP-COM2-39	9.50E-05	5.20E-01	OPER-4160X+OPER-SDGSTART
%TE_S_WC	7.96E-03	4.28E-01	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
EDG1DGN-EXTTM-D002	3.84E-02	3.75E-01	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
X-AC-C01S_WC	9.62E-01	3.06E-01	Offsite Power Recovery
OPER-SPCE	1.00E+00	2.68E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
OPER-SWRHR-C	1.00E+00	2.45E-01	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
OPER-SPCL	1.00E+00	2.44E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
EDG2DGN-EXTTM-D004	3.84E-02	2.33E-01	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
EDG2DGN-EXTTM-D003	3.84E-02	2.13E-01	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_GC	6.79E-03	1.97E-01	SITE LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
X-AC-C01S_GC	7.63E-01	1.97E-01	Offsite Power Recovery

Table A6-9: Unit 1 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
EDG1DGN-EXTTM-D001	3.84E-02	1.79E-01	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_SC	5.55E-03	1.66E-01	SITE LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
X-AC-C01S_SC	7.96E-01	1.66E-01	Offsite Power Recovery
XOP-COM2-12	1.00E-06	1.21E-01	OPER-4160X+OPER-SPCL
OPER-SWRHR-O	1.00E+00	1.14E-01	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
X-AC-C05_S_WC	2.12E-01	1.00E-01	WC SITE LOSP CASE 5
%1T_T	8.24E-01	8.37E-02	TURBINE TRIP INITIATOR
OPER-N2SUPPLY	1.00E+00	8.27E-02	FAILURE TO ALIGN NITROGEN SUPPLY
OPER-GENDISC	1.00E+00	8.25E-02	FAILURE TO LOCALLY ALIGN ELECTRICAL BUSSES FOR BACKFEED
RHR1PTF-TM-LOOPA	3.50E-03	7.24E-02	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
XOP-COM2-36	3.85E-05	6.45E-02	OPER-4160X+OPER-SWRHR-O
OPER-FPS1	1.00E+00	6.44E-02	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
XOP-SDGSTART	5.20E-03	5.11E-02	Operator fails to start Supp-DG
EDG2DGN-FR-004	5.90E-02	4.63E-02	DIESEL GENERATOR 4 FAILS TO RUN
SDG1DGN-FR-001	5.90E-02	4.55E-02	SUPPLEMENTAL DIESEL GENERATOR FAILS TO RUN
EDG2DGN-FR-003	5.90E-02	4.41E-02	DIESEL GENERATOR 3 FAILS TO RUN
%1TE_U1_WC	9.38E-03	4.31E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
X-AC-C01U1_WC	7.06E-01	4.31E-02	Offsite Power Recovery
XOP-FPS1	4.10E-03	4.27E-02	OPER-FPS1
OPER-ALT120V	1.00E+00	4.12E-02	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
OPER-ISOSWAP	1.00E+00	4.12E-02	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
XOP-COM3-12	1.00E-06	4.12E-02	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	4.10E-02	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
OPER-TBCMGT	1.00E+00	3.93E-02	FAILURE TO THROTTLE TBCCW FLOW (INITIATOR)
OPER-DCDG	1.00E+00	3.57E-02	FAILURE TO ALIGN PORTABLE DC GENERATOR TO BATTERY CHARGERS
OPER-DFPFUEL	1.00E+00	3.54E-02	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
OPER-FPXFER	1.00E+00	3.40E-02	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
XOP-COM3-08	1.00E-06	3.35E-02	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
EDG2XHE-MN-DG3	8.00E-03	3.30E-02	Failure to restore EDG #3 or subsystem following test or maintenance
EDG1DGN-FR-002	5.90E-02	3.26E-02	DIESEL GENERATOR 2 FAILS TO RUN
EDG2XHE-MN-DG4	8.00E-03	3.22E-02	Failure to restore EDG #4 or subsystem following test or maintenance
EDG2DGN-TM-D003	7.15E-03	2.95E-02	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
OPER-LDSDN	6.90E-01	2.95E-02	SUCCESS OF DC LOAD SHED (COMPLEMENT OF OPER-LDSHD)
EDG2DGN-TM-D004	7.15E-03	2.83E-02	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
%1TE_U1_SC	7.81E-03	2.79E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
X-AC-C01U1_SC	5.95E-01	2.79E-02	Offsite Power Recovery
ACP0XHE-MN-E2E4	8.00E-03	2.65E-02	Failure to properly restore breaker following maintenance

Table A6-9: Unit 1 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
FL-BATDEPL1B	1.00E+00	2.42E-02	BATTERY BANK 1B DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
ACP0BKR-CC-1AC5	2.55E-03	2.32E-02	CIRCUIT BREAKER FROM UAT #1 TO 1C (1AC5) FAILS TO OPEN
ACP0BKR-OO-1AC7	2.55E-03	2.32E-02	CIRCUIT BREAKER FROM SAT #1 TO 1C (1-AC7) FAILS TO CLOSE
EDG1XHE-MN-DG2	8.00E-03	2.31E-02	Failure to restore EDG #2 or subsystem following test or maintenance
OPER-DEPRESS1	1.00E+00	2.30E-02	FAILURE TO DEPRESSURIZE FOLLOWING HCTL CURVES
XOP-COM2-14	1.00E-06	2.30E-02	OPER-4160X+OPER-DEPRESS1
EDG1DGN-FR-001	5.90E-02	2.28E-02	DIESEL GENERATOR 1 FAILS TO RUN
%1TE_U1_GC	4.21E-03	2.12E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
X-AC-C01U1_GC	8.48E-01	2.12E-02	Offsite Power Recovery
EDG2DGN-FS-003	5.38E-03	2.08E-02	DIESEL GENERATOR 3 FAILS TO START
EDG1DGN-TM-D002	7.15E-03	2.02E-02	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
EDG2DGN-FS-004	5.38E-03	1.95E-02	DIESEL GENERATOR 4 FAILS TO START
TRAN-LOOP	3.00E-03	1.83E-02	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
ACP0BKR-CC-1AD7	2.55E-03	1.81E-02	UAT #1 TO 1D (1-AD7) CIRCUIT BREAKER FAILS TO OPEN
ACP0BKR-OO-1AD5	2.55E-03	1.81E-02	CIRCUIT BREAKER FROM SAT #1 TO 1D (1-AD5) FAILS TO CLOSE
RHR1PTF-TM-LOOPB	3.50E-03	1.70E-02	RHR LOOP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
X-AC-C09_S_WC	1.32E-01	1.52E-02	WC SITE LOSP CASE 9
ACP0XHE-MN-E1E3	8.00E-03	1.51E-02	Failure to properly restore breaker following maintenance
FL-SBO	1.00E+00	1.45E-02	STATION BLACKOUT FLAG
EDG1XHE-MN-DG1	8.00E-03	1.45E-02	Failure to restore EDG #1 or subsystem following test or maintenance
EDG1DGN-FS-002	5.38E-03	1.41E-02	DIESEL GENERATOR 2 FAILS TO START
EDG1DGN-TM-D001	7.15E-03	1.29E-02	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
OPER-DCPALTDC1	1.00E+00	1.24E-02	FAILURE TO ALIGN DC BUS TO STANDBY DC POWER SUPPLY - UNIT 1
FL-BATDEPL1A	1.00E+00	1.15E-02	BATTERY BANK 1A DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
OPER-CRD-FO-INJ	1.00E+00	1.09E-02	FAILURE TO ALIGN/CONTROL CRD SYSTEM FOR MAKEUP
RHR1FPS-NO-N021A	1.08E-03	9.24E-03	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
EDG1DGN-FS-001	5.38E-03	9.08E-03	DIESEL GENERATOR 1 FAILS TO START
ACP0BKR-OO-DGE3	2.55E-03	8.99E-03	CIRCUIT BREAKER AI5 FAILS TO CLOSE
ACP2BKR-CC-1AI6	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AI6 FAILS TO OPEN
ACP2BKR-CC-1AI9	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AI9 FAILS TO OPEN
ACP2BKR-CC-1AJ1	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AJ1 FAILS TO OPEN
ACP2BKR-CC-1AJ3	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AJ3 FAILS TO OPEN
ACP2BKR-CC-2AI7	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AI7 FAILS TO OPEN
ACP2BKR-CC-2AI8	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AI8 FAILS TO OPEN
ACP2BKR-CC-2AJ2	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AJ2 FAILS TO OPEN
ACP2BKR-CC-2AJ4	2.55E-03	8.99E-03	CIRCUIT BREAKER 2-AJ4 FAILS TO OPEN
XOP-4160X	1.90E-04	8.62E-03	OPER-4160X

Table A6-9: Unit 1 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
%1T_C	1.35E-01	7.97E-03	LOSS OF CONDENSER VACUUM
ACP0BKR-OO-DGE4	2.55E-03	7.79E-03	CIRCUIT BREAKER AK2 FAILS TO CLOSE
ACP2BKR-CC-2AK3	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AK3 FAILS TO OPEN
ACP2BKR-CC-2AK4	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AK4 FAILS TO OPEN
ACP2BKR-CC-2AK5	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AK5 FAILS TO OPEN
ACP2BKR-CC-2AK6	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AK6 FAILS TO OPEN
ACP2BKR-CC-2AK8	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AK8 FAILS TO OPEN
ACP2BKR-CC-2AK9	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AK9 FAILS TO OPEN
ACP2BKR-CC-2AL0	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AL0 FAILS TO OPEN
ACP2BKR-CC-2AL1	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AL1 FAILS TO OPEN
ACP2BKR-CC-2AL2	2.55E-03	7.79E-03	CIRCUIT BREAKER 2-AL2 FAILS TO OPEN
%1T_DC1B	2.92E-04	7.11E-03	LOSS OF DC SWITCHBOARD 1B
FL_TEMP<90	1.00E+00	7.05E-03	OUTSIDE AIR TEMP < 90 DEG F
%1T_M	1.19E-01	7.02E-03	MSIV CLOSURE INITIATOR
OPER-LDSHD	3.10E-01	6.25E-03	FAILURE TO COMPLETE DC LOAD SHED
XOP-COM3-16	1.90E-05	6.13E-03	OPER-4160X+OPER-DCPALTDC1+OPER-SWRHR-C
SWS1MDP-FS-CSW1B	1.69E-03	5.82E-03	MOTOR-DRIVEN PUMP CSW 1B FAILS TO START
OPER-WVDHR	1.00E+00	5.71E-03	FAILURE TO INITIATE WETWELL VENTING FOR DHR
OPER-DGHMAN	1.00E+00	5.70E-03	FAILURE TO MANUALLY START EDG EXHAUST FAN(S)
ACP0BKR-OO-DGE2	2.55E-03	5.57E-03	CIRCUIT BREAKER AG7 FAILS TO CLOSE
ACP1BKR-CC-1AG8	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AG8 FAILS TO OPEN
ACP1BKR-CC-1AG9	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AG9 FAILS TO OPEN
ACP1BKR-CC-1AH0	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AH0 FAILS TO OPEN
ACP1BKR-CC-1AH2	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AH2 FAILS TO OPEN
ACP1BKR-CC-1AH3	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AH3 FAILS TO OPEN
ACP1BKR-CC-1AH4	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AH4 FAILS TO OPEN
ACP1BKR-CC-1AH5	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AH5 FAILS TO OPEN
ACP1BKR-CC-1AH6	2.55E-03	5.57E-03	CIRCUIT BREAKER 1-AH6 FAILS TO OPEN
%1T_DC1B2	2.92E-04	5.28E-03	LOSS OF 125V DC PANEL 1B2
XOP-COM2-10	1.00E-06	5.18E-03	OPER-SPCE+OPER-WVDHR
X-AC-C10_S_WC	1.23E-01	5.12E-03	WC SITE LOSP CASE 10
XOP-DCDG	2.80E-04	5.12E-03	OPER-DCDG

Table A6-10: Unit 2 RAW Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Ach W	Description
XOP-COM2-12	1.00E-06	1.24E+05	OPER-4160X+OPER-SPCL

Table A6-10: Unit 2 RAW Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Ach W	Description
XOP-COM3-12	1.00E-06	4.40E+04	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	4.38E+04	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
XOP-COM2-14	1.00E-06	2.21E+04	OPER-4160X+OPER-DEPRESS1
XOP-COM2-39	9.50E-05	5.31E+03	OPER-4160X+OPER-SDGSTART
XOP-COM2-10	1.00E-06	4.99E+03	OPER-SPCE+OPER-WVDHR
XOP-COM2-36	3.85E-05	1.71E+03	OPER-4160X+OPER-SWRHR-O
XOP-COM2-35	1.00E-06	1.00E+03	OPER-4160X+OPER-FPS1
XOP-COM2-22	1.00E-06	753.99	OPER-DCPALTDC1+OPER-MANSW-120
XOP-COM2-41	1.00E-06	753.99	OPER-4160X+OPER-DCPALTDC1
XOP-COM2-19	1.00E-06	503	OPER-DCPALTDC1+OPER-N2SUPPLY
XOP-COM2-26	1.00E-06	503	OPER-4160X+OPER-WVDHR
XOP-COM3-09	1.00E-06	252	OPER-DCPALTDC1+OPER-SWRHR-O+OPER-SPCL
XOP-COM3-10	1.00E-06	252	OPER-DCPALTDC1+OPER-SWRHR-C+OPER-SPCL
%TE_S_WC	7.96E-03	54.43	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
XOP-4160X	1.90E-04	37.64	OPER-4160X
%TE_S_SC	5.55E-03	30.99	SITE LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
XOP-COM2-13	9.59E-05	30.3	OPER-4160X+OPER-480X
%TE_S_GC	6.79E-03	29.79	SITE LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
XOP-FPS1	4.10E-03	25.25	OPER-FPS1
RHR2PTF-TM-LOOPA	3.50E-03	22.1	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
XOP-DCDG	2.80E-04	18.57	OPER-DCDG
%2T_DC2B2	2.92E-04	14.75	LOSS OF 125V DC PANEL 2B2
XOP-SPCL	8.10E-05	10.07	OPER-SPCL
RHR2FPS-NO-N021A	1.08E-03	10.04	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE

Table A6-11: Unit 2 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
X-POWEROP1	9.24E-01	1.00E+00	Fraction of annual year at power
FL-NSBO	1.00E+00	9.91E-01	NO STATION BLACKOUT FLAG
OPER-SDGSTART	1.00E+00	9.57E-01	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
OPER-4160X	1.00E+00	8.24E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
OPER-480X	1.00E+00	7.67E-01	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
XOP-COM2-39	9.50E-05	5.04E-01	OPER-4160X+OPER-SDGSTART
%TE_S_WC	7.96E-03	4.29E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
EDG2DGN-EXTTM-D004	3.84E-02	3.50E-01	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
X-AC-C01S_WC	9.62E-01	3.07E-01	Offsite Power Recovery
OPER-SWRHR-C	1.00E+00	2.45E-01	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION

Table A6-11: Unit 2 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
OPER-SPCE	1.00E+00	2.42E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
EDG1DGN-EXTTM-D001	3.84E-02	2.32E-01	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
EDG1DGN-EXTTM-D002	3.84E-02	2.19E-01	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
OPER-SPCL	1.00E+00	2.19E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
EDG2DGN-EXTTM-D003	3.84E-02	1.99E-01	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_GC	6.79E-03	1.97E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
X-AC-C01S_GC	7.63E-01	1.97E-01	Offsite Power Recovery
%TE_S_SC	5.55E-03	1.67E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
X-AC-C01S_SC	7.96E-01	1.67E-01	Offsite Power Recovery
XOP-COM2-12	1.00E-06	1.25E-01	OPER-4160X+OPER-SPCL
OPER-FPS1	1.00E+00	1.21E-01	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
OPER-SWRHR-O	1.00E+00	1.19E-01	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
X-AC-C05_S_WC	2.12E-01	1.03E-01	WC SITE LOSP CASE 5
XOP-FPS1	4.10E-03	9.99E-02	OPER-FPS1
OPER-N2SUPPLY	1.00E+00	8.98E-02	FAILURE TO ALIGN NITROGEN SUPPLY
OPER-GENDISC	1.00E+00	7.93E-02	FAILURE TO LOCALLY ALIGN ELECTRICAL BUSSES FOR BACKFEED
%2T_T	8.24E-01	7.84E-02	TURBINE TRIP INITIATOR
RHR2PTF-TM-LOOPA	3.50E-03	7.41E-02	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
XOP-COM2-36	3.85E-05	6.60E-02	OPER-4160X+OPER-SWRHR-O
SWS2MDP-TM-NSW2B	8.54E-03	5.39E-02	NSW PUMP 2B UNAVAILABLE DUE TO TEST OR MAINTENANCE
OPER-ALT120V	1.00E+00	4.54E-02	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
XOP-SDGSTART	5.20E-03	4.53E-02	Operator fails to start Supp-DG
OPER-ISOSWAP	1.00E+00	4.41E-02	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
XOP-COM3-12	1.00E-06	4.41E-02	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	4.38E-02	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
EDG1DGN-FR-001	5.90E-02	4.36E-02	DIESEL GENERATOR 1 FAILS TO RUN
%2TE_U2_SC	7.80E-03	4.28E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
EDG1DGN-FR-002	5.90E-02	4.10E-02	DIESEL GENERATOR 2 FAILS TO RUN
OPER-TBCMGT	1.00E+00	3.78E-02	FAILURE TO THROTTLE TBCCW FLOW (INITIATOR)
SDG1DGN-FR-001	5.30E-02	3.73E-02	SUPPLEMENTAL DIESEL GENERATOR FAILS TO RUN
EDG1XHE-MN-DG1	8.00E-03	3.65E-02	Failure to restore EDG #1 or subsystem following test or maintenance
OPER-DCDG	1.00E+00	3.43E-02	FAILURE TO ALIGN PORTABLE DC GENERATOR TO BATTERY CHARGERS
EDG1DGN-TM-D001	7.15E-03	3.19E-02	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
EDG2DGN-FR-004	5.90E-02	3.06E-02	DIESEL GENERATOR 4 FAILS TO RUN
%2TE_U2_PC	5.85E-03	2.98E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
EDG1XHE-MN-DG2	8.00E-03	2.93E-02	Failure to restore EDG #2 or subsystem following test or maintenance
OPER-LDSDN	6.90E-01	2.83E-02	SUCCESS OF DC LOAD SHED (COMPLEMENT OF OPER-LDSHD)

Table A6-11: Unit 2 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
ACP0XHE-MN-E2E4	8.00E-03	2.80E-02	Failure to properly restore breaker following maintenance
EDG2DGN-FR-003	5.90E-02	2.72E-02	DIESEL GENERATOR 3 FAILS TO RUN
EDG1DGN-TM-D002	7.15E-03	2.60E-02	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
FL-BATDEPL2B	1.00E+00	2.32E-02	BATTERY BANK 2B DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
EDG1DGN-FS-001	5.38E-03	2.28E-02	DIESEL GENERATOR 1 FAILS TO START
ACP0BKR-CC-2AC4	2.55E-03	2.23E-02	UAT #2 TO 2C (2-AC4) CIRCUIT BREAKER FAILS TO OPEN
ACP0BKR-OO-2AC6	2.55E-03	2.23E-02	CIRCUIT BREAKER FROM SAT #2 TO 2C (2-AC6) FAILS TO CLOSE
OPER-DEPRESS1	1.00E+00	2.22E-02	FAILURE TO DEPRESSURIZE FOLLOWING HCTL CURVES
XOP-COM2-14	1.00E-06	2.22E-02	OPER-4160X+OPER-DEPRESS1
EDG2XHE-MN-DG4	8.00E-03	2.08E-02	Failure to restore EDG #4 or subsystem following test or maintenance
%2TE_U2_GC	4.20E-03	2.06E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
EDG2XHE-MN-DG3	8.00E-03	1.89E-02	Failure to restore EDG #3 or subsystem following test or maintenance
EDG2DGN-TM-D004	7.15E-03	1.84E-02	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
EDG1DGN-FS-002	5.38E-03	1.81E-02	DIESEL GENERATOR 2 FAILS TO START
RHR2PTF-TM-LOOPB	3.50E-03	1.74E-02	RHR LOOP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
ACP0BKR-CC-2AD6	2.55E-03	1.74E-02	CIRCUIT BREAKER FROM UAT #2 TO 2D (2-AD6) FAILS TO OPEN
ACP0BKR-OO-2AD4	2.55E-03	1.74E-02	CIRCUIT BREAKER FROM SAT #2 TO 2D (2-AD4) FAILS TO CLOSE
EDG2DGN-TM-D003	7.15E-03	1.62E-02	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
TRAN-LOOP	3.00E-03	1.48E-02	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
ACP0XHE-MN-E1E3	8.00E-03	1.47E-02	Failure to properly restore breaker following maintenance
%2TE_U2_WC	3.12E-03	1.37E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
EDG2DGN-FS-004	5.38E-03	1.33E-02	DIESEL GENERATOR 4 FAILS TO START
X-AC-C09_S_WC	1.32E-01	1.31E-02	WC SITE LOSP CASE 9
EDG2DGN-FS-003	5.38E-03	1.18E-02	DIESEL GENERATOR 3 FAILS TO START
FL-BATDEPL2A	1.00E+00	1.11E-02	BATTERY BANK 2A DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
OPER-CRD-FO-INJ	1.00E+00	1.05E-02	FAILURE TO ALIGN/CONTROL CRD SYSTEM FOR MAKEUP
ACP0BKR-OO-DGE1	2.55E-03	9.97E-03	CIRCUIT BREAKER AE9 FAILS TO CLOSE
ACP1BKR-CC-1AF0	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AFO FAILS TO OPEN
ACP1BKR-CC-1AF1	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF1 FAILS TO OPEN
ACP1BKR-CC-1AF2	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF2 FAILS TO OPEN
ACP1BKR-CC-1AF3	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF3 FAILS TO OPEN
ACP1BKR-CC-1AF4	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF4 FAILS TO OPEN
ACP1BKR-CC-1AF5	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF5 FAILS TO OPEN
ACP1BKR-CC-1AF6	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF6 FAILS TO OPEN
ACP1BKR-CC-1AF7	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF7 FAILS TO OPEN
ACP1BKR-CC-1AF9	2.55E-03	9.97E-03	CIRCUIT BREAKER 1-AF9 FAILS TO OPEN
RHR2FPS-NO-N021A	1.08E-03	9.79E-03	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE

Table A6-11: Unit 2 FV Ranking for the IE w/internal Flooding Models			
Event Name	Probability	Fus Ves	Description
FL-SBO	1.00E+00	8.60E-03	STATION BLACKOUT FLAG
ACP0BKR-OO-DGE2	2.55E-03	7.49E-03	CIRCUIT BREAKER AG7 FAILS TO CLOSE
ACP1BKR-CC-1AG8	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AG8 FAILS TO OPEN
ACP1BKR-CC-1AG9	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AG9 FAILS TO OPEN
ACP1BKR-CC-1AH0	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AH0 FAILS TO OPEN
ACP1BKR-CC-1AH2	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AH2 FAILS TO OPEN
ACP1BKR-CC-1AH3	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AH3 FAILS TO OPEN
ACP1BKR-CC-1AH4	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AH4 FAILS TO OPEN
ACP1BKR-CC-1AH5	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AH5 FAILS TO OPEN
ACP1BKR-CC-1AH6	2.55E-03	7.49E-03	CIRCUIT BREAKER 1-AH6 FAILS TO OPEN
%2T_C	1.35E-01	7.31E-03	LOSS OF CONDENSER VACUUM
XOP-4160X	1.90E-04	6.96E-03	OPER-4160X
%2T_M	1.19E-01	6.44E-03	MSIV CLOSURE INITIATOR
OPER-DCPALTDC2	1.00E+00	6.08E-03	FAILURE TO ALIGN DC BUS TO STANDBY DC POWER SUPPLY - UNIT 1
OPER-LDSHD	3.10E-01	6.01E-03	FAILURE TO COMPLETE DC LOAD SHED
OPER-WVDHR	1.00E+00	5.49E-03	FAILURE TO INITIATE WETWELL VENTING FOR DHR
ACP0BKR-OO-DGE4	2.55E-03	5.36E-03	CIRCUIT BREAKER AK2 FAILS TO CLOSE
ACP2BKR-CC-2AK3	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AK3 FAILS TO OPEN
ACP2BKR-CC-2AK4	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AK4 FAILS TO OPEN
ACP2BKR-CC-2AK5	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AK5 FAILS TO OPEN
ACP2BKR-CC-2AK6	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AK6 FAILS TO OPEN
ACP2BKR-CC-2AK8	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AK8 FAILS TO OPEN
ACP2BKR-CC-2AK9	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AK9 FAILS TO OPEN
ACP2BKR-CC-2AL0	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AL0 FAILS TO OPEN
ACP2BKR-CC-2AL1	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AL1 FAILS TO OPEN
ACP2BKR-CC-2AL2	2.55E-03	5.36E-03	CIRCUIT BREAKER 2-AL2 FAILS TO OPEN

Table A6-12: Unit 1 RAW Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Ach W	Description
XOP-COM2-12	1.00E-06	1.05E+05	OPER-4160X+OPER-SPCL
XOP-COM3-12	1.00E-06	3.60E+04	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	3.58E+04	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
XOP-COM3-08	1.00E-06	2.93E+04	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
XOP-COM2-14	1.00E-06	1.98E+04	OPER-4160X+OPER-DEPRESS1
XOP-COM2-39	9.50E-05	4.98E+03	OPER-4160X+OPER-SDGSTART
XOP-COM2-10	1.00E-06	4.46E+03	OPER-SPCE+OPER-WVDHR

Table A6-12: Unit 1 RAW Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Ach W	Description
%EXTFL_1	5.00E-05	1.83E+03	PROBABILITY OF A 23 FOOT STORM SURGE
XOP-COM2-36	3.85E-05	1.51E+03	OPER-4160X+OPER-SWRHR-O
XOP-COM2-35	1.00E-06	1.12E+03	OPER-4160X+OPER-FPS1
XOP-COM2-22	1.00E-06	674.33	OPER-DCPALTDC1+OPER-MANSW-120
XOP-COM2-19	1.00E-06	449.89	OPER-DCPALTDC1+OPER-N2SUPPLY
XOP-COM2-26	1.00E-06	449.89	OPER-4160X+OPER-WVDHR
XOP-COM2-41	1.00E-06	449.89	OPER-4160X+OPER-DCPALTDC1
XOP-COM3-06	1.00E-06	449.89	OPER-4160X+OPER-DCPALTDC1+OPER-FPXFER
XOP-COM3-16	1.90E-05	278.41	OPER-4160X+OPER-DCPALTDC1+OPER-SWRHR-C
XOP-COM3-09	1.00E-06	225.45	OPER-DCPALTDC1+OPER-SWRHR-O+OPER-SPCL
XOP-COM3-10	1.00E-06	225.45	OPER-DCPALTDC1+OPER-SWRHR-C+OPER-SPCL
%EXTFL_2	7.40E-04	66.74	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
XOP-COM2-13	9.59E-05	49.17	OPER-4160X+OPER-480X
XOP-4160X	1.90E-04	48.49	OPER-4160X
%TE_S_WC	7.96E-03	46.82	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
RHR1PTF-TM-LOOPA	3.50E-03	27.3	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
%TE_S_SC	5.55E-03	26.51	SITE LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
%TE_S_GC	6.79E-03	25.77	SITE LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
XOP-DCDG	2.80E-04	24.91	OPER-DCDG
%1T_DC1B	2.92E-04	21.93	LOSS OF DC SWITCHBOARD 1B
%1T_DC1B2	2.92E-04	16.55	LOSS OF 125V DC PANEL 1B2
XOP-SPCL	8.10E-05	15.59	OPER-SPCL
RHR1FPS-NO-N021A	1.08E-03	14.44	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
RHR1FST-HI-N014A	8.34E-04	11.72	FLOW ELEMENT E11-FE-N014A FAILS HIGH
RHR1MOV-CC-F007A	8.34E-04	11.72	MOTOR-OPERATED VALVE E11-F007A FAILS TO OPEN
RHR1MOV-CC-F024A	8.34E-04	11.72	MOTOR OPERATED VALVE E11-F024A FAILS TO OPEN
RHR1MOV-CC-F028A	8.34E-04	11.72	MOTOR OPERATED VALVE E11-F028A FAILS TO OPEN
RHR1MOV-OO-F048A	8.34E-04	11.72	MOTOR-OPERATED VALVE E11-F048A FAILS TO CLOSE
SWS1MOV-CC-F068A	8.34E-04	11.72	MOTOR OPERATED VALVE SW F068A FAILS TO OPEN
SWS1HTX-HW-RHR1A	7.12E-04	10.91	RHR HEAT EXCHANGER 1A LOSS OF COOLING/PLUGGED
XOP-FPS1	4.10E-03	10.38	OPER-FPS1
EDG1DGN-EXTTM-D002	3.84E-02	10.37	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)

Table A6-13: Unit 1 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
X-POWEROP1	9.24E-01	1.00E+00	Fraction of annual year at power
FL-NSBO	1.00E+00	9.84E-01	NO STATION BLACKOUT FLAG

Table A6-13: Unit 1 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
OPER-SDGSTART	1.00E+00	8.49E-01	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
OPER-4160X	1.00E+00	7.85E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
OPER-480X	1.00E+00	6.69E-01	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
XOP-COM2-39	9.50E-05	4.73E-01	OPER-4160X+OPER-SDGSTART
EDG1DGN-EXTTM-D002	3.84E-02	3.74E-01	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_WC	7.96E-03	3.68E-01	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
X-AC-C01S_WC	9.62E-01	2.63E-01	Offsite Power Recovery
EDG2DGN-EXTTM-D004	3.84E-02	2.58E-01	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
OPER-SPCE	1.00E+00	2.34E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
OPER-SWRHR-C	1.00E+00	2.20E-01	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
OPER-SPCL	1.00E+00	2.13E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
EDG2DGN-EXTTM-D003	3.84E-02	2.03E-01	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_GC	6.79E-03	1.69E-01	SITE LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
X-AC-C01S_GC	7.63E-01	1.69E-01	Offsite Power Recovery
EDG1DGN-EXTTM-D001	3.84E-02	1.64E-01	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_SC	5.55E-03	1.42E-01	SITE LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
X-AC-C01S_SC	7.96E-01	1.42E-01	Offsite Power Recovery
FL-EXTFLOOD	1.00E+00	1.40E-01	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
XOP-COM2-12	1.00E-06	1.06E-01	OPER-4160X+OPER-SPCL
OPER-SWRHR-O	1.00E+00	1.01E-01	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
EDG2DGN-FR-004	5.90E-02	9.26E-02	DIESEL GENERATOR 4 FAILS TO RUN
RHR1PTF-TM-LOOPA	3.50E-03	9.24E-02	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
%EXTFL_1	5.00E-05	9.15E-02	PROBABILITY OF A 23 FOOT STORM SURGE
X-AC-C05_S_WC	2.12E-01	8.61E-02	WC SITE LOSP CASE 5
OPER-N2SUPPLY	1.00E+00	7.23E-02	FAILURE TO ALIGN NITROGEN SUPPLY
%1T_T	8.24E-01	7.20E-02	TURBINE TRIP INITIATOR
OPER-GENDISC	1.00E+00	7.09E-02	FAILURE TO LOCALLY ALIGN ELECTRICAL BUSSES FOR BACKFEED
EDG1DGN-FR-002	5.90E-02	7.07E-02	DIESEL GENERATOR 2 FAILS TO RUN
EDG2DGN-FR-003	5.90E-02	6.35E-02	DIESEL GENERATOR 3 FAILS TO RUN
XOP-COM2-36	3.85E-05	5.81E-02	OPER-4160X+OPER-SWRHR-O
OPER-FPS1	1.00E+00	5.73E-02	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
SDG1DGN-FR-001	5.90E-02	4.91E-02	SUPPLEMENTAL DIESEL GENERATOR FAILS TO RUN
%EXTFL_2	7.40E-04	4.87E-02	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
XOP-SDGSTART	5.20E-03	4.57E-02	Operator fails to start Supp-DG
XOP-FPS1	4.10E-03	3.86E-02	OPER-FPS1
%1TE_U1_WC	9.38E-03	3.71E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
X-AC-C01U1_WC	7.06E-01	3.71E-02	Offsite Power Recovery

Table A6-13: Unit 1 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
OPER-ALT120V	1.00E+00	3.60E-02	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
OPER-ISOSWAP	1.00E+00	3.60E-02	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
XOP-COM3-12	1.00E-06	3.60E-02	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	3.58E-02	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
OPER-TBCMGT	1.00E+00	3.38E-02	FAILURE TO THROTTLE TBCCW FLOW (INITIATOR)
OPER-DCDG	1.00E+00	3.30E-02	FAILURE TO ALIGN PORTABLE DC GENERATOR TO BATTERY CHARGERS
EDG1DGN-FR-001	5.90E-02	3.26E-02	DIESEL GENERATOR 1 FAILS TO RUN
EDG2XHE-MN-DG4	8.00E-03	3.17E-02	Failure to restore EDG #4 or subsystem following test or maintenance
OPER-DFPFUEL	1.00E+00	3.10E-02	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
OPER-FPXFER	1.00E+00	2.98E-02	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
XOP-COM3-08	1.00E-06	2.93E-02	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
EDG2XHE-MN-DG3	8.00E-03	2.92E-02	Failure to restore EDG #3 or subsystem following test or maintenance
ACP0XHE-MN-E2E4	8.00E-03	2.88E-02	Failure to properly restore breaker following maintenance
EDG2DGN-TM-D004	7.15E-03	2.77E-02	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
OPER-LDSDN	6.90E-01	2.76E-02	SUCCESS OF DC LOAD SHED (COMPLEMENT OF OPER-LDSHD)
EDG2DGN-TM-D003	7.15E-03	2.61E-02	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
%1TE_U1_SC	7.81E-03	2.40E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
X-AC-C01U1_SC	5.95E-01	2.40E-02	Offsite Power Recovery
EDG1XHE-MN-DG2	8.00E-03	2.35E-02	Failure to restore EDG #2 or subsystem following test or maintenance
FL-BATDEPL1B	1.00E+00	2.31E-02	BATTERY BANK 1B DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
EDG1DGN-TM-D002	7.15E-03	2.04E-02	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
ACP0BKR-CC-1AC5	2.55E-03	1.99E-02	CIRCUIT BREAKER FROM UAT #1 TO 1C (1AC5) FAILS TO OPEN
ACP0BKR-OO-1AC7	2.55E-03	1.99E-02	CIRCUIT BREAKER FROM SAT #1 TO 1C (1-AC7) FAILS TO CLOSE
OPER-DEPRESS1	1.00E+00	1.98E-02	FAILURE TO DEPRESSURIZE FOLLOWING HCTL CURVES
XOP-COM2-14	1.00E-06	1.98E-02	OPER-4160X+OPER-DEPRESS1
ACP0XHE-MN-E1E3	8.00E-03	1.90E-02	Failure to properly restore breaker following maintenance
EDG2DGN-FS-003	5.38E-03	1.85E-02	DIESEL GENERATOR 3 FAILS TO START
EDG2DGN-FS-004	5.38E-03	1.83E-02	DIESEL GENERATOR 4 FAILS TO START
%1TE_U1_GC	4.21E-03	1.82E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
X-AC-C01U1_GC	8.48E-01	1.82E-02	Offsite Power Recovery
TRAN-LOOP	3.00E-03	1.57E-02	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
FL-SBO	1.00E+00	1.57E-02	STATION BLACKOUT FLAG
RHR1PTF-TM-LOOPB	3.50E-03	1.55E-02	RHR LOOP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
ACP0BKR-CC-1AD7	2.55E-03	1.55E-02	UAT #1 TO 1D (1-AD7) CIRCUIT BREAKER FAILS TO OPEN
ACP0BKR-OO-1AD5	2.55E-03	1.55E-02	CIRCUIT BREAKER FROM SAT #1 TO 1D (1-AD5) FAILS TO CLOSE
RHR1FPS-NO-N021A	1.08E-03	1.46E-02	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
EDG1DGN-FS-002	5.38E-03	1.34E-02	DIESEL GENERATOR 2 FAILS TO START

Table A6-13: Unit 1 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
X-AC-C09_S_WC	1.32E-01	1.30E-02	WC SITE LOSP CASE 9
EDG1XHE-MN-DG1	8.00E-03	1.29E-02	Failure to restore EDG #1 or subsystem following test or maintenance
EDG1DGN-TM-D001	7.15E-03	1.15E-02	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
OPER-DCPALTDC1	1.00E+00	1.07E-02	FAILURE TO ALIGN DC BUS TO STANDBY DC POWER SUPPLY - UNIT 1
FL-BATDEPL1A	1.00E+00	9.92E-03	BATTERY BANK 1A DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
OPER-CRD-FO-INJ	1.00E+00	9.35E-03	FAILURE TO ALIGN/CONTROL CRD SYSTEM FOR MAKEUP
XOP-4160X	1.90E-04	9.03E-03	OPER-4160X
FL_V101	1.00E+00	8.95E-03	FLAG FOR FAILURE OF FLOW PATH THROUGH RHR HX 1A
RHR1MOV-CC-F007A	8.34E-04	8.95E-03	MOTOR-OPERATED VALVE E11-F007A FAILS TO OPEN
RHR1MOV-CC-F024A	8.34E-04	8.95E-03	MOTOR OPERATED VALVE E11-F024A FAILS TO OPEN
RHR1MOV-CC-F028A	8.34E-04	8.95E-03	MOTOR OPERATED VALVE E11-F028A FAILS TO OPEN
RHR1MOV-OO-F048A	8.34E-04	8.95E-03	MOTOR-OPERATED VALVE E11-F048A FAILS TO CLOSE
SWS1MOV-CC-F068A	8.34E-04	8.95E-03	MOTOR OPERATED VALVE SW F068A FAILS TO OPEN
RHR1FST-HI-N014A	8.34E-04	8.94E-03	FLOW ELEMENT E11-FE-N014A FAILS HIGH
FL_TEMP<90	1.00E+00	8.36E-03	OUTSIDE AIR TEMP < 90 DEG F
EDG1DGN-FS-001	5.38E-03	8.09E-03	DIESEL GENERATOR 1 FAILS TO START
ACP0BKR-OO-DGE3	2.55E-03	7.73E-03	CIRCUIT BREAKER AI5 FAILS TO CLOSE
ACP2BKR-CC-1AI6	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AI6 FAILS TO OPEN
ACP2BKR-CC-1AI9	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AI9 FAILS TO OPEN
ACP2BKR-CC-1AJ1	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AJ1 FAILS TO OPEN
ACP2BKR-CC-1AJ3	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AJ3 FAILS TO OPEN
ACP2BKR-CC-2AI7	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AI7 FAILS TO OPEN
ACP2BKR-CC-2AI8	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AI8 FAILS TO OPEN
ACP2BKR-CC-2AJ2	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AJ2 FAILS TO OPEN
ACP2BKR-CC-2AJ4	2.55E-03	7.73E-03	CIRCUIT BREAKER 2-AJ4 FAILS TO OPEN
OPER-DGHMAN	1.00E+00	7.20E-03	FAILURE TO MANUALLY START EDG EXHAUST FAN(S)
SWS1HTX-HW-RHR1A	7.12E-04	7.06E-03	RHR HEAT EXCHANGER 1A LOSS OF COOLING/PLUGGED
ACP0BKR-OO-DGE4	2.55E-03	7.04E-03	CIRCUIT BREAKER AK2 FAILS TO CLOSE
ACP2BKR-CC-2AK3	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AK3 FAILS TO OPEN
ACP2BKR-CC-2AK4	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AK4 FAILS TO OPEN
ACP2BKR-CC-2AK5	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AK5 FAILS TO OPEN
ACP2BKR-CC-2AK6	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AK6 FAILS TO OPEN
ACP2BKR-CC-2AK8	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AK8 FAILS TO OPEN
ACP2BKR-CC-2AK9	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AK9 FAILS TO OPEN
ACP2BKR-CC-2AL0	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AL0 FAILS TO OPEN
ACP2BKR-CC-2AL1	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AL1 FAILS TO OPEN
ACP2BKR-CC-2AL2	2.55E-03	7.04E-03	CIRCUIT BREAKER 2-AL2 FAILS TO OPEN

Table A6-13: Unit 1 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
%1T_C	1.35E-01	6.85E-03	LOSS OF CONDENSER VACUUM
XOP-DCDG	2.80E-04	6.70E-03	OPER-DCDG
%1T_DC1B	2.92E-04	6.11E-03	LOSS OF DC SWITCHBOARD 1B
%1T_M	1.19E-01	6.04E-03	MSIV CLOSURE INITIATOR
SWS1MDP-FS-CSW1B	1.69E-03	5.60E-03	MOTOR-DRIVEN PUMP CSW 1B FAILS TO START
OPER-LDSHD	3.10E-01	5.37E-03	FAILURE TO COMPLETE DC LOAD SHED
XOP-COM3-16	1.90E-05	5.27E-03	OPER-4160X+OPER-DCPALTDC1+OPER-SWRHR-C
ACP0BKR-OO-DGE2	2.55E-03	5.13E-03	CIRCUIT BREAKER AG7 FAILS TO CLOSE
ACP1BKR-CC-1AG8	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AG8 FAILS TO OPEN
ACP1BKR-CC-1AG9	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AG9 FAILS TO OPEN
ACP1BKR-CC-1AH0	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AH0 FAILS TO OPEN
ACP1BKR-CC-1AH2	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AH2 FAILS TO OPEN
ACP1BKR-CC-1AH3	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AH3 FAILS TO OPEN
ACP1BKR-CC-1AH4	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AH4 FAILS TO OPEN
ACP1BKR-CC-1AH5	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AH5 FAILS TO OPEN
ACP1BKR-CC-1AH6	2.55E-03	5.13E-03	CIRCUIT BREAKER 1-AH6 FAILS TO OPEN

Table A6-14: Unit 2 RAW Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Ach W	Description
XOP-COM2-12	1.00E-06	1.09E+05	OPER-4160X+OPER-SPCL
XOP-COM3-12	1.00E-06	3.86E+04	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	3.84E+04	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
XOP-COM2-14	1.00E-06	1.91E+04	OPER-4160X+OPER-DEPRESS1
XOP-COM2-39	9.50E-05	4.85E+03	OPER-4160X+OPER-SDGSTART
XOP-COM2-10	1.00E-06	4.31E+03	OPER-SPCE+OPER-WVDHR
%EXTFL_1	5.00E-05	1.77E+03	PROBABILITY OF A 23 FOOT STORM SURGE
XOP-COM2-36	3.85E-05	1.55E+03	OPER-4160X+OPER-SWRHR-O
XOP-COM2-35	1.00E-06	868.38	OPER-4160X+OPER-FPS1
XOP-COM2-22	1.00E-06	651.54	OPER-DCPALTDC1+OPER-MANSW-120
XOP-COM2-41	1.00E-06	651.54	OPER-4160X+OPER-DCPALTDC1
XOP-COM2-19	1.00E-06	434.69	OPER-DCPALTDC1+OPER-N2SUPPLY
XOP-COM2-26	1.00E-06	434.69	OPER-4160X+OPER-WVDHR
XOP-COM3-09	1.00E-06	217.85	OPER-DCPALTDC1+OPER-SWRHR-O+OPER-SPCL
XOP-COM3-10	1.00E-06	217.85	OPER-DCPALTDC1+OPER-SWRHR-C+OPER-SPCL
%EXTFL_2	7.40E-04	65.36	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
%TE_S_WC	7.96E-03	47.16	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
XOP-4160X	1.90E-04	40.47	OPER-4160X

Table A6-14: Unit 2 RAW Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Ach W	Description
XOP-COM2-13	9.59E-05	35.08	OPER-4160X+OPER-480X
RHR2PTF-TM-LOOPA	3.50E-03	27.51	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
%TE_S_SC	5.55E-03	26.91	SITE LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
%TE_S_GC	6.79E-03	25.87	SITE LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
XOP-DCDG	2.80E-04	24.1	OPER-DCDG
XOP-FPS1	4.10E-03	23.07	OPER-FPS1
RHR2FPS-NO-N021A	1.08E-03	14.71	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
%2T_DC2B2	2.92E-04	12.88	LOSS OF 125V DC PANEL 2B2
RHR2FST-HI-N014A	8.34E-04	11.57	FLOW ELEMENT E11-FE-N014A FAILS HIGH
RHR2MOV-CC-F007A	8.34E-04	11.57	MOTOR-OPERATED VALVE E11-F007A FAILS TO OPEN
RHR2MOV-CC-F024A	8.34E-04	11.57	MOTOR OPERATED VALVE E11-F024A FAILS TO OPEN
RHR2MOV-CC-F028A	8.34E-04	11.57	MOTOR OPERATED VALVE E11-F028A FAILS TO OPEN
RHR2MOV-OO-F048A	8.34E-04	11.57	MOTOR-OPERATED VALVE E11-F048A FAILS TO CLOSE
SWS2MOV-CC-F068A	8.34E-04	11.57	MOTOR OPERATED VALVE SW F068A FAILS TO OPEN
SWS2HTX-HW-RHR2A	7.12E-04	11.04	RHR HEAT EXCHANGER 2A LOSS OF COOLING/PLUGGED

Table A6-15: Unit 2 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
X-POWEROP1	9.24E-01	1.00E+00	Fraction of annual year at power
FL-NSBO	1.00E+00	9.89E-01	NO STATION BLACKOUT FLAG
OPER-SDGSTART	1.00E+00	8.65E-01	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
OPER-4160X	1.00E+00	7.44E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
OPER-480X	1.00E+00	6.90E-01	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
XOP-COM2-39	9.50E-05	4.60E-01	OPER-4160X+OPER-SDGSTART
%TE_S_WC	7.96E-03	3.70E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
EDG2DGN-EXTTM-D004	3.84E-02	3.51E-01	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
X-AC-C01S_WC	9.62E-01	2.65E-01	Offsite Power Recovery
EDG1DGN-EXTTM-D002	3.84E-02	2.43E-01	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
EDG1DGN-EXTTM-D001	3.84E-02	2.22E-01	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
OPER-SWRHR-C	1.00E+00	2.21E-01	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
OPER-SPCE	1.00E+00	2.12E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
OPER-SPCL	1.00E+00	1.92E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
EDG2DGN-EXTTM-D003	3.84E-02	1.85E-01	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_GC	6.79E-03	1.70E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
X-AC-C01S_GC	7.63E-01	1.70E-01	Offsite Power Recovery
%TE_S_SC	5.55E-03	1.45E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
X-AC-C01S_SC	7.96E-01	1.45E-01	Offsite Power Recovery

Table A6-15: Unit 2 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
FL-EXTFLOOD	1.00E+00	1.36E-01	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
XOP-COM2-12	1.00E-06	1.09E-01	OPER-4160X+OPER-SPCL
OPER-FPS1	1.00E+00	1.09E-01	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
OPER-SWRHR-O	1.00E+00	1.05E-01	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
RHR2PTF-TM-LOOPA	3.50E-03	9.31E-02	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
XOP-FPS1	4.10E-03	9.08E-02	OPER-FPS1
X-AC-C05_S_WC	2.12E-01	8.87E-02	WC SITE LOSP CASE 5
%EXTFL_1	5.00E-05	8.84E-02	PROBABILITY OF A 23 FOOT STORM SURGE
EDG1DGN-FR-002	5.90E-02	8.37E-02	DIESEL GENERATOR 2 FAILS TO RUN
OPER-N2SUPPLY	1.00E+00	7.87E-02	FAILURE TO ALIGN NITROGEN SUPPLY
OPER-GENDISC	1.00E+00	6.85E-02	FAILURE TO LOCALLY ALIGN ELECTRICAL BUSSES FOR BACKFEED
%2T_T	8.24E-01	6.77E-02	TURBINE TRIP INITIATOR
EDG2DGN-FR-004	5.90E-02	6.68E-02	DIESEL GENERATOR 4 FAILS TO RUN
EDG1DGN-FR-001	5.90E-02	6.34E-02	DIESEL GENERATOR 1 FAILS TO RUN
XOP-COM2-36	3.85E-05	5.95E-02	OPER-4160X+OPER-SWRHR-O
SWS2MDP-TM-NSW2B	8.54E-03	4.88E-02	NSW PUMP 2B UNAVAILABLE DUE TO TEST OR MAINTENANCE
%EXTFL_2	7.40E-04	4.77E-02	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
SDG1DGN-FR-001	5.30E-02	4.09E-02	SUPPLEMENTAL DIESEL GENERATOR FAILS TO RUN
XOP-SDGSTART	5.20E-03	4.03E-02	Operator fails to start the Supp-DG
OPER-ALT120V	1.00E+00	3.98E-02	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
EDG2DGN-FR-003	5.90E-02	3.88E-02	DIESEL GENERATOR 3 FAILS TO RUN
OPER-ISOSWAP	1.00E+00	3.86E-02	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
XOP-COM3-12	1.00E-06	3.86E-02	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	3.84E-02	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
%2TE_U2_SC	7.80E-03	3.70E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
OPER-TBCMGT	1.00E+00	3.27E-02	FAILURE TO THROTTLE TBCCW FLOW (INITIATOR)
EDG1XHE-MN-DG1	8.00E-03	3.23E-02	Failure to restore EDG #1 or subsystem following test or maintenance
OPER-DCDG	1.00E+00	3.19E-02	FAILURE TO ALIGN PORTABLE DC GENERATOR TO BATTERY CHARGERS
ACP0XHE-MN-E2E4	8.00E-03	2.97E-02	Failure to properly restore breaker following maintenance
EDG1XHE-MN-DG2	8.00E-03	2.92E-02	Failure to restore EDG #2 or subsystem following test or maintenance
EDG1DGN-TM-D001	7.15E-03	2.83E-02	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
OPER-LDSDN	6.90E-01	2.67E-02	SUCCESS OF DC LOAD SHED (COMPLEMENT OF OPER-LDSHD)
%2TE_U2_PC	5.85E-03	2.57E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
EDG1DGN-TM-D002	7.15E-03	2.57E-02	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
FL-BATDEPL2B	1.00E+00	2.23E-02	BATTERY BANK 2B DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
EDG2XHE-MN-DG4	8.00E-03	2.15E-02	Failure to restore EDG #4 or subsystem following test or maintenance
EDG1DGN-FS-001	5.38E-03	2.02E-02	DIESEL GENERATOR 1 FAILS TO START

Table A6-15: Unit 2 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
ACP0BKR-CC-2AC4	2.55E-03	1.93E-02	UAT #2 TO 2C (2-AC4) CIRCUIT BREAKER FAILS TO OPEN
ACP0BKR-OO-2AC6	2.55E-03	1.93E-02	CIRCUIT BREAKER FROM SAT #2 TO 2C (2-AC6) FAILS TO CLOSE
OPER-DEPRESS1	1.00E+00	1.91E-02	FAILURE TO DEPRESSURIZE FOLLOWING HCTL CURVES
XOP-COM2-14	1.00E-06	1.91E-02	OPER-4160X+OPER-DEPRESS1
EDG2DGN-TM-D004	7.15E-03	1.88E-02	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
ACP0XHE-MN-E1E3	8.00E-03	1.83E-02	Failure to properly restore breaker following maintenance
%2TE_U2_GC	4.20E-03	1.78E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
EDG1DGN-FS-002	5.38E-03	1.71E-02	DIESEL GENERATOR 2 FAILS TO START
EDG2XHE-MN-DG3	8.00E-03	1.67E-02	Failure to restore EDG #3 or subsystem following test or maintenance
RHR2PTF-TM-LOOPB	3.50E-03	1.60E-02	RHR LOOP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
ACP0BKR-CC-2AD6	2.55E-03	1.50E-02	CIRCUIT BREAKER FROM UAT #2 TO 2D (2-AD6) FAILS TO OPEN
ACP0BKR-OO-2AD4	2.55E-03	1.50E-02	CIRCUIT BREAKER FROM SAT #2 TO 2D (2-AD4) FAILS TO CLOSE
RHR2FPS-NO-N021A	1.08E-03	1.48E-02	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
EDG2DGN-TM-D003	7.15E-03	1.43E-02	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
TRAN-LOOP	3.00E-03	1.28E-02	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
EDG2DGN-FS-004	5.38E-03	1.26E-02	DIESEL GENERATOR 4 FAILS TO START
%2TE_U2_WC	3.12E-03	1.18E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
X-AC-C09_S_WC	1.32E-01	1.13E-02	WC SITE LOSP CASE 9
FL-SBO	1.00E+00	1.06E-02	STATION BLACKOUT FLAG
EDG2DGN-FS-003	5.38E-03	1.04E-02	DIESEL GENERATOR 3 FAILS TO START
FL-BATDEPL2A	1.00E+00	9.58E-03	BATTERY BANK 2A DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
OPER-CRD-FO-INJ	1.00E+00	9.03E-03	FAILURE TO ALIGN/CONTROL CRD SYSTEM FOR MAKEUP
FL_V101	1.00E+00	8.82E-03	FLAG FOR FAILURE OF FLOW PATH THROUGH RHR HX 2A
RHR2MOV-CC-F007A	8.34E-04	8.82E-03	MOTOR-OPERATED VALVE E11-F007A FAILS TO OPEN
RHR2MOV-CC-F024A	8.34E-04	8.82E-03	MOTOR OPERATED VALVE E11-F024A FAILS TO OPEN
RHR2MOV-CC-F028A	8.34E-04	8.82E-03	MOTOR OPERATED VALVE E11-F028A FAILS TO OPEN
RHR2MOV-OO-F048A	8.34E-04	8.82E-03	MOTOR-OPERATED VALVE E11-F048A FAILS TO CLOSE
SWS2MOV-CC-F068A	8.34E-04	8.82E-03	MOTOR OPERATED VALVE SW F068A FAILS TO OPEN
RHR2FST-HI-N014A	8.34E-04	8.82E-03	FLOW ELEMENT E11-FE-N014A FAILS HIGH
ACP0BKR-OO-DGE1	2.55E-03	8.61E-03	CIRCUIT BREAKER AE9 FAILS TO CLOSE
ACP1BKR-CC-1AF0	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AFO FAILS TO OPEN
ACP1BKR-CC-1AF1	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF1 FAILS TO OPEN
ACP1BKR-CC-1AF2	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF2 FAILS TO OPEN
ACP1BKR-CC-1AF3	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF3 FAILS TO OPEN
ACP1BKR-CC-1AF4	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF4 FAILS TO OPEN
ACP1BKR-CC-1AF5	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF5 FAILS TO OPEN
ACP1BKR-CC-1AF6	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF6 FAILS TO OPEN

Table A6-15: Unit 2 FV Ranking for the IE w/internal and external Flooding Models			
Event Name	Probability	Fus Ves	Description
ACP1BKR-CC-1AF7	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF7 FAILS TO OPEN
ACP1BKR-CC-1AF9	2.55E-03	8.61E-03	CIRCUIT BREAKER 1-AF9 FAILS TO OPEN
XOP-4160X	1.90E-04	7.50E-03	OPER-4160X
SWS2HTX-HW-RHR2A	7.12E-04	7.15E-03	RHR HEAT EXCHANGER 2A LOSS OF COOLING/PLUGGED
ACP0BKR-OO-DGE2	2.55E-03	6.80E-03	CIRCUIT BREAKER AG7 FAILS TO CLOSE
ACP1BKR-CC-1AG8	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AG8 FAILS TO OPEN
ACP1BKR-CC-1AG9	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AG9 FAILS TO OPEN
ACP1BKR-CC-1AH0	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AH0 FAILS TO OPEN
ACP1BKR-CC-1AH2	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AH2 FAILS TO OPEN
ACP1BKR-CC-1AH3	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AH3 FAILS TO OPEN
ACP1BKR-CC-1AH4	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AH4 FAILS TO OPEN
ACP1BKR-CC-1AH5	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AH5 FAILS TO OPEN
ACP1BKR-CC-1AH6	2.55E-03	6.80E-03	CIRCUIT BREAKER 1-AH6 FAILS TO OPEN
OPER-DGHMAN	1.00E+00	6.47E-03	FAILURE TO MANUALLY START EDG EXHAUST FAN(S)
XOP-DCDG	2.80E-04	6.47E-03	OPER-DCDG
%2T_C	1.35E-01	6.32E-03	LOSS OF CONDENSER VACUUM
%2T_M	1.19E-01	5.57E-03	MSIV CLOSURE INITIATOR
OPER-DCPALTDC2	1.00E+00	5.26E-03	FAILURE TO ALIGN DC BUS TO STANDBY DC POWER SUPPLY - UNIT 1
OPER-LDSHD	3.10E-01	5.19E-03	FAILURE TO COMPLETE DC LOAD SHED

Table A6-16: Unit 1 RAW Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Ach W	Description
XOP-COM2-12	1.00E-06	5.58E+04	OPER-4160X+OPER-SPCL
XOP-COM3-12	1.00E-06	1.91E+04	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	1.89E+04	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
XOP-COM3-08	1.00E-06	1.55E+04	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
XOP-COM2-14	1.00E-06	1.05E+04	OPER-4160X+OPER-DEPRESS1
XOP-COM2-39	9.50E-05	2.64E+03	OPER-4160X+OPER-SDGSTART
XOP-COM2-10	1.00E-06	2.36E+03	OPER-SPCE+OPER-WVDHR
%EXTFL_1	5.00E-05	969.7	PROBABILITY OF A 23 FOOT STORM SURGE
XOP-COM2-36	3.85E-05	799.42	OPER-4160X+OPER-SWRHR-O
XOP-COM2-35	1.00E-06	595.09	OPER-4160X+OPER-FPS1
XOP-COM2-22	1.00E-06	357.46	OPER-DCPALTDC1+OPER-MANSW-120
%HW_5	2.32E-04	329.77	HIGH WIND INITIATING EVENT (EF4=166-200 MPH)
XOP-COM2-19	1.00E-06	238.64	OPER-DCPALTDC1+OPER-N2SUPPLY
XOP-COM2-26	1.00E-06	238.64	OPER-4160X+OPER-WVDHR
XOP-COM2-41	1.00E-06	238.64	OPER-4160X+OPER-DCPALTDC1

Table A6-16: Unit 1 RAW Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Ach W	Description
XOP-COM3-06	1.00E-06	238.64	OPER-4160X+OPER-DCPALTDC1+OPER-FPXFER
XOP-COM2-40WH	9.50E-04	215.43	OPER-4160X-WH+OPER-SDGSTART
XOP-COM3-16	1.90E-05	147.86	OPER-4160X+OPER-DCPALTDC1+OPER-SWRHR-C
XOP-COM3-09	1.00E-06	119.82	OPER-DCPALTDC1+OPER-SWRHR-O+OPER-SPCL
XOP-COM3-10	1.00E-06	119.82	OPER-DCPALTDC1+OPER-SWRHR-C+OPER-SPCL
TRAN-LOOP	3.00E-03	91.13	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
XOP-COM2-56WH	6.80E-04	90.16	OPER-4160X-WH+OPER-SWRHR-O
XOP-COM2-57WH	6.60E-04	84.21	OPER-4160X-WH+OPER-SWRHR-C
XOP-4160-WH	9.50E-04	52.28	High Winds recovery of OPER-4160X
XOP-COM2-53WH	2.90E-05	43.64	OPER-4160X-WH+OPER-RCICEXT
XOP-COM2-61WH	1.40E-04	42.67	OPER-4160X-WH+OPER-DEPRESS-WH
%HW_4	3.40E-03	39.85	HIGH WIND INITIATING EVENT (EF3=136-165 MPH)
%EXTFL_2	7.40E-04	35.8	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
XOP-COM2-13	9.59E-05	26.5	OPER-4160X+OPER-480X
XOP-4160X	1.90E-04	26.14	OPER-4160X
%TE_S_WC	7.96E-03	25.26	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
EDG0DGN-CF34-018	1.01E-04	22.57	CCF - DIESEL GENERATORS 1 & 2 AND 3 FAIL TO RUN
EDG0DGN-CF34-019	1.01E-04	22.57	CCF - DIESEL GENERATORS 1 & 2 AND 4 FAIL TO RUN
EDG0DGN-CF34-020	1.01E-04	22.57	CCF - DIESEL GENERATORS 1 & 3 AND 4 FAIL TO RUN
EDG0DGN-CF34-021	1.01E-04	22.57	CCF - DIESEL GENERATORS 2 & 3 AND 4 FAIL TO RUN
RHR1PTF-TM-LOOPA	3.50E-03	18.38	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
%TE_S_SC	5.55E-03	14.5	SITE LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
%TE_S_GC	6.79E-03	14.11	SITE LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
XOP-DCDG	2.80E-04	13.66	OPER-DCDG
%1T_DC1B	2.92E-04	12.08	LOSS OF DC SWITCHBOARD 1B
EDG1DGN-EXTTM-D002	3.84E-02	11.17	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
RHR1FPS-NO-N021A	1.08E-03	10.66	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
HW_SWRH_H4	1.31E-02	10.59	FAILURE OF SWITCHYARD RELAY HOUSE FOR HIGH WIND INTERVAL 4

Table A6-17: Unit 1 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
X-POWEROP1	9.24E-01	1.00E+00	Fraction of annual year at power
OPER-SDGSTART	1.00E+00	7.62E-01	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
FL-NSBO	1.00E+00	6.05E-01	NO STATION BLACKOUT FLAG
FL-HIGHWINDS	1.00E+00	4.71E-01	FLAG TO ENABLE HIGH WINDS EVALUATION
OPER-4160X	1.00E+00	4.16E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
EDG1DGN-EXTTM-D002	3.84E-02	4.06E-01	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)

Table A6-17: Unit 1 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
FL-SBO	1.00E+00	3.95E-01	STATION BLACKOUT FLAG
OPER-480X	1.00E+00	3.95E-01	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
OPER-4160X-WH	1.00E+00	3.75E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
TRAN-LOOP	3.00E-03	2.71E-01	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
EDG1DGN-EXTTM-D001	3.84E-02	2.67E-01	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
XOP-COM2-39	9.50E-05	2.50E-01	OPER-4160X+OPER-SDGSTART
EDG1DGN-FR-002	5.90E-02	2.27E-01	DIESEL GENERATOR 2 FAILS TO RUN
FL-CSTMU	1.00E+00	2.25E-01	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
OPER-HWLVLCV	1.00E+00	2.25E-01	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO
XOP-COM2-40WH	9.50E-04	2.04E-01	OPER-4160X-WH+OPER-SDGSTART
%TE_S_WC	7.96E-03	1.95E-01	SITE LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
EDG1DGN-FR-001	5.90E-02	1.83E-01	DIESEL GENERATOR 1 FAILS TO RUN
EDG2DGN-EXTTM-D004	3.84E-02	1.79E-01	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
OPER-DCDG	1.00E+00	1.76E-01	FAILURE TO ALIGN PORTABLE DC GENERATOR TO BATTERY CHARGERS
FL-BATDEPL1B	1.00E+00	1.72E-01	BATTERY BANK 1B DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
OPER-SWRHR-C	1.00E+00	1.72E-01	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
EDG2DGN-EXTTM-D003	3.84E-02	1.48E-01	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
X-AC-C01S_WC	9.62E-01	1.39E-01	Offsite Power Recovery
OPER-LDSDN	6.90E-01	1.36E-01	SUCCESS OF DC LOAD SHED (COMPLEMENT OF OPER-LDSHD)
%HW_4	3.40E-03	1.33E-01	HIGH WIND INITIATING EVENT (EF3=136-165 MPH)
HW_SWRH_H4	1.31E-02	1.27E-01	FAILURE OF SWITCHYARD RELAY HOUSE FOR HIGH WIND INTERVAL 4
OPER-SPCE	1.00E+00	1.24E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
OPER-FPS1	1.00E+00	1.22E-01	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
OPER-SWRHR-O	1.00E+00	1.14E-01	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
%HW_2	5.92E-02	1.14E-01	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
OPER-CSTMU	1.00E+00	1.13E-01	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
OPER-SPCL	1.00E+00	1.13E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
EDG2DGN-FR-004	5.90E-02	1.10E-01	DIESEL GENERATOR 4 FAILS TO RUN
OPER-DFPFUEL	1.00E+00	1.06E-01	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
OPER-FPXFER	1.00E+00	1.02E-01	FAILURE TO CLOSE MD FIRE PUMP TRANSFER SWITCH 2-FP-P2-XFER-SW
%HWM_2	5.43E-02	9.86E-02	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
EDG2DGN-FR-003	5.90E-02	9.36E-02	DIESEL GENERATOR 3 FAILS TO RUN
HW_SDG_H1_04	1.00E+00	9.23E-02	FAILURE OF SDG FOR HIGH WIND INTERVAL 4
%TE_S_GC	6.79E-03	8.96E-02	SITE LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
X-AC-C01S_GC	7.63E-01	8.96E-02	Offsite Power Recovery
%HW_5	2.32E-04	7.63E-02	HIGH WIND INITIATING EVENT (EF4=166-200 MPH)
HW_SWRH_H5	1.07E-01	7.63E-02	FAILURE OF SWITCHYARD RELAY HOUSE FOR HIGH WIND INTERVAL 5

Table A6-17: Unit 1 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
%TE_S_SC	5.55E-03	7.54E-02	SITE LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
X-AC-C01S_SC	7.96E-01	7.54E-02	Offsite Power Recovery
FL-EXTFLOOD	1.00E+00	7.42E-02	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
RHR1PTF-TM-LOOPA	3.50E-03	6.10E-02	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
XOP-COM2-56WH	6.80E-04	6.07E-02	OPER-4160X-WH+OPER-SWRHR-O
HW_SDG_H1_05	1.00E+00	5.74E-02	FAILURE OF SDG FOR HIGH WIND INTERVAL 5
XOP-COM2-12	1.00E-06	5.59E-02	OPER-4160X+OPER-SPCL
XOP-COM2-57WH	6.60E-04	5.50E-02	OPER-4160X-WH+OPER-SWRHR-C
XOP-ONE	1.00E+00	5.31E-02	Operator screening value set to 1.0
XOP-4160-WH	9.50E-04	4.88E-02	High Winds recovery of OPER-4160X
%EXTFL_1	5.00E-05	4.84E-02	PROBABILITY OF A 23 FOOT STORM SURGE
X-AC-C05_S_WC	2.12E-01	4.56E-02	WC SITE LOSP CASE 5
FL-BATDEPL1A	1.00E+00	4.30E-02	BATTERY BANK 1A DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
OPER-LDSHD	3.10E-01	4.17E-02	FAILURE TO COMPLETE DC LOAD SHED
OPER-N2SUPPLY	1.00E+00	3.83E-02	FAILURE TO ALIGN NITROGEN SUPPLY
%1T_T	8.24E-01	3.81E-02	TURBINE TRIP INITIATOR
OPER-GENDISC	1.00E+00	3.75E-02	FAILURE TO LOCALLY ALIGN ELECTRICAL BUSSES FOR BACKFEED
FPS0TNK-H4-FPTNK	4.03E-01	3.53E-02	FAILURE OF FIRE WATER STORAGE TANK FOR HIGH WIND INTERVAL 4
SDG1DGN-FR-001	5.90E-02	3.12E-02	SUPPLEMENTAL DIESEL GENERATOR FAILS TO RUN
XOP-COM2-36	3.85E-05	3.07E-02	OPER-4160X+OPER-SWRHR-O
FL_TEMP<90	1.00E+00	2.73E-02	OUTSIDE AIR TEMP < 90 DEG F
%EXTFL_2	7.40E-04	2.58E-02	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
FPS0TNK-H5-FPTNK	5.55E-01	2.50E-02	FAILURE OF FIRE WATER STORAGE TANK FOR HIGH WIND INTERVAL 5
%HW_3	1.63E-02	2.43E-02	HIGH WIND INITIATING EVENT (EF2=111-135 MPH)
XOP-SDGSTART	5.20E-03	2.42E-02	Operator fails to start the Supp-DG
EDG1XHE-MN-DG2	8.00E-03	2.34E-02	Failure to restore EDG #2 or subsystem following test or maintenance
XOP-FPS1	4.10E-03	2.04E-02	OPER-FPS1
EDG2XHE-MN-DG4	8.00E-03	1.97E-02	Failure to restore EDG #4 or subsystem following test or maintenance
%HWM_3	1.63E-02	1.97E-02	HIGH WIND MISSLE INITIATING EVENT (EF2=111-135 MPH)
%1TE_U1_WC	9.38E-03	1.96E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (WEATHER-CENTERED)
X-AC-C01U1_WC	7.06E-01	1.96E-02	Offsite Power Recovery
EDG1DGN-TM-D002	7.15E-03	1.95E-02	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
OPER-ALT120V	1.00E+00	1.91E-02	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
OPER-ISOSWAP	1.00E+00	1.91E-02	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
XOP-COM3-12	1.00E-06	1.91E-02	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	1.90E-02	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
ACP0XHE-MN-E2E4	8.00E-03	1.87E-02	Failure to properly restore breaker following maintenance

Table A6-17: Unit 1 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
FPS2EDP-H4-P-1	2.47E-01	1.80E-02	FAILURE OF DIESEL-DRIVEN FIRE PUMP FOR HIGH WIND INTERVAL 4
EDG2XHE-MN-DG3	8.00E-03	1.80E-02	Failure to restore EDG #3 or subsystem following test or maintenance
OPER-TBCMGT	1.00E+00	1.79E-02	FAILURE TO THROTTLE TBCCW FLOW (INITIATOR)
EDG1XHE-MN-DG1	8.00E-03	1.70E-02	Failure to restore EDG #1 or subsystem following test or maintenance
FPS2EDP-H5-P-1	4.14E-01	1.69E-02	FAILURE OF DIESEL-DRIVEN FIRE PUMP FOR HIGH WIND INTERVAL 5
EDG2DGN-TM-D004	7.15E-03	1.64E-02	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
OPER-DGHMAN-WH	1.00E+00	1.62E-02	FAILURE TO MANUALLY START EDG EXHAUST FAN(S)
XOP-COM3-08	1.00E-06	1.55E-02	OPER-4160X+OPER-FPXFER+OPER-DFPFUEL
EDG2DGN-TM-D003	7.15E-03	1.54E-02	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
EDG1DGN-TM-D001	7.15E-03	1.43E-02	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
ACP0XHE-MN-E1E3	8.00E-03	1.42E-02	Failure to properly restore breaker following maintenance
%1TE_U1_SC	7.81E-03	1.27E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (SWITCHYARD-CENTERED)
X-AC-C01U1_SC	5.95E-01	1.27E-02	Offsite Power Recovery
EDG1DGN-FS-002	5.38E-03	1.17E-02	DIESEL GENERATOR 2 FAILS TO START
ACP0BKR-CC-1AC5	2.55E-03	1.06E-02	CIRCUIT BREAKER FROM UAT #1 TO 1C (1AC5) FAILS TO OPEN
ACP0BKR-OO-1AC7	2.55E-03	1.06E-02	CIRCUIT BREAKER FROM SAT #1 TO 1C (1-AC7) FAILS TO CLOSE
OPER-DEPRESS1	1.00E+00	1.05E-02	FAILURE TO DEPRESSURIZE FOLLOWING HCTL CURVES
XOP-COM2-14	1.00E-06	1.05E-02	OPER-4160X+OPER-DEPRESS1
RHR1FPS-NO-N021A	1.08E-03	1.05E-02	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
EDG2DGN-FS-004	5.38E-03	1.02E-02	DIESEL GENERATOR 4 FAILS TO START
EDG2DGN-FS-003	5.38E-03	1.02E-02	DIESEL GENERATOR 3 FAILS TO START
%1TE_U1_GC	4.21E-03	9.65E-03	UNIT LOSS OF OFFSITE POWER TO UNIT 1 (GRID-CENTERED)
X-AC-C01U1_GC	8.48E-01	9.65E-03	Offsite Power Recovery
EDG1DGN-FS-001	5.38E-03	8.78E-03	DIESEL GENERATOR 1 FAILS TO START
RHR1PTF-TM-LOOPB	3.50E-03	8.69E-03	RHR LOOP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
ACP0BKR-CC-1AD7	2.55E-03	8.22E-03	UAT #1 TO 1D (1-AD7) CIRCUIT BREAKER FAILS TO OPEN
ACP0BKR-OO-1AD5	2.55E-03	8.22E-03	CIRCUIT BREAKER FROM SAT #1 TO 1D (1-AD5) FAILS TO CLOSE
X-AC-C09_S_WC	1.32E-01	6.90E-03	WC SITE LOSP CASE 9
FL_V101	1.00E+00	6.86E-03	FLAG FOR FAILURE OF FLOW PATH THROUGH RHR HX 1A
RHR1MOV-CC-F007A	8.34E-04	6.86E-03	MOTOR-OPERATED VALVE E11-F007A FAILS TO OPEN
RHR1MOV-CC-F024A	8.34E-04	6.86E-03	MOTOR OPERATED VALVE E11-F024A FAILS TO OPEN
RHR1MOV-CC-F028A	8.34E-04	6.86E-03	MOTOR OPERATED VALVE E11-F028A FAILS TO OPEN
RHR1MOV-OO-F048A	8.34E-04	6.86E-03	MOTOR-OPERATED VALVE E11-F048A FAILS TO CLOSE
SWS1MOV-CC-F068A	8.34E-04	6.86E-03	MOTOR OPERATED VALVE SW F068A FAILS TO OPEN
RHR1FST-HI-N014A	8.34E-04	6.85E-03	FLOW ELEMENT E11-FE-N014A FAILS HIGH
XOP-DGHMAN-WH	3.15E-03	6.42E-03	High Winds Recovery for OPER-DGHMAN
OPER-DEPRESS-WH	1.00E+00	6.08E-03	FAILURE TO MANUALLY INITIATE AND ALIGN LOW-PRESSURE SYSTEMS

Table A6-17: Unit 1 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
XOP-COM2-61WH	1.40E-04	5.83E-03	OPER-4160X-WH+OPER-DEPRESS-WH
OPER-DCPALTDC1	1.00E+00	5.64E-03	FAILURE TO ALIGN DC BUS TO STANDBY DC POWER SUPPLY - UNIT 1
SWS1HTX-HW-RHR1A	7.12E-04	5.55E-03	RHR HEAT EXCHANGER 1A LOSS OF COOLING/PLUGGED
%HWM_4	3.42E-03	5.27E-03	HIGH WIND MISSILE INITIATING EVENT (EF3=136-165 MPH)

Table A6-18: Unit 2 RAW Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Ach W	Description
XOP-COM2-12	1.00E-06	6.48E+04	OPER-4160X+OPER-SPCL
XOP-COM3-12	1.00E-06	2.29E+04	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	2.28E+04	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
XOP-COM2-14	1.00E-06	1.14E+04	OPER-4160X+OPER-DEPRESS1
XOP-COM2-39	9.50E-05	2.88E+03	OPER-4160X+OPER-SDGSTART
XOP-COM2-10	1.00E-06	2.56E+03	OPER-SPCE+OPER-WVDHR
%EXTFL_1	5.00E-05	1.05E+03	PROBABILITY OF A 23 FOOT STORM SURGE
XOP-COM2-36	3.85E-05	918.06	OPER-4160X+OPER-SWRHR-O
XOP-COM2-35	1.00E-06	515.96	OPER-4160X+OPER-FPS1
XOP-COM2-22	1.00E-06	387.22	OPER-DCPALTDC1+OPER-MANSW-120
XOP-COM2-41	1.00E-06	387.22	OPER-4160X+OPER-DCPALTDC1
%HW_5	2.32E-04	315.36	HIGH WIND INITIATING EVENT (EF4=166-200 MPH)
XOP-COM2-19	1.00E-06	258.48	OPER-DCPALTDC1+OPER-N2SUPPLY
XOP-COM2-26	1.00E-06	258.48	OPER-4160X+OPER-WVDHR
XOP-COM2-40WH	9.50E-04	149.12	OPER-4160X-WH+OPER-SDGSTART
XOP-COM3-09	1.00E-06	129.74	OPER-DCPALTDC1+OPER-SWRHR-O+OPER-SPCL
XOP-COM3-10	1.00E-06	129.74	OPER-DCPALTDC1+OPER-SWRHR-C+OPER-SPCL
XOP-COM2-56WH	6.80E-04	92.86	OPER-4160X-WH+OPER-SWRHR-O
XOP-COM2-57WH	6.60E-04	87.92	OPER-4160X-WH+OPER-SWRHR-C
TRAN-LOOP	3.00E-03	72.84	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
XOP-COM2-61WH	1.40E-04	46.15	OPER-4160X-WH+OPER-DEPRESS-WH
%EXTFL_2	7.40E-04	39.21	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
XOP-COM2-53WH	2.90E-05	37.96	OPER-4160X-WH+OPER-RCICEXT
XOP-4160-WH	9.50E-04	37.77	High Winds Recovery for OPER-4160X
%HW_4	3.40E-03	37.67	HIGH WIND INITIATING EVENT (EF3=136-165 MPH)
%TE_S_WC	7.96E-03	28.41	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
XOP-4160X	1.90E-04	24.43	OPER-4160X
EDG0DGN-CF34-018	1.01E-04	24.37	CCF - DIESEL GENERATORS 1 & 2 AND 3 FAIL TO RUN
EDG0DGN-CF34-019	1.01E-04	24.37	CCF - DIESEL GENERATORS 1 & 2 AND 4 FAIL TO RUN
EDG0DGN-CF34-020	1.01E-04	24.37	CCF - DIESEL GENERATORS 1 & 3 AND 4 FAIL TO RUN

Table A6-18: Unit 2 RAW Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Ach W	Description
EDG0DGN-CF34-021	1.01E-04	24.37	CCF - DIESEL GENERATORS 2 & 3 AND 4 FAIL TO RUN
XOP-COM2-13	9.59E-05	21.23	OPER-4160X+OPER-480X
RHR2PTF-TM-LOOPA	3.50E-03	20.48	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
%TE_S_SC	5.55E-03	16.38	SITE LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
%TE_S_GC	6.79E-03	15.76	SITE LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
XOP-DCDG	2.80E-04	14.71	OPER-DCDG
XOP-FPS1	4.10E-03	14.1	OPER-FPS1
RHR2FPS-NO-N021A	1.08E-03	11.89	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
EDG2DGN-EXTTM-D004	3.84E-02	10.64	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
HW_SWRH_H4	1.31E-02	10.1	FAILURE OF SWITCHYARD RELAY HOUSE FOR HIGH WIND INTERVAL 4
RHR2FST-HI-N014A	8.34E-04	10.03	FLOW ELEMENT E11-FE-N014A FAILS HIGH
RHR2MOV-CC-F007A	8.34E-04	10.03	MOTOR-OPERATED VALVE E11-F007A FAILS TO OPEN
RHR2MOV-CC-F024A	8.34E-04	10.03	MOTOR OPERATED VALVE E11-F024A FAILS TO OPEN
RHR2MOV-CC-F028A	8.34E-04	10.03	MOTOR OPERATED VALVE E11-F028A FAILS TO OPEN
RHR2MOV-OO-F048A	8.34E-04	10.03	MOTOR-OPERATED VALVE E11-F048A FAILS TO CLOSE
SWS2MOV-CC-F068A	8.34E-04	10.03	MOTOR OPERATED VALVE SW F068A FAILS TO OPEN

Table A6-19: Unit 2 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
X-POWEROP1	9.24E-01	1.00E+00	Fraction of annual year at power
OPER-SDGSTART	1.00E+00	7.67E-01	OPERATOR FAILS TO START AND ALIGN SUPPLEMENTAL DIESEL GENERATOR
FL-NSBO	1.00E+00	6.69E-01	NO STATION BLACKOUT FLAG
OPER-480X	1.00E+00	4.44E-01	FAILURE TO CONNECT UNIT 1 SUBSTATIONS E5 AND E6
OPER-4160X	1.00E+00	4.42E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
FL-HIGHWINDS	1.00E+00	4.06E-01	FLAG TO ENABLE HIGH WINDS EVALUATION
EDG2DGN-EXTTM-D004	3.84E-02	3.84E-01	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
FL-SBO	1.00E+00	3.31E-01	STATION BLACKOUT FLAG
OPER-4160X-WH	1.00E+00	3.03E-01	FAILURE TO ALIGN POWER FROM OPPOSITE UNIT
XOP-COM2-39	9.50E-05	2.73E-01	OPER-4160X+OPER-SDGSTART
EDG2DGN-EXTTM-D003	3.84E-02	2.64E-01	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
%TE_S_WC	7.96E-03	2.20E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
TRAN-LOOP	3.00E-03	2.16E-01	CONDITIONAL PROBABILITY OF A LOOP GIVEN A PLANT TRIP (OTHER THAN A LOCA)
EDG2DGN-FR-004	5.90E-02	2.05E-01	DIESEL GENERATOR 4 FAILS TO RUN
OPER-SWRHR-C	1.00E+00	1.89E-01	FAILURE TO LOCALLY CLOSE SW VALVES FOR FW INJECTION
EDG1DGN-EXTTM-D002	3.84E-02	1.86E-01	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
FL-CSTMU	1.00E+00	1.85E-01	FAILURE OF CST MAKEUP AFTER STATION BLACKOUT
OPER-HWLVLCV	1.00E+00	1.85E-01	FAILURE TO ISOLATE HOTWELL MAKEUP FOLLOWING AN SBO

Table A6-19: Unit 2 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
EDG2DGN-FR-003	5.90E-02	1.68E-01	DIESEL GENERATOR 3 FAILS TO RUN
EDG1DGN-EXTTM-D001	3.84E-02	1.66E-01	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
OPER-FPS1	1.00E+00	1.61E-01	FAILURE TO ALIGN FIREWATER FOR COOLANT INJECTION FLOW (ONE UNIT)
X-AC-C01S_WC	9.62E-01	1.57E-01	Offsite Power Recovery
OPER-DCDG	1.00E+00	1.56E-01	FAILURE TO ALIGN PORTABLE DC GENERATOR TO BATTERY CHARGERS
FL-BATDEPL2B	1.00E+00	1.52E-01	BATTERY BANK 2B DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER
XOP-COM2-40WH	9.50E-04	1.41E-01	OPER-4160X-WH+OPER-SDGSTART
OPER-SPCE	1.00E+00	1.26E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING EARLY
OPER-SWRHR-O	1.00E+00	1.25E-01	FAILURE TO LOCALLY OPEN THE DISCHARGE VALVES FOR RHR INJECTION
%HW_4	3.40E-03	1.25E-01	HIGH WIND INITIATING EVENT (EF3=136-165 MPH)
HW_SWRH_H4	1.31E-02	1.21E-01	FAILURE OF SWITCHYARD RELAY HOUSE FOR HIGH WIND INTERVAL 4
OPER-LDSDN	6.90E-01	1.20E-01	SUCCESS OF DC LOAD SHED (COMPLEMENT OF OPER-LDSHD)
OPER-CSTMU	1.00E+00	1.15E-01	OPERATOR FAILS TO MAKEUP THE CST AFTER STATION BLCAKOUT
OPER-SPCL	1.00E+00	1.14E-01	FAILURE TO INITIATE AND ALIGN SUPPRESSION POOL COOLING LATE
EDG1DGN-FR-002	5.90E-02	1.07E-01	DIESEL GENERATOR 2 FAILS TO RUN
%TE_S_GC	6.79E-03	1.01E-01	SITE LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
X-AC-C01S_GC	7.63E-01	1.01E-01	Offsite Power Recovery
%HW_2	5.92E-02	9.15E-02	HIGH WIND INITIATING EVENT (EF1=86-110 MPH)
HW_SDG_H1_04	1.00E+00	9.00E-02	FAILURE OF SDG FOR HIGH WIND INTERVAL 4
EDG1DGN-FR-001	5.90E-02	8.91E-02	DIESEL GENERATOR 1 FAILS TO RUN
%TE_S_SC	5.55E-03	8.59E-02	SITE LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
X-AC-C01S_SC	7.96E-01	8.59E-02	Offsite Power Recovery
FL-EXTFLOOD	1.00E+00	8.08E-02	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
%HWM_2	5.43E-02	7.59E-02	HIGH WIND MISSILE INITIATING EVENT (EF1=86-110 MPH)
%HW_5	2.32E-04	7.30E-02	HIGH WIND INITIATING EVENT (EF4=166-200 MPH)
HW_SWRH_H5	1.07E-01	7.30E-02	FAILURE OF SWITCHYARD RELAY HOUSE FOR HIGH WIND INTERVAL 5
RHR2PTF-TM-LOOPA	3.50E-03	6.84E-02	RHR LOOP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
XOP-COM2-12	1.00E-06	6.50E-02	OPER-4160X+OPER-SPCL
XOP-COM2-56WH	6.80E-04	6.25E-02	OPER-4160X-WH+OPER-SWRHR-O
XOP-ONE	1.00E+00	5.75E-02	Operator screening value set to 1.0
XOP-COM2-57WH	6.60E-04	5.74E-02	OPER-4160X-WH+OPER-SWRHR-C
HW_SDG_H1_05	1.00E+00	5.71E-02	FAILURE OF SDG FOR HIGH WIND INTERVAL 5
XOP-FPS1	4.10E-03	5.39E-02	OPER-FPS1
X-AC-C05_S_WC	2.12E-01	5.26E-02	WC SITE LOSP CASE 5
%EXTFL_1	5.00E-05	5.25E-02	PROBABILITY OF A 23 FOOT STORM SURGE
OPER-N2SUPPLY	1.00E+00	4.67E-02	FAILURE TO ALIGN NITROGEN SUPPLY
FL-BATDEPL2A	1.00E+00	4.44E-02	BATTERY BANK 2A DEPLETION FOLLOWING LOSS OF POWER FROM CHARGER

Table A6-19: Unit 2 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
OPER-GENDISC	1.00E+00	4.07E-02	FAILURE TO LOCALLY ALIGN ELECTRICAL BUSSES FOR BACKFEED
%2T_T	8.24E-01	4.02E-02	TURBINE TRIP INITIATOR
OPER-LDSHD	3.10E-01	3.85E-02	FAILURE TO COMPLETE DC LOAD SHED
FPS0TNK-H4-FPTNK	4.03E-01	3.82E-02	FAILURE OF FIRE WATER STORAGE TANK FOR HIGH WIND INTERVAL 4
XOP-COM2-36	3.85E-05	3.53E-02	OPER-4160X+OPER-SWRHR-O
XOP-4160-WH	9.50E-04	3.50E-02	High Winds recovery for OPER-4160
SWS2MDP-TM-NSW2B	8.54E-03	3.11E-02	NSW PUMP 2B UNAVAILABLE DUE TO TEST OR MAINTENANCE
%EXTFL_2	7.40E-04	2.83E-02	PROBABILITY OF A 20 FLOOD ENTERING SWITCHYARD
SDG1DGN-FR-001	5.30E-02	2.77E-02	SUPPLEMENTAL DIESEL GENERATOR FAILS TO RUN
FPS0TNK-H5-FPTNK	5.55E-01	2.71E-02	FAILURE OF FIRE WATER STORAGE TANK FOR HIGH WIND INTERVAL 5
XOP-SDGSTART	5.20E-03	2.39E-02	Operator Fails to start the Supp-DG
OPER-ALT120V	1.00E+00	2.36E-02	FAILURE TO ALIGN ALTERNATE 120V AC POWER SUPPLY
OPER-ISOSWAP	1.00E+00	2.29E-02	FAILURE TO SWAP DIVISION II ISOLATION SIGNAL POWER SUPPLY
XOP-COM3-12	1.00E-06	2.29E-02	OPER-SPCE+OPER-ISOSWAP+OPER-N2SUPPLY
XOP-COM4-01	1.00E-06	2.28E-02	OPER-SPCE+OPER-480X+OPER-ALT120V+OPER-N2SUPPLY
EDG2XHE-MN-DG4	8.00E-03	2.27E-02	Failure to restore EDG #4 or subsystem following test or maintenance
%2TE_U2_SC	7.80E-03	2.20E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (SWITCHYARD-CENTERED)
EDG1XHE-MN-DG1	8.00E-03	2.18E-02	Failure to restore EDG #1 or subsystem following test or maintenance
ACP0XHE-MN-E2E4	8.00E-03	2.14E-02	Failure to properly restore breaker following maintenance
%HW_3	1.63E-02	2.08E-02	HIGH WIND INITIATING EVENT (EF2=111-135 MPH)
EDG1XHE-MN-DG2	8.00E-03	2.06E-02	Failure to restore EDG #2 or subsystem following test or maintenance
OPER-TBCMGT	1.00E+00	1.94E-02	FAILURE TO THROTTLE TBCCW FLOW (INITIATOR)
EDG2XHE-MN-DG3	8.00E-03	1.92E-02	Failure to restore EDG #3 or subsystem following test or maintenance
EDG2DGN-TM-D004	7.15E-03	1.89E-02	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
EDG1DGN-TM-D001	7.15E-03	1.84E-02	DIESEL GENERATOR 1 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
EDG1DGN-TM-D002	7.15E-03	1.72E-02	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
FPS2EDP-H4-P-1	2.47E-01	1.66E-02	FAILURE OF DIESEL-DRIVEN FIRE PUMP FOR HIGH WIND INTERVAL 4
EDG2DGN-TM-D003	7.15E-03	1.59E-02	DIESEL GENERATOR 3 UNAVAILABLE DUE TO MAINTENANCE (AT POWER)
%HWM_3	1.63E-02	1.58E-02	HIGH WIND MISSLE INITIATING EVENT (EF2=111-135 MPH)
FPS2EDP-H5-P-1	4.14E-01	1.55E-02	FAILURE OF DIESEL-DRIVEN FIRE PUMP FOR HIGH WIND INTERVAL 5
ACP0XHE-MN-E1E3	8.00E-03	1.54E-02	Failure to properly restore breaker following maintenance
%2TE_U2_PC	5.85E-03	1.53E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (PLANT-CENTERED)
OPER-DFPFUEL	1.00E+00	1.43E-02	FAILURE TO REFILL DIESEL DRIVEN PUMP FUEL OIL TANK WITHIN 8 HOURS
EDG1DGN-FS-001	5.38E-03	1.25E-02	DIESEL GENERATOR 1 FAILS TO START
RHR2FPS-NO-N021A	1.08E-03	1.18E-02	FLOW SWITCH E11-PDIS-N021A FAILS TO OPERATE
EDG2DGN-FS-004	5.38E-03	1.18E-02	DIESEL GENERATOR 4 FAILS TO START
ACP0BKR-CC-2AC4	2.55E-03	1.14E-02	UAT #2 TO 2C (2-AC4) CIRCUIT BREAKER FAILS TO OPEN

Table A6-19: Unit 2 FV Ranking for the IE w/internal and external Flooding and High Winds Models			
Event Name	Probability	Fus Ves	Description
ACP0BKR-OO-2AC6	2.55E-03	1.14E-02	CIRCUIT BREAKER FROM SAT #2 TO 2C (2-AC6) FAILS TO CLOSE
OPER-DEPRESS1	1.00E+00	1.14E-02	FAILURE TO DEPRESSURIZE FOLLOWING HCTL CURVES
XOP-COM2-14	1.00E-06	1.14E-02	OPER-4160X+OPER-DEPRESS1
EDG1DGN-FS-002	5.38E-03	1.08E-02	DIESEL GENERATOR 2 FAILS TO START
%2TE_U2_GC	4.20E-03	1.06E-02	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (GRID-CENTERED)
EDG2DGN-FS-003	5.38E-03	1.03E-02	DIESEL GENERATOR 3 FAILS TO START
RHR2PTF-TM-LOOPB	3.50E-03	9.98E-03	RHR LOOP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
ACP0BKR-CC-2AD6	2.55E-03	8.90E-03	CIRCUIT BREAKER FROM UAT #2 TO 2D (2-AD6) FAILS TO OPEN
ACP0BKR-OO-2AD4	2.55E-03	8.90E-03	CIRCUIT BREAKER FROM SAT #2 TO 2D (2-AD4) FAILS TO CLOSE
OPER-DGHMAN-WH	1.00E+00	7.56E-03	FAILURE TO MANUALLY START EDG EXHAUST FAN(S)
FL_V101	1.00E+00	7.54E-03	FLAG FOR FAILURE OF FLOW PATH THROUGH RHR HX 2A
RHR2MOV-CC-F007A	8.34E-04	7.54E-03	MOTOR-OPERATED VALVE E11-F007A FAILS TO OPEN
RHR2MOV-CC-F024A	8.34E-04	7.54E-03	MOTOR OPERATED VALVE E11-F024A FAILS TO OPEN
RHR2MOV-CC-F028A	8.34E-04	7.54E-03	MOTOR OPERATED VALVE E11-F028A FAILS TO OPEN
RHR2MOV-OO-F048A	8.34E-04	7.54E-03	MOTOR-OPERATED VALVE E11-F048A FAILS TO CLOSE
SWS2MOV-CC-F068A	8.34E-04	7.54E-03	MOTOR OPERATED VALVE SW F068A FAILS TO OPEN
RHR2FST-HI-N014A	8.34E-04	7.53E-03	FLOW ELEMENT E11-FE-N014A FAILS HIGH
%2TE_U2_WC	3.12E-03	7.00E-03	UNIT LOSS OF OFFSITE POWER TO UNIT 2 (WEATHER-CENTERED)
XOP-DGHMAN-WH	3.15E-03	6.95E-03	High Winds recovery for OPER-DGHMAN
X-AC-C09_S_WC	1.32E-01	6.72E-03	WC SITE LOSP CASE 9
OPER-DEPRESS-WH	1.00E+00	6.59E-03	FAILURE TO MANUALLY INITIATE AND ALIGN LOW-PRESSURE SYSTEMS
XOP-COM2-61WH	1.40E-04	6.32E-03	OPER-4160X-WH+OPER-DEPRESS-WH
SWS2HTX-HW-RHR2A	7.12E-04	6.21E-03	RHR HEAT EXCHANGER 2A LOSS OF COOLING/PLUGGED
OPER-CRD-FO-INJ	1.00E+00	5.36E-03	FAILURE TO ALIGN/CONTROL CRD SYSTEM FOR MAKEUP
ACP0BKR-OO-DGE1	2.55E-03	5.11E-03	CIRCUIT BREAKER AE9 FAILS TO CLOSE
ACP1BKR-CC-1AF0	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AFO FAILS TO OPEN
ACP1BKR-CC-1AF1	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF1 FAILS TO OPEN
ACP1BKR-CC-1AF2	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF2 FAILS TO OPEN
ACP1BKR-CC-1AF3	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF3 FAILS TO OPEN
ACP1BKR-CC-1AF4	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF4 FAILS TO OPEN
ACP1BKR-CC-1AF5	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF5 FAILS TO OPEN
ACP1BKR-CC-1AF6	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF6 FAILS TO OPEN
ACP1BKR-CC-1AF7	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF7 FAILS TO OPEN
ACP1BKR-CC-1AF9	2.55E-03	5.11E-03	CIRCUIT BREAKER 1-AF9 FAILS TO OPEN

Table A6-20: Units 1 and 2 RAW Ranking for the IE w/internal and external Flooding LERF Models

Event Name	Probability	Ach W	Description
PCI1AOV-CF22-001	2.22E-05	4.50E+04	CCF - VALVES G16-F003 & G16-F004 FAIL TO CLOSE ON DEMAND
%EXTFL_1	5.00E-05	2.00E+04	PROBABILITY OF A 23 FOOT STORM SURGE
EDG1DGN-EXTTM-D002	3.84E-02	13.54	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
EDG2DGN-EXTTM-D004	3.84E-02	13.54	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)

Table A6-21: Units 1 and 2 FV Ranking for the IE w/internal and external Flooding LERF Models			
Event Name	Probability	Fus Ves	Description
%EXTFL_1	5.00E-05	1.00E+00	PROBABILITY OF A 23 FOOT STORM SURGE
FL-EXTFLOOD	1.00E+00	1.00E+00	FLAG TO ENABLE EXTERNAL FLOOD EVALUATION
FL-LPISTART-120	1.00E+00	1.00E+00	FLAG TO ACTIVATE OPERATOR ACTION TO START LPI IN 120 MIN
FL-NSBO	1.00E+00	1.00E+00	NO STATION BLACKOUT FLAG
PCI1AOV-CF22-001	2.22E-05	1.00E+00	CCF - VALVES G16-F003 & G16-F004 FAIL TO CLOSE ON DEMAND
X-ID1-43	1.00E+00	1.00E+00	LERF-No cool MU w/low RPV press: Isolation fails
X-POWEROP1	9.24E-01	1.00E+00	Fraction of annual year at power
EDG1DGN-EXTTM-D002	3.84E-02	5.00E-01	DIESEL GENERATOR 2 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
EDG1DGN-FR-002	5.90E-02	5.00E-01	DIESEL GENERATOR 2 FAILS TO RUN
EDG2DGN-EXTTM-D004	3.84E-02	5.00E-01	DIESEL GENERATOR 4 UNAVAILABLE DUE TO MAINTENANCE (>7 days)
EDG2DGN-FR-004	5.90E-02	5.00E-01	DIESEL GENERATOR 4 FAILS TO RUN

DIESEL GENERATOR COMPLETION TIME EXTENSION

COMMITMENT LIST

COMMITMENT LIST

DIESEL GENERATOR COMPLETION TIME EXTENSION

COMMITMENT LIST

The following table identifies those actions committed to by Carolina Power and Light Company (CP&L), now doing business as Progress Energy Carolinas, Inc., in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments.

Commitment	Schedule
1. The SUPP-DG will be protected, as defense-in-depth, during the extended DG CT.	Prior to startup from the 2013 Brunswick Unit 2 refueling outage.
2. The SUPP-DG will be routinely monitored during Operator Rounds, with monitoring criteria identified in the Operator Rounds. The SUPP-DG will be monitored for fire hazards during Operator Rounds.	
3. Component testing or maintenance of safety systems and important nonsafety equipment in the offsite power systems which can increase the likelihood of a plant transient (i.e., unit trip) or LOOP, will be avoided during the extended DG CT.	
4. No discretionary switchyard maintenance will be allowed during the extended DG CT.	
5. Weather conditions will be evaluated prior to intentionally entering the extended DG CT and will not be entered if official weather forecasts are predicting severe weather conditions (i.e., thunderstorm, tornado, or hurricane warnings). Operators will monitor weather forecasts each shift during the extended DG CT. If severe weather or grid instability is expected after a DG outage begins, station managers will assess the conditions and determine the best course for returning the DG to an operable status.	
6. Licensed Operators and Auxiliary Operators, for the operating crews on-shift when the extended DG CT is in use, will be briefed on the DG work plan, the revised TS 3.8.1, and procedural actions regarding LOOP, SBO, and SUPP-DG alignment and use prior to entering the extended DG CT.	
7. Licensed Operators and Auxiliary Operators will be appropriately trained on the purpose and use of the SUPP-DG and the revised AOP actions. Personnel performing maintenance on the SUPP-DG will be appropriately trained.	
8. The High Pressure Coolant Injection (HPCI) pump, the Reactor Core Isolation Cooling (RCIC) pump, and the Residual Heat Removal (RHR) pump associated with the operable DG will not be removed from service for elective maintenance activities during the extended DG CT.	

DIESEL GENERATOR COMPLETION TIME EXTENSION

COMMITMENT LIST

Commitment	Schedule
9. The PRA Fire Peer Review is scheduled for December 2011. CP&L expects to receive the Fire Peer Review Final Report in January 2012, and will provide the Fire Peer Review supplemental information within 30 days of receipt of the Final Report.	The PRA Fire Peer Review is scheduled for December 2011. CP&L expects to receive the Fire Peer Review Final Report in January 2012, and will provide the Fire Peer Review supplemental information within 30 days of receipt of the Final Report.