RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

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Question No. 19-85

10 CFR 52.47(a)(27) states that a DC application must contain an FSAR that includes a description of the design-specific PRA and its results. In addition, Standard Review Plan (SRP) Chapter 19.0, draft Revision 3, Items 25 through 37 on Pages 19.0-18 and 19.0-19 provide the acceptance criteria for a PRA-based seismic margin analysis (SMA) submitted in support of a design certification (DC) application, in part, it states that “The staff will determine that the applicant has performed a PRA-based SMA to determine the seismic capacity of the plant and for each sequence that may lead to core damage or large release.” In addition, SRP Chapter 19, Section III “Review Procedures / Design-Specific PRA (PRA-Based SMA),” states “It is important that the plant systems analysis focus on those sequences leading to core damage or containment failures, including applicable sequences leading to the following containment failures: (1) loss of containment integrity, (2) loss of containment isolation, and (3) loss of function for prevention of containment bypass. The applicant should address the following operating modes in the analysis: (1) at power (full power), (2) low power, and (3) shutdown.”

In APR1400 DCD, Section 19.1.5.1.1 “Description of the Seismic Risk Evaluation,” the applicant describes the methodology (Tasks (a) through (g)) used to evaluate the seismic margin. However, the staff review finds that, among these tasks, only Task (b) “Development of seismic equipment list” and Task (e) “Fragility analysis” are discussed in detail in Sections 19.1.5.1.1.1 and 19.1.5.1.1.2, respectively. Therefore, in order for the staff to reach a reasonable assurance finding, please address by providing and discussing in detail the analyses performed for Tasks (a), (c), (d), (f), and (g) in theAPR1400 DCD, including the following items:

a) Consequential initiating events that were actually quantified in the seismic model

b) Recoveries of mitigating systems and seismic related failures that were credited in the PRA-based seismic margin analysis (SMA)

c) The modeling of structures, systems, and components (SSCs) that are not on the seismic equipment list (SEL) in SMA analysis, if any

d) The protection against flooding, spraying, steam impingement, pipe whip, jet forces, missiles, fire and the effect of failure of any non-seismic Category I equipment

e) Evaluation of human error probabilities (HEPs) for the operator actions included in the analysis

f) Operator actions that were identified as being important to mitigating seismic accident sequences

g) Accident sequences (at cutset level) that were examined to assess the plant-level high confidence of low probability of failures (HCLPF) capacity

h) Evaluation of containment performance as described in Section 5.1.1 of DC/COL-ISG-20 as referenced in the SRP so that the appropriate Level 2 SSCs are appropriately included in the SEL

i) Significant functions, SSCs, and operator actions that are limiting in determining the plant-level HCLPF capacity.

Response – (Rev. 1)

The PRA-based seismic margin analysis (SMA) for at-power conditions was performed. Both at-power and LPSD SMA results reflect the latest PRA model updates. Details of the at-power PRA-based SMA are documented in DCD 19.1.5.1, “Seismic Risk Evaluation” and include the plant systems analysis focused on those sequences leading to core damage or containment failures, including applicable sequences leading to loss of containment integrity, loss of containment isolation, and loss of function for prevention of containment bypass.

Attachment 1 provides the DCD markups summarizing how the APR1400 PRA-based SMA was applied to at-power conditions. Results of the at-power PRA-based SMA include the seismic cutsets and the sequence HCLPF capacities, as well as assessment of random failures and operator actions. In order to provide the modeling information, the detail information for event tree, fault tree for the at-power conditions are provided in Attachments 2 and 3. In addition, Attachment 4 provides a cross-walk to how the at-power PRA-based SMA was developed to follow NRC Interim Staff Guidance on Implementation of a Probabilistic Risk Assessment-Based Seismic Margin Analysis for New Reactors, DC/COL-ISG-020.

DCD Section 19.1.5.1.1 and 19.1.5.1.2 are to be revised to reflect the at-power PRA-based SMA results, as shown in Attachment 1, and address each of the RAI items (a) through (i), and cross-referenced with the respective DCD subsection to address the item, as shown below:

a) Treatment of consequential initiating events is described in Section 19.1.5.1.2.1 of the DCD Rev. 1 (Refer to Attachment 1).

b) Recoveries of mitigating systems and seismic related failures that were credited in the PRA-based SMA are described in Section 19.1.5.1.1.4.9(j) of the DCD Rev. 1 (Refer to Attachment 1).

c) The modeling of structures, systems, and components (SSCs) that are not on the seismic equipment list (SEL) in the PRA-based SMA is discussed in 19.1.5.1.1.2 of the DCD Rev. 1 (Refer to Attachment 1).

d) The protection against flooding, spraying, steam impingement, pipe whip, jet forces, missiles, fire and the effect of failure of any non-seismic Category I equipment is discussed in Section 19.1.5.1.1.4.9 (h) of the DCD Rev. 1 (Refer to Attachment 1).

e) Human error probabilities (HEPs) for the operator actions included in the analysis is discussed in Section 19.1.5.1.1.4.9 (p) of the DCD Rev. 1 (Refer to Attachment 1).

f) Operator actions that were identified as being important to mitigating seismic accident sequences are described in Section 19.1.5.1.2.3 (k) of the DCD Rev. 1 (Refer to Attachment 1).

g) Accident sequences (at cutset level) that were examined to assess the plant-level HCLPF capacity is described in Section 19.1.5.1.2.3 of the DCD Rev. 1 (Refer to Attachment 1).

h) The at-power PRA-based SMA event trees include top events that evaluate containment performance, and cutsets are provided for all the seismic event trees. Containment failure, containment isolation failure and loss of function for prevention of containment bypass is described Section 19.1.5.1.2.3 of the DCD Rev. 1 (Refer to Attachment 1).

i) Significant functions, SSCs, and operator actions that are limiting in determining the plant-level HCLPF capacity is discussed in Section 19.1.5.1.2.3 of the DCD Rev. 1 (Refer to Attachment 1).

Impact on DCD

The previous DCD markup which relate to DCD Section 19.1.2.3 and 19.1.5.1 will be withdrawn. These sections will be superseded as discussed above, and provided in Attachment 1.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

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19.1.2.3 PRA Technical Adequacy

The content of the Probabilistic Risk Assessment (PRA) and the steps taken to provide for its technical quality are consistent with the guidance in the ASME/ANS PRA Standard and NRC RG 1.200. This PRA Standard presents high level requirements (HLRs) for various PRA technical elements and, for each HLR, a set of more detailed supporting requirements (SRs). The supporting requirements are related to the three capability categories addressed in the standard.

These requirements were formulated for application to operating nuclear power plants, and in some cases cannot be explicitly satisfied for a PRA performed in the design phase. Table 19.1-1 provides a summary of the degree to which the APR1400 PRA relates to the capability categories for the nine technical elements addressed in the ASME/ANS PRA Standard.

A COL applicant and/or holder that references the APR1400 design certification should conduct a peer review of the PRA relative to the ASME/ANS PRA Standard prior to use of the PRA to support risk-informed applications (COL 19.1(5)). The findings and observations from this review should be dispositioned after the review to provide reasonable assurance that captured issues are addressed. Changes that are made to the PRA model and associated documentation as a result of this resolution process are to be conducted in a manner consistent with Subsection 19.1.2.4.

The ASME/ANS PRA Standard does not fully address Low Power and Shutdown (LPSD) modes of operation (the standard is still in draft form). For analyses in which the ASME/ANS PRA Standard does not directly apply, the APR1400 PRA has used the latest industry guidance available to perform assessments commensurate with the uses of the PRA. This additional guidance includes the following:

a. Internal fire analysis: The internal fire PRA uses the guidance provided in NUREG/CR-6850 and its supplement for at-power fire analysis, and NUREG/CR-7114 for LPSD fire analysis. These reports document the latest methodology available for practical assessment of internal fires in nuclear power plants. Limitations in applying this methodology because some design details are not yet available are addressed in Subsection 19.1.5.2.

b. LPSD analysis: The ASME/ANS PRA Standard and the associated NRC guidance on PRA adequacy apply only to accidents initiated from power operation. The APR1400 PRA also addresses LPSD modes. The LPSD PRA methodology and

level of detail are consistent with industry practice. The LPSD methodology and modeling are state of the art and are designed to meet the requirements of the draft ANS/ASME LPSD PRA Standard (Reference 9).

c. PRA-based seismic margins assessment: The APR1400 PRA uses a PRA-based SMA approach to evaluate potential vulnerabilities to seismic events. The methodology and level of detail used to develop the PRA-based SMA are consistent with industry practice at the DC stage. The methods as implemented for the United States is consistent with guidance in SECY-93-087 and follows the general approach delineated in the NRC staff interim guidance document DC/COL-ISG-020 (Reference 57). A self-assessment has been conducted to ensure that the technical adequacy of APR1400 PRA-based SMA meets NRC recognized guidance and requirements.

d. Other external events: The APR1400 PRA for design certification uses a screening method to address other external events that could represent challenges to safe operation. The screening approach follows guidance provided in the ASME/ANS PRA Standard.

19.1.5.1 Seismic Risk Evaluation

The scope of a seismic risk evaluation is limited due to the design-specific aspects within the scope of the design certification (DC). The design-specific PRA developed for the DC stage does not evaluate site specific information (e.g., local hazards, switchyard and offsite grid configuration, and ultimate heat sink) and can not explicitly model all aspects of the design (e.g., balance of plant).

Without a site-specific probabilistic seismic hazard analysis (PSHA), as-built information, etc., the NRC guidance allows for a PRA-based seismic margin analysis to evaluate risk at the DC stage. Evaluation of the risk due to seismic events was performed using a PRA-based seismic margins approach for the ARR1400. This subsection describes the seismic risk evaluation including the results of the evaluation. The scope of this analysis is at-power operation. The seismic risk evaluation for low power and shutdown states is presented in Section 19.1.6.5.

19.1.5.1.1 Description of the Seismic Risk Evaluation

The seismic margin methodology was applied to estimate the seismic margin and accident sequences for APR 1400. The seismic margin for the APR1400 is evaluated by using PRA-based SMA. This methodology satisfies the recommendation of SECY-93-087 (Reference 8), as modified and approved by EPRI 3002000709 (Reference 77), for a seismic risk evaluation. The PRA-based SMA identifies potential vulnerabilities and demonstrates seismic margins beyond the design basis safe shutdown earthquake (SSE). The capacity of components required to bring the plant to safe and stable conditions is assessed. The plant structures, systems, and components (SSC) identified as important to seismic risk are addressed.

a. Selection of review level earthquake

   The starting point to perform PRA-based SMA is to select a review level earthquake (RLE). PRA-based SMA demonstrates that sufficient margin in seismic design exists by showing the high confidence of low probability of failures (HCLPFs) of the plant and components is greater than the RLE. The RLE is 1.67 times of the certified seismic design response spectra (CSDRS) in Chapter 3, which are shown in Figure 3.7-1 and 3.7-2. The RLE for APR1400 is 0.5g which is 1.67 times of SSE and is consistent with the requirement of DC/COL-ISG-020.

b. Development of seismic equipment list

The seismic equipment list (SEL) is developed from the internal events PRA model. The SEL provides a documented list of SSCs that could be used to respond to an earthquake or mitigate potential plant damage initiated by a seismic event. Also, earthquake-specific SSCs such as passive components and structures related to a safety function, which are not addressed in the internal events PRA model, are included in the fragility analysis and system analysis.

c. Identification of seismic initiating event category

Initiating events due to a seismic event are identified based on the internal events PRA. However, there are some major differences between seismic and internal events for the purpose of identifying the initiating event category, which are as follows: 1) seismic events may damage passive plant components and structures (e.g., steam generators, auxiliary building, etc.) that are not explicitly modeled in the internal events PRA; and 2) seismic events may simultaneously damage multiple SSCs in the plant.

d. Development of system models

The PRA-based SMA system models are developed from the internal events PRA model to include the important accident sequences. This model also contains random failures and human errors from the internal events PRA. System models are modified to accommodate a seismic event and seismic induced failures. The model is used to estimate seismic margins and to identify vulnerabilities in the design.

e. Fragility analysis

Per ISG-020 (Reference 57), two methods can be used to calculate the structure, system and component HCLPF capacity to demonstrate a seismic margin over the design-specific CSDRS. They are the Conservative Deterministic Failure Margin (CDFM) approach and the Separation of Variables approach. For the APR1400 Design Certification application, the CDFM approach is used. As delineated in ISG-020, APR1400 design-specific documents and drawings are reviewed to identify potential failure modes of the individual SSCs and APR1400 design-specific seismic demands are used. As for capacity, code capacities are used and inelastic energy absorption capability, if any, is considered. The resulting HCLPF capacities are described in DCD Section 19.1.5.1.2.2.

At the design certification phase, specific design data for the balance of plant (BOP) components, such as material properties, analysis results, qualification test information, etc. are not available. Appendix E of EPRI-NP-1002988 (Reference 58) presents example calculations showing that the equipment designed for 0.25 g SSE can have 0.5 g or higher HCLPF considering the conservatism in the design process. The EPRI-NP-6041 (Reference 39) indicates that Seismic Category I concrete structure and BOP equipment can have 0.5 g HCLPF as long as the structure and the equipment are designed in accordance with the current code and standard and the anchorage is rugged. The generic fragility data provided by the Electric Power Research Institute (EPRI) Utility Requirements Document (Reference 37) show the BOP components have HCLPF capacities higher than 0.5 g.

The seismic capacity for equipment qualified by testing should ensure that the equipment should remain functional within 1.67 times the required response spectra (RRS) as provided in the respective equipment's procurement specification. The seismic demands to equipment defined in terms of RRS should use CSDRS-based seismic input and account for the structural amplifications caused by the supporting structures, including soil-structure interaction effects and supporting systems, and incorporate an additional seismic margin factor (1.67 times RRS).

f. Evaluation for the plant seismic capacity

There are two acceptable approaches to evaluate the plant seismic margin as described in NUREG/CR-4482 (Reference 38).

1) "Min-max" method, in which HCLPF is assessed for accident sequences by taking the lower HCLPF value for components operating under OR logic and the highest HCLPF value for components operating under AND logic.

2) "Convolution" method, in which probabilities of non-seismic and operator failures are included in the calculation as well as the component fragilities. This is a fully quantitative approach in which the importance and contribution of seismic as well as non-seismic failures can be assessed quantitatively.

For the APR1400 PRA-based SMA, the "min-max" method was selected as the appropriate method at the design certification phase since detailed plant-specific data are unavailable at the design certification stage. This method is accomplished by calculating HCLPFs for each seismic core damage cutset. Cutset HCLPFs are determined considering seismic-induced failures. Cutsets with random equipment failures and/or operator action failures are reviewed separately.

g. Demonstration of seismic margin in the design

The objective is to demonstrate that there is sufficient seismic margin in the design. If the plant HCLPF earthquake is less than the RLE, modification of the design or refinements of the model are required.

h. Sensitivities and Uncertainties

Uncertainties are taken into account explicitly in the fragility development and in evaluating non-seismic failures of equipment. Because the APR1400 PRA-based SMA is primarily qualitative, no sensitivity studies are conducted.

19.1.5.1.1.1 Selection of Review Level Earthquake

Development of the PRA-based SMA uses a Review Level Earthquake (RLE) which has a reasonable probability of occurring, but does not mask or overwhelm systems needed to respond to the event. For the APR1400, the RLE is selected based on the design response spectra of the site-independent SSE which is developed from the certified seismic design response spectra (CSDRS). The peak ground acceleration (PGA) of the CSDRS has been established as 0.3g for the APR1400 design for both the horizontal and vertical directions. To perform the PRA-based SMA, the RLE is selected as 1.67 times the SSE or 0.5g which is consistent with the requirement of ISG-020.

19.1.5.1.1.2 Development of Seismic Equipment List

The SEL provides a documented list of the plant SSCs that could be used to respond to an earthquake or mitigate potential reactor plant damage initiated by a seismic event. This design certification SEL then is used to develop the PRA-based SMA systems logic model (i.e., event trees and fault trees).

While the objectives of the internal events PRA and PRA-based SMA are similar, there are differences between the SSCs included in each of the models. As a result, not all SSCs included in the internal events PRA model are included in the SEL. For example, many balance-of-plant components, such as the main feedwater system, are not considered in the PRA-based SMA since they depend on offsite power, which is expected to be unavailable after a seismic event. In addition, some SSCs are not modeled explicitly in the internal events PRA but must be considered in the PRA-based SMA and, therefore, in the SEL. Examples include distribution systems such as piping, cable trays, ventilation ducts, and structural items such as masonry block walls that could fail and damage nearby safety equipment.

The first step in developing the SEL was to determine the potential initiating events that could occur as a result of a seismic event. Initiating events considered could occur either directly as a result of the earthquake or due to random or consequential events that occur subsequent to the earthquake. A discussion of initiating events evaluated in the PRA-based SMA, including consequential initiating events, is provided in Section 19.1.5.1.1.3. Identification of potential initiating events make use of the internal events PRA for guidance. The safety functions that would be required to respond to initiating events identified above were determined based on EPRI NP-6041 (Reference 39) and NUREG-1407 (Reference 40). These safety functions are:

a. Reactivity control

b. Reactor Coolant System (RCS) pressure control

c. RCS inventory control

d. Decay heat removal

e. Containment integrity

The front-line systems used to meet the five safety functions were identified from the internal events PRA, including the additional required support systems. Unlike the internal events PRA, only systems that do not require offsite power were selected. Because the offsite power grid, switchyard insulators, and large transformers have relatively low seismic capacity, they cannot be relied on to provide power after a major earthquake. Only systems that can be supported by the onsite emergency ac power sources are considered.

The initial list of equipment for the SEL is then identified using the following data sources:

a. List of basic events from the internal events PRA

b. The internal events PRA systems notebooks

c. Piping and instrumentation diagrams (P&IDs)

d. Electrical diagrams (for offsite power and emergency power)

e. Plant arrangement drawings

f. Emergency Operating Guidelines (EOGs)

For the PRA-based SMA, the initial list of equipment was identified beginning with the internal events PRA and reviewing the system P&IDs and electrical diagrams to provide reasonable assurance that all necessary components are on the SEL. For example, components needed to provide reasonable assurance of system integrity or electrical isolat

ion were examined. These components were identified and added to the SEL when appropriate. Small, passive, in-line filters that are supported only by the piping or ducting, and instrumentation, which are not required for mitigation of the seismic accident sequence, are not included on the SEL (e.g., local instrumentation may be excluded, unless it is part of a plant procedure that would be implemented during a seismic event).

The following assumptions were used to develop the SEL:

a. The following components are considered to have seismically rugged capacity (i.e., having a HCLPF 2.5 times CSDRS):

1) Piping and supports

2) HVAC ducting, supports, and dampers

3) Cable trays and supports, and electrical conduit

4) Motor-operated valves

5) Air-operated valves

6) Solenoid-operated valves

7) Pilot-operated safety relief valves

8) Relief valves

9) Manual valves

10) Check valves

11) Instrumentation such as resistance temperature detectors, pressure transmitters, etc.

19.1.5.1.1.3 Identification of Seismic Initiating Event Categories

Identification of feasible seismic initiating event categories for the PRA-based SMA is based on the initiating events defined for the internal events PRA. These events were reviewed to identify those that could be caused by a seismic event which would also impair equipment needed to mitigate the event. Then a determination was made as to whether the seismic-induced failures would require a unique response or would be evaluated by the seismic fault tree models.

All seismic events are assumed to cause a loss of offsite power (LOOP) and that transient event is explicitly considered. Other transient events considered in the internal events PRA could result from failure of plant components or systems. Failure of other support systems, e.g., loss of a 4kV AC bus, could occur during a seismic event. Due to the correlated simultaneous failures of multiple 4kV AC buses by earthquake, it is considered as seismic event specific Station Blackout (SBO). Therefore, for all the seismic specific initiators with total loss of a supporting system should be considered. The examples for this are loss of a 4kV AC bus and loss of one train safety-related DC bus. All the initiators by the total loss of a supporting system in the internal event are considered in the seismic event analysis.

The other initiating events that should be considered are supporting system failures due to a seismic event which are not considered in the internal event analysis. An example is loss of all I&C caused by the seismic-induced failure of ESF-CCS GC, LC and PPS cabinets. In such an event, the plant operators would have no ability to control plant parameters. Consequently, this event is evaluated explicitly. Similarly, the ATWS event requires unique plant response and the seismic event could induce the failures that prevent inserting the control rods.

Loss of coolant accident (LOCA) events are also considered to be induced by a seismic event. Large, medium, and small LOCAs are considered explicitly in the PRA-based SMA. Excessive LOCAs are those breaks in the RCS that have a break flow larger than evaluated for large LOCA events considered in the internal events PRA. Excessive LOCA events could occur when multiple seismic failures occur simultaneously in the RCS. Such events as well as vessel rupture are considered as a direct core damage event and are considered bounded by auxiliary building or containment building failures. An interfacing systems LOCA is considered not credible and is discussed further below.

19.1.5.1.1.4 Development of System Models

System logic models, i.e., fault trees, that were developed for the internal events PRA model were used as the basis for the PRA-based SMA logic models. The PRA-based SMA logic models include the seismic failures. Details of the fault tree logic model development for systems where explicit evaluation of seismic failures needed to be included are provided in the subsections that follow. The developed model was for seismic induced initiating events which were identified and shown in the seismic induced initiating event tree illustrated in figure 19.1-48A.

19.1.5.1.1.4.1 Direct Core Damage (S-DMG)

A seismic event that causes significant structural failure is assumed to preclude equipment operation and operator actions needed to prevent core damage because structural failure could cause widespread equipment failures. The fault tree for top event S-DMG was created to model seismic failure of structures. Failures included in this fault tree include the following:

- Reactor Containment

  Two separate failures were considered in modeling seismic structural failure of the reactor containment, failure of the external containment structure and failure on the internal containment structure.

- Auxiliary Building

  Seismic structural failure of the Auxiliary Building is modeled as direct core damage.

- Nuclear Island

  Seismic induced sliding of the Nuclear Island is modeled as direct core damage.

- Turbine Building

  Seismic structural failure of the Turbine Building is modeled as direct core damage.

- Compound Building

  Seismic structural failure of the Compound Building is modeled as direct core damage.

A seismic event that causes significant RCS component failure is assumed to lead to an excessive LOCA which cannot be accommodated by the ECCS, and it is assumed to lead to direct core damage. These seismic induced failures are also included in the S-DMG. Failures included in this fault tree include the following:

- Reactor Pressure Vessel (RPV)

  Seismic induced column support failure of the RPV is modeled as direct core damage.

- Reactor Pressure Vessel Internal Failure

  Seismic induced core support barrel lower flange failure of the RPV internal is modeled as direct core damage.

- Steam Generator

  Seismic induced Anchor failure of snubber lever support assembly failure of the Steam Generator is modeled as direct core damage.

- Steam Generator Nozzle

  Seismic induced economizer nozzle failure of the Steam Generator is modeled as direct core damage.

- Pressurizer

Seismic induced pressurizer skirt support failure is modeled as direct core damage.

- Reactor Coolant Pump (RCP)

Seismic induced RCP upper horizontal column support failure is modeled as direct core damage.

S-DMG is assumed to lead to containment integrity failure upon the seismic event. Thus it is assumed to lead to large release.

19.1.5.1.1.4.2 Station Blackout (S-SBO)

As described in the section 19.1.5.1.1.3, LOOP is assumed with the occurrence of seismic event and off-site power recovery is not credited in the seismic event. Therefore, the failure of EDGs will lead to the SBO without off-site power recovery and consequently lead to the direct core damage. The seismic induced failures of the equipment leads to seismically induced SBO.

- Emergency Diesel Generators (EDG)
- Emergency Diesel Fuel Oil transfer pump
- Starting Air Tank
- Diesel Fuel Oil Day Tank
- Diesel Fuel Oil Storage Tank
- Silencer
- Air Intake Filter
- Lube Oil Water Heat Exchanger
- Motor Driven Fuel Oil Feed Pump
- EDG Room Emergency Exhaust Fan

- 125V DC Control Center
- 4.16kV MCSG
- Batteries & Racks

Additionally, S-SBO is assumed to lead to containment isolation failure due to the loss of all I&C before or at the time of core damage.

19.1.5.1.1.4.3 Loss of All Instrumentation and Control (S-IC)

Mitigation of an accident requires that the operators have adequate indication available to progress through the emergency operation guidelines and operate the equipment necessary to control the plant. However, plant instrumentation and control (I&C) are not explicitly modeled in the internal events PRA. Loss of instrumentation and control is assumed to result directly in core damage.

Of the equipment on the SEL, Table 19.1-42, the ESF-CCS GC, ESF-CCS LC, and plant protection system (PPS) cabinets are needed to route and process signals and indications needed for the operators to control plant parameters and equipment. The cabinets all are located on the 156-foot elevation and have the same parameters for fragility values. Specific fragility assessments of the cabinets were not performed. Rather, all cabinets were assigned a HCLPF of 0.5g and seismic failure of all the cabinets was modeled with a single, correlated failure.

The 480V MCC cabinets are located on the various building elevations, and specific fragility assessment of the cabinets were not performed. Loss of all 480V MCC is conservatively modeled as the one correlated event which leads to total loss of I&C. In addition to the seismic failure of the cabinets, loss of all 120 VAC instrumentation power also could cause a total loss of I&C. Loss of all 120 VAC is modeled as failure of the inverter and regulating transformer on each of the four 120 VAC power channels.

Though the failure of the equipment below does not directly cause loss of instrumentation & control, it will cause numerous component failures. Thus the failure of the equipment below will cause similar circumstances as S-IC with respect to accident mitigation. Therefore, the equipment failures below are assumed to cause the initiating event as S-IC.

- 125V DC Battery Chargers

- 480V Load Center
- 480V Motor Control Center (MCC)
- Main Control Room (MCR) Safety Consoles

S-IC is assumed to lead to containment isolation failure due to the loss of all I&Cs before or at the time of core damage.

19.1.5.1.1.4.4 Main Steam Line Break (S-MSLB)

Seismic induced failure of MSSV, MSADV or MSSV is assumed to result in a MSLB for which reactivity control is not assured, since steam line failure at auxiliary building location cause the containment isolation fail. Consequently, this initiating event is assumed to lead to direct core damage.

S-MSLB is assumed to lead to containment isolation failure due to the opening path through main steam line upon the seismic induced failure of the components above.

19.1.5.1.1.4.5 Total Loss of Component Cooling Water (S-TLOCCW)

Seismic induced failures of equipment which are lead to prompt or delayed loss of total CCW or total Essential Service Water (ESW) is defined as seismic induced total loss of component cooling water. Over time, the loss of ESW and CCW are essentially the same with respect to accident mitigation under seismic event. This initiating event is assumed to lead to direct core damage due to the loss of all cooling water over time. The seismic induced failures which will cause this initiating event are below.

- Essential Service Water Intake Structure (ESW IS)
- Component Cooling Water Heat Exchanger (CCW HX) Building
- Essential Service Water Pump
- CCW Heat Exchangers
- CCW Pump

- CCW Surge Tank
- Essential Chilled Water Pumps
- Essential Chillers
- ECW Compression Tank
- ECW Air Separator
- Essential Chilled Water System Control Panel
- AFWP Room Cubicle Cooler
- CCWP Room Cubicle Cooler
- SI Room Cubicle Cooler
- SC Pump & Mini-flow HX. Room Cubicle Cooler
- Mech. Pen. Room Cubicle Cooler
- CS Pump Room Cubicle Cooler
- Auxiliary Charging Pump Room Cubicle Cooler
- Charging Pump Room Cubicle Cooler
- Electrical Penetration Room Area Cubicle Cooler
- I&C Equipment Room Cubicle Cooler
- EDG Room Emergency Cubicle Cooler
- EDG Room Emergency Cubicle Cooler
- Essential Chiller & Pump Cubicle Cooler
- ESW Pump Room Supply Fan

Containment failure event for this initiator is considered containment isolation failure and late overpressure failure before or at the time of core damage.

19.1.5.1.1.4.6 Anticipated Transient Without Scram (S-ATWS)

Seismic induced ATWS is modeled based on the seismic failure of control element drive mechanism (CEDM) leading to CEDM binding in the extension shaft. Due to the total failure of CEA insertion and limited capacity of secondary heat removal during the early phase of the accident, this initiator is assumed to directly lead to core damage.

S-ATWS is assumed to lead to containment failure due to the lower HCLPF of mitigation system than the ATWS initiating event before or at the time of core damage.

19.1.5.1.1.4.7 Loss of Coolant Accidents

Modeling of LOCAs for the PRA-based SMA is performed to identify insights related to seismic design of the plant. As with the internal events PRA, three sizes of LOCAs are considered, small, medium, and large. For seismic-initiated breaches in the RCS, there are significant uncertainties in the size of the break that would result from any specific failure. That is, any seismic-induced failure of the RCS could result in a spectrum of break flow and analytical means are not available to predict the specific size of a break that would occur due to seismic-induced failure or the likelihood of a break range given a spectrum of potential seismically-induced failures.

Given the analytical limitations for determining seismic-induced LOCA break flow, a practice was employed to use available information to evaluate and express the three LOCA categories for the PRA-based SMA. For the PRA-based SMA, the available component fragility data are evaluated for identifying LOCA events and component seismic failures, that are considered to result in nuclear steam supply system (NSSS) boundary breaches, are used to categorize LOCA size categories. Component failures that can result in NSSS boundary breaches are sorted by maximum potential size. Then, the maximum size for each failure is grouped into the size range from the internal events LOCA categories mentioned previously.

Although multiple, smaller, breaches of the RCS could occur simultaneously and result in a total flow that would be considered in a larger LOCA category than that being considered for each individual failures, consideration of such effects is beyond the ability to identify with existing data sources and assumed to result in direct core damage. Additionally, no means is available to determine the degree of correlation between different seismic-induced

failures of the RCS. Consequently, it is not feasible to use existing data to determine how multiple, seismically-induced, failures of the RCS would result in a specific plant response. Use of the maximum potential break size from each of the identified RCS failures is considered adequate for use in the PRA-based SMA to determine the plant-level HCLPF and identify seismic-related insights.

The occurrence of a LOCA after a seismic event presents unique challenges to accident mitigation. The seismic failures having potentially sufficient breach size are modeled as follows:

- Pressurizer

  Seismic failure of the Pressurizer Surge Line is modeled as Large LOCA.

- Pressurizer spray nozzle

  Seismic failure of the Pressurizer spray nozzle is modeled as Medium LOCA.

- Various RCS small piping or Tubing Line

  Seismic failure of the RCS small piping or tubing line is modeled as Small LOCA

S-LLOCA and S-MLOCA are assumed to lead to direct core damage and also containment failure due to lower HCLPF of mitigation than LLOCA or MLOCA initiating event.

After a S-SLOCA, mitigation systems are assumed available. In the event of a loss of mitigation systems after S-SLOCA occurs, it would lead to core damage. This would also lead to a loss of containment isolation and late overpressurization before or at the time of core damage.

19.1.5.1.1.4.8 Loss of Off-Site Power

Seismic induced LOOP is assumed, should no initiating event causing seismic induced SSC damage occur. After a S-LOOP, mitigation systems are assumed available. In the event of a loss of mitigation systems after S-LOOP occurs, it would lead to core damage. This would also lead to a loss of containment isolation and late overpressurization before or at the time of core damage.

19.1.5.1.1.4.9 Seismic Event Additions to Internal Events Fault Trees

The internal events PRA model were modified to include seismically-induced failures. Since not all the plant equipment have specific fragility data, BOP components in the SEL were assigned a HCLPF of 0.5g. However, seismic failure of each plant component was modeled as a separate basic event to identify important components to mitigate seismic induced initiating events.

The major assumptions for the PRA-based SMA system model are as follows:

a. The loss of offsite power from the earthquake occurs due to the failure of the switchyard or transformer stations outside the plant. It is generally known that the weak link in the offsite power system is ceramic insulators installed in the switchyard and transformer station. Assuming that the offsite power system has the similar type of ceramic insulators, the HCLPF capacity for the offsite power is assigned to be 0.09g (Reference 79). It is assumed that the seismic event would result in a LOOP, since offsite power equipment are not seismic Category I.

b. No credit is taken for non-safety-related systems, and they are assumed in the model to have failed or to be non-functional due to the seismic event.

c. In the PRA-based SMA system fault trees, the operator actions in the random failure cutsets from the internal events PRA are assumed to apply.

d. If components are same, located on same building location and elevation, they are treated as fully correlated. To account for potential correlation and dependencies, the correlation between component seismic capacities was assigned binary values of 0 or 1 (fully independent or fully dependent). Consequently, the components of the same type in the system conservatively assumed to be 100% correlated and assigned them as “1”, and the specific correlation is identified in Table 19.1-42.

e. Failure of the reactor trip signal is not modeled since the breakers for motor generator sets would be de-energized following a LOOP due to a seismic event, thereby causing the release of control rods into the core even if the reactor trip function fails. However, seismic induced mechanical failure was modeled to represent the inability of control rod insertion.

f. The following seismic Category I buildings and structures are identified as buildings and structures that involve safety-related SSCs to prevent core damage.

   1) Reactor Containment Building

   2) Reactor Containment Internal

   3) Auxiliary Building

   4) CCW heat exchanger building

   5) ESW building

   6) Emergency Diesel generator building/Diesel Fuel Oil tank building

g. The HCLPFs of turbine building and compound building is assumed to be 1.67 times CSDRS, given design details for turbine building and compound building are not available. The failure of these buildings is assumed to result in impact to safety-related SSCs and direct core damage at the Beyond Design Basis.

h. Seismic spatial interactions between seismic Category I equipment and non-seismically qualified equipment will be avoided by proper equipment layout and design. This interaction includes flooding, spraying, steam impingement, pipe whip, jet forces, missiles, fire and the effect of failure of any non-seismic Category I equipment.

i. Vulnerability of a relay to seismic-induced chatter is highly dependent on the specific type, make and model of relay. The HCLPF for relays is assumed to be 1.67 times CSDRS, given design details for relays are not available.

j. No credit is given to recovery of the mitigation systems and seismic induced failures.

k. When the seismic induced initiating event occurs at the high level of HCLPF (e.g. Large LOCA, Medium LOCA etc.), it is assumed that SSCs for mitigation would not be available and it leads to directly core damage and containment failure.

l. At APR1400 design, no RCP seal design information was available for seismic fragility development. However, the RCP motor is supported by motor stand, which is direct load path of seismic inertia of the motor to the pump and its support. Consequently, seismically induced stress in the RCP sealing is assumed to be small such that the seal failure at a seismic event will not govern seismic fragility of the RCP. Therefore, it is assumed to be bounded by Small LOCA.

m. At APR1400 design, steam generator tube design information was not available for seismic fragility development. For steam generator tube fragility, a HCLPF of 2.5 times CSDRS was assumed. The COL applicant is to demonstrate that HCLPF of steam generator tube is equal to or higher than 2.5 times CSDRS.

n. To derive core damage cutsets for the seismic induced initiating events which do not directly lead to core damage. i.e. Small LOCA and LOOP, the event trees of at-power internal event PRA were used. In the event trees, the reactor trip failure was excluded because seismic induced ATWS is separately treated.

o. To identify dominant containment failure cutsets for the seismic induced initiating events which are not directly lead to containment failure, Level 1 event trees above was extended to incorporate containment isolation failure and late overpressure failure as the most probable containment failure modes. Failure of the containment heat removal was classified as a late overpressure failure whether the reactor cavity is flooded or not. Therefore, BMT (Basemat Melt-Through) is explicitly considered in the model.

p. HEPs for all operator actions are set to 0.1 to easily identify human failure events in the cutsets. If single operator action is in the cutset with only seismic induced failures, the operator action is considered important. The relative importance of the operator action is based on the HEPs in the internal event model. The performance-shaping factor such as ground motion intensity, location of the action, and time for the action are considered. The damage state of all of the operator action in APR1400 is assumed to be in the most severe condition, because HCLPF of the SSCs except for structures and NSSS are 0.5g. The performance shape factors with the consideration of the

seismic condtion are assumed (e.g. “5” for MCR or “10” for local area) in accordance with EPRI 3002000709 (Reference 77).

q. As indicated in the EPRI 3002000709 (Reference 77), seismic induced breaks in one or a very few small impulse lines connected to the primary circuits cannot be precluded, given the large number of such lines and their unusual configurations. Therefore, it is a common (although not a universal) practice in Seismic PRAs to include such a Very Small LOCA (VSLOCA) as an additional assumed failure impact in every seismically initiated accident sequence. The EPRI 3002000709 (Reference 77) presents four optional approaches to model the VSLOCA. In this analysis, the approach of option 2 is adopted, i.e., the VSLOCA has the seismic capacity of 0.3g HCLPF.

r. As indicated in the EPRI 1025287 (Reference 78), the HCLPF value of rugged SSCs for a site is above about 2.5 times GMRS. In order to avoid that the PRA-based SMA-results masked by such inherently ruggedness items (e.g. distribution systems, check valve, small instrumentation, etc.), HCLPF capacity are assumed to be 2.5 times the CSDRS. The COL applicant should confirm that the SSCs are rugged with HCLPFs equal to or higher than 2.5 times the CSDRS (COL19.1(8)).

s. Plant walkdowns are assumed to be conducted to confirm the assumptions and information used in PRA-based SMA, HCLPF fragilities and LPSD procedures. Walkdowns also would address impacts of the seismic induced flooding, fire, and accessibility issues affecting operator actions. Plant specific seismic walkdowns are not applicable for DC application phase, and the COL holder should demonstrate the seismic walkdown (COL 19.1(4)).

19.1.5.1.1.5 Seismic Fragility Analysis

The lack of site-specific information for a DC application application limits the ability to conduct a more meaningful assessment of the secondary effects following a seismic event. For example, effects of consequential line breaks causing jet impingement cannot be performed because the physical plant layout and construction details are not available. Similarly, any assessment of human error probability values cannot be performed. Because the DC uses a PRA-based SMA, however, changes in probability value do not

affect the overall conclusions of the results, i.e., the plant level HCLPF. If there are any secondary effects causing changes in the HCLPF of SSCs, it will be included in the model.

Seismic fragilities are calculated for specific structures and NSSS components. With the exception of the nuclear island (containment building and auxiliary building), emergency diesel generator building, diesel fuel oil building, and the nuclear steam supply system (NSSS), fragility values for the other components included in the SEL are assumed to have a HCLPF equal to or exceeding 1.67 times CSDRS. For this SMA the HCLPF is 0.5g.

According to DC/COL-ISG-020, two methods are acceptable for determining seismic fragility of the structures, systems, and components (SSCs) to demonstrate a seismic margin over the design-specific CSDRS. They are the Conservative Deterministic Failure Margin (CDFM) method and the Separation of Variables (SOV) method. The CDFM method requires code allowable as capacity and design analysis demand while the SOV method requires determination of medians and variabilities associated with capacities, equipment response, and structural response. The CDFM method is selected for this evaluation for the APR1400 Design Certification application.

19.1.5.1.2 Determination of Seismic Margin in the Design

19.1.5.1.2.1 Seismic Equipment List

The seismic equipment list (SEL) is developed from the internal events PRA model. The SEL provides a documented list of the plant SSCs that could be used to respond to an earthquake or mitigate potential reactor plant damage initiated by a seismic event. The plant has a number of systems that are available for safe shutdown after a seismic event. In selecting the systems, the following potential seismic initiating event scenarios were considered:

a. Direct core damage scenarios such as building collapse or RCS component catastrophic failure (S-DMG)

b. Station blackout (S-SBO)

c. Loss of all I&C (S-IC)

d. Main Steam Line Break (S-MSLB)

e. Anticipated transient without scram (S-ATWS)

f. Total Loss of Component Cooling Water (S- TLOCCW)

g. Large break LOCA (S-LLOCA)

h. Medium break LOCA (S-MLOCA)

i. Small break LOCA (S-SLOCA)

j. Loss of offsite power (S- LOOP)

As with typical PRA-based SMAs, the analysis considers equipment needed to supply offsite power to be of very low seismic capacity. If offsite power is available after an earthquake, then the earthquake was relatively mild and such events would cause very little damage, with virtually all of the safety systems being available for accident mitigation following such a mild event. Additionally, it would be reasonably expected that much of the balance-of-plant systems would also be undamaged.

The following scenarios are not considered further for the SEL:

a. Interfacing Systems LOCA (ISLOCA) – The active ISLOCA-related valves are on the SEL. Check valves have very high seismic capacity, and a potential ISLOCA from these valves following a seismic event is considered not significant.

b. Initiating Event with Partial Failure of Support System – Initiating events such as loss of one train DC power or loss of one train cooling water are not considered as seismically induced initiators because all the same redundant components in the support system will fail simultaneously by earthquake due to an assumed full correlated failure.

Table 19.1-41 lists the systems that were evaluated for the PRA-based SMA with their associated plant designators. Only specific portions of these systems are included in the SEL and SMA models. Because the support systems provide support functions for multiple frontline systems, their availability after an earthquake is critical for successful mitigation of the seismic event.

As described in Subsection 19.1.5.1.1.2, the P&IDs and electrical single-line diagrams were used as the initial input to the SEL. The internal events PRA basic events were then reviewed to provide reasonable assurance that all appropriate equipment was included in

the SEL. The SELs are presented in Table 19.1-42 which includes approximately 350 components. The system modeling and structures associated with the SEL equipment are discussed in Subsection 19.1.5.1.1.4.

19.1.5.1.2.2 Seismic Fragility Analysis Results

The following building structures and the RCS components of the APR1400 standard design are evaluated by the CDFM method using the design-specific information within the scope of the DC application. The resulting HCLPF capacities and the associated failure modes of the SSCs are summarized in Table 19.1-43. All the other SSCs are assumed to meet the 1.67 times CSDRS and assumed to have HCLPF of 0.5g conservatively.

a. Safety-related building structures

1) Reactor containment building

2) Reactor containment internal

3) Auxiliary building

4) Emergency diesel generator building/Diesel fuel oil tank building

b. RCS components

1) Reactor pressure vessel (RPV)

2) Reactor vessel internals (RVI)

3) Control element drive mechanism (CEDM)

4) Pressurizer (PZR)

5) Steam generators (SG)

6) Reactor coolant pumps (RCP)

7) Reactor coolant loop (RCL) piping

The APR1400 PRA-based SMA is bounding for site-specific SSCs and soil effects (including sliding, overturning, liquefaction, and slope failure) (COL 19.1(8)).

The dominant contributors to the plant HCLPF are provided in Table 19.1-44A, B, C and D.

19.1.5.1.2.3 Plant Level HCLPF

The dominant cutsets for core damage or containment failure is derived through the system analysis. The cutsets are grouped into the categories below based on the basic event type in the cutset:

a. Seismic event(s) only

b. Seismic event(s) and Human Failure Event(s)

c. Seismic event(s) and Random Equipment Failure Event(s)

d. Seismic event(s), Human Failure Event(s) and Random Equipment Failure Event(s)

The plant level HCLPF is calculated based on the min-max approach. The plant level HCLPF is obtained by directly applying the cutsets into the equation below.

Plant Level HCLPF= Min{Max(cutset(1)), Max(cutset(2)), ...Max(cutset(n))}

where, (n) is the number for cutsets which includes seismic failure event(s) only.

For example, the plant level HCLPF by the seismic induced initiators not directly leading to core damage is can be calculated as follows. Let us assume that the cutsets from seismic induced initiators of LOOP, Small LOCA and Large LOCA which includes seismic induced failure(s) only are as follows.

Cutset 1: SEIS-LOOP-0.09G * SEIS-SIPP01-FAIL-0.5G * SEIS-CSPP01-FAIL-0.5G

Cutset 2: SEIS-RCS-LEAK-0.3G * SEIS-SIPP01-FAIL-0.5G * SEIS-CSPP01-FAIL-0.5G

Cutset 3: SEIS-PIPE-RCS-FAIL-0.55G

By applying the custsets to the min-max equation, the plant level HCLPF can be obtained by the loop initiator below.

Plant level HCLPF = Min{Max(0.09g, 0.5g, 0.5g), Max(0.3g, 0.5g, 0.5g), Max(0.55g)}

= Min(0.5g, 0.5g, 0.55g) = 0.5g

The APR1400 PRA-based SMA considered sequence-level HCLPFs and fragilities for all sequences leading to core damage or containment failures up to approximately one and two thirds the ground motion acceleration of the Design Basis SSE. The plant HCLPF was calculated by finding the lowest HCLPF sequence. The resultant plant level HCLPF value is equal to 0.5g, which is greater than or equal to the RLE. Therefore, the plant level HCLPF demonstrates the APR1400 design can withstand a review level earthquake of 1.67 times the CSDRS and the assessment of the seismic capacity of the APR1400 design meets the expectations of SECY-93-087.

19.1.5.1.2.3 Risk Insights

19.1.5.1.2.3.1 Core Damage Risk Insights

All the core damage cutsets with single direct core damage event are shown in Table 19.1-44A. The top 100 core damage cutsets, having more than 2 basic events (including seismic induced events) are shown in Table 19.1-44B. As discussed above, based on the cutsets review, the plant HCLPF of APR1400 for core damage is 0.5g. Consequently, APR1400 meets the requirement to withstand a review level earthquake of 1.67 times CSDRS. The important at-power insights, core damage cutsets and HCLPF values for the APR1400 PRA-based SMA are as follows:

a. APR1400 has 5 structures, any one of which fails leads to direct core damage due to the catastrophic failure of RCS or safety-related components. The sequence HCLPF is 0.5g, because each of structure is 0.94g, 0.51g, 0.52g, 0.5g and 0.5g. The results are led by the collapse of seismic category II building (e.g. turbine building and compound building), COL applicant confirm that the HCLPF of turbine building and compound building is equal to or higher than 1.67 times CSDRS. The 5 structures are listed in the section 19.1.5.1.1.4.1. Therefore the structure failure induced S-DMG HCLPF is 0.5g.

b. APR1400 has 6 RCS components, any one of which fails leads to direct core damage due to the catastrophic failure of RCS. The HCLPF of the each component is 0.92g, 0.51g, 0.6g, 0.54g, 0.63g and 1.31g. The 6 RCS components are listed in the section 19.1.5.1.1.4.1. Therefore the RCS component catastrophic failure induced DCD HCLPF is 0.51g.

c. APR1400 has 13 components, any one of which fails leads to SBO thus resulting in core damage. The HCLPF of the each component is same as 0.5g. The 13

components are listed in the section 19.1.5.1.1.4.2. Therefore the S-SBO HCLPF is 0.5g.

d. APR1400 has 4 components, any one of which fails leads to S-IC thus resulting in core damage. The HCLPF of the each component is same as 0.5g except for one component type. The exceptional one component type is all the screen-outed plant-wide distributed equipment. It has the HCLPF of 0.75g. The 4 components are listed in the section 19.1.5.1.1.4.3. Therefore the S-IC HCLPF is 0.5g.

e. APR1400 has 3 components, any one of which failure leads to S-MSLB thus resulting in core damage. The HCLPF of the each component is same as 0.5g. The 3 components are listed in the section 19.1.5.1.1.4.4. Therefore the S-MSLB HCLPF is 0.5g.

f. APR1400 has 25 SSCs, any one of which fails leads to S-TLOCCW thus resulting in core damage. The HCLPF of the each SSC is same as 0.5g. The 25 SSCs are listed in the section 19.1.5.1.1.4.5. Therefore the S-TLOCCW HCLPF is 0.5g.

g. APR1400 has 1 component, of which fails leads to S-ATWS thus resulting in core damage. The HCLPF of the component is same as 0.64g. The component is listed in the section 19.1.5.1.1.4.6. Therefore the S-ATWS HCLPF is 0.64g.

h. APR 1400 has 2 components, any one of which fails leads to S-LLOCA, S-MLOCA thus resulting in core damage. The S-LLOCA HCLPF is 0.55g and the S-MLOCA HCLPF is 0.51g. In case of large LOCA and medium LOCA have the relatively lower HCLPF than usual, it because the HCLPF result have the conservatism (e.g. enveloped 9 site response spectrum and design). When the plant specific design information is reflected in the HCLPF, it may result in a higher value. COL applicant has to demonstrate that the design of NSSS to have higher 2.5 times CSDRS.

i. APR1400 has 2 seismic induced initiating events which do not directly lead to core damage. They are small LOCA and LOOP. The sequence level HCLPF for Small LOCA and LOOP are 0.5g and 0.5g.

j. Important seismic induced failures for non-direct core damage initiators are seismic induced failures of a motor driven auxiliary feed water pump, turbine driven auxiliary feed water pump, containment spray pump, shutdown cooling pump, and

safety injection pump. These SSCs are related to perform the secondary heat removal, RCS injection and long term containment heat removal.

k. Important operator actions for non-direct core damage initiators are as follows.

- RCOPH-S-SDSE-FW (Operator Fails to Open POSRVs in Early Phase for F&B Operation): Failure of operator action to open POSRV causes failure of feed & bleed operation. The failure of feed & bleed operation and secondary heat removal after seismic induced LOOP or SLOCA event leads to core damage.

- SIOPH-S-IRWSTCOOL (Operator Fails to Cool IRWST Water Using SCS Pump): Failure of operator action to cool IRWST water using SCS pump causes the failure of long term containment heat removal. The failure of long term containment heat removal and secondary heat removal after seismic induced S-LOOP or SLOCA event leads to core damage.

- SIOPH-S-INJ (Operator Fails to Align SCS for Injection): Failure of operator fails to align SCS for injection causes the failure of SCS injection. The failure of the SCS injection and SI injection after seismic event of LOOP or SLOCA leads to core damage.

- MSOPH-S-ASC-SLOCA (Operator Fails to Perform Aggressive Secondary Cooldown After SLOCA): Failure of operator to perform aggressive secondary cooldown causing failure of the aggressive secondary cooldown. The failure of operator to perform aggressive secondary cooldown and SI injection after seismic event of SLOCA leads to core damage.

- AFOPH-S-ALT-LT (Operator Fails to Transfer AFW Source from AFWST to RWT): Failure of operator to transfer AFW source from AFWST to RWT causes the failure of secondary heat removal. The failure of secondary heat removal and long term containment heat removal after seismic event of SLOCA or S-LOOP leads to core damage.

The final HEP is based on the internal events and calculated by applying a performance shaping factor. The important operator actions after updating the HEP are in the following order:

1) MSOPH-S-ASC-SLOCA

2) RCOPH-S-SDSE-FW

3) SIOPH-S-INJ

4) AFOPH-S-ALT-LT

5) SIOPH-S-IRWSTCOOL

l. Important random failure events for non-direct core damage initiators are as follows.

- DGDGR-A-DGA, DGDGR-B-DGB, DGDGR-C-DGC, DGDGR-D-DGD (FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A, B, C and D): Failure of EDG A, B, C or D with LOOP leads to failure of essential power supply partially.

- RCPVWQ4-200/1/2/3 (4/4 CCF of RC PV V200/201/202/203): CCF of RC PV V200/201/202/203 cause the failure of the feed & bleed operation. The failure of feed and bleed operation and failure of secondary heat removal leads to core damage.

- CSMPM2A-PP01A, CSMPM2B-PP01B (CS PUMP 1 PP01A/ CS PUMP 2 PP01B UNAVAILABLE DUE TO T&M): Failure of CS Pump 01A& 01B is related to the failure of long term containment heat removal. The failure of long term containment heat removal and secondary heat removal after seismic event of S-LOOP or SLOCA leads to core damage.

- SIMPM1A-SCPP01A, SIMPM1B-SCPP01B (SC PUMP PP01A or 01B UNAVAILABLE DUE TO T&M): Failure of SC pump 01A & 01B is related to the failure of long term containment heat removal. The failure of long term containment heat removal and secondary heat removal after seismic event of S-LOOP or SLOCA leads to core damage.

19.1.5.1.2.3.2 Containment Failure Risk Insights

All the containment failure cutsets which are directly resulted from single seismic induced damage are shown Table 19.1-44C. The top 100 containment failure cutsets which are composed of more than 2 failure events including seismic induced failure event are shown in Table 19.1-44D. Based on the cutsets review, the plant HCLPF of APR1400 for containment failure is 0.5g. The important insights, containment failure cutsets and HCLPF values for the APR1400 PRA-based SMA are as follows:

a. APR1400 has 5 structures, anyone of which failure leads to direct core damage due to the catastrophic failure of RCS or safety-related components. This event is also assumed to directly lead to the containment structural failure. The sequence HCLPF is 0.5g, because each of structure is 0.94g, 0.51g, 0.52g, 0.5g and 0.5g. The results are driven by the collapse of seismic category II building (e.g. turbine building and compound building). The COL applicant is to confirm that the HCLPF of turbine building and compound building is equal to or higher than 1.67 times CSDRS. The 5 structures are listed in the section 19.1.5.1.1.4.1. Therefore the structure failure induced S-DMG HCLPF is 0.5g. This containment failure can be classified as early containment failure.

b. APR1400 has 6 RCS components, anyone of which failure leads to direct core damage due to the catastrophic failure of RCS. This event is also assumed to directly lead to the containment structural failure due to impact to the containment from the large movement or vibration of RCS, and the containment structural failure. The HCLPF of the each component is 0.92g, 0.51g, 0.6g, 0.54g, 0.63g and 1.31g. The 6 RCS components are listed in the section 19.1.5.1.1.4.1. Therefore the RCS component catastrophic failure induced S-DCF HCLPF is 0.51g. This containment failure can be classified as early containment failure.

c. APR1400 has 13 components, anyone of which failure leads to S-SBO thus resulting in core damage. This event is also assumed to directly lead to the containment isolation failure due to the total loss of supporting system failure. The HCLPF of the each component is same as 0.5g. The 13 components are listed in the section 19.1.5.1.1.4.2. Therefore the S-SBO induced containment failure HCLPF is 0.5g. This containment failure can be classified as containment isolation failure.

d. APR1400 has 4 components, anyone of which failure lead to S-IC thus resulting in core damage. The HCLPF of the each component is same as 0.5g except for one component type. The exceptional one component type is all the screen-outed plant-wide distributed equipment (e.g. BOP piping & supports, AOVs, cable trays & supports, etc.). This event is also assumed to directly lead to the containment isolation failure due to the total loss of all instrumentation and control. It has the containment failure HCLPF of 0.75g. The 4 components are listed in the section 19.1.5.1.1.4.3. Therefore the S-IC containment HCLPF is 0.5g. This containment failure can be classified as containment isolation failure.

e. APR1400 has 3 components, anyone of which failure lead to S-MSLB thus resulting in core damage. This event is also assumed to directly lead to the containment isolation failure through the failed main steam line components. The HCLPF of the each component is same as 0.5g. The 3 components are listed in the section 19.1.5.1.1.4.4. Therefore the S-MSLB containment failure HCLPF is 0.5g. This containment failure can be classified as containment isolation failure.

f. For the seismic initiators of S-TLOCCW, S-SLOCA and S-LOOP, additional mitigation was considered for the containment failure.

g. Important seismic induced failures for non-direct containment failure initiators leading to containment failure are seismic induced failures of motor driven auxiliary feed water pump, turbine driven auxiliary feed water pump, containment spray pump, shutdown cooling pump, and safety injection pump. These SSCs are related to perform the secondary heat removal, RCS injection and long term containment heat removal.

h. Important operator actions for non-direct core damage initiators are as follows.

- AFOPH-S-ALT-LT (Operator Fails to Transfer AFW Source from AFWST to RWT): Failure of operator to transfer AFW source from AFWST to RWT causes the failure of secondary heat removal. The failure of secondary heat removal and long term containment heat removal after seismic event of SLOCA or S-LOOP leads to containment failure.

- MSOPH-S-ASC-SLOCA (Operator Fails to Perform Aggressive Secondary Cooldown After SLOCA): Failure of operator to perform aggressive secondary cooldown causing the failure of aggressive secondary cooldown. The failure of operator to perform aggressive secondary cooldown, SI

injection and Containment isolation after seismic event of SLOCA leads to containment failure.

- RCOPH-S-SDSE-FW (Operator Fails to Open POSRVs in Early Phase for F&B Operation): Failure of operator action to open POSRV causes failure of feed & bleed operation. The failure of feed & bleed operation, secondary heat removal and Containment isolation after seismic induced LOOP or SLOCA event leads to containment failure.

- SIOPH-S-IRWSTCOOL (Operator Fails to Cool IRWST Water Using SCS Pump): Failure of operator action to cool IRWST water using SCS pump causes the failure of long term containment heat removal. The failure of long term containment heat removal, secondary heat removal and Containment isolation seismic induced S-LOOP or SLOCA event leads to containment isolation.

The final HEPs are based on the internal events is calculated with performance shaping factor. The important operator actions are the same as those in Section 19.15.1.2.3.1.

m. Important random failure events for non-direct containment failure initiators do not impact significantly in the PRA-based SMA results in the top 100 cutsets.

19.1.9 Combined License Information

COL 19.1(4) The COL applicant or holder is to review as-designed and as-built information and conduct walkdowns as necessary to confirm that the assumptions used in the PRA (including PRA inputs to RAP and SAMDA) remain valid with respect to internal events, internal flood and fire events (fire barrier and fire barrier penetrations, routings and locations of pipe, cable, and conduit), and HRA analyses (development of operating procedures, emergency operating procedures, and severe accident management guidelines and training), external events including PRA-based seismic margins and HCLPF fragilities, and LPSD procedures. See Subsection 19.1.2.2.

COL 19.1(8) The COL applicant is to confirm that the PRA-based seismic margin assessment is bounding for the selected site, site-specific SSC and soil effects (including sliding, overturning liquefaction, and slope failure). The COL applicant is to confirm that the as-built plant has adequate seismic margin and do not exceed the CDF and LRF design targets specified in Subsection 1.2.1.1.1 e. See Subsection 19.1.5.1.2.

The COL applicant is to demonstrate that HCLPF capacity is equal to or exceed 1.67 times the GMRS for site-specific structures (ESW IS and CCW HX Building).

The COL applicant is to demonstrate that HCLPF capacity is equal to or exceed 1.67 times the CSDRS for BOP components and is to complete the SEL.

The COL applicant is to demonstrate that the seismic capacity for equipment and relay qualified by testing should remain functionally operational within 1.67 times the required response spectra (CSDRS-based RRS) in the procurement specification.

The COL applicant is to demonstrate that HCLPF capacity is equal to or exceed 1.67 times the CSDRS for turbine building and compound building.

The COL applicant is to demonstrate that HCLPF capacity is equal to or exceed 2.5 times the CSDRS for inherently rugged items (such as valves, small instrumentation and distribution systems, etc.).

COL applicant is to demonstrate that the NSSS is designed to have a HCLPF value higher than 2.5 times the CSDRS.

COL 19.1(22) The COL applicant is to demonstrate that failure of buildings that are not seismic Category I (e.g., turbine building and compound building) does not impact SSCs designed to be seismic Category I at the SSE level.

19.1.10 References

74. WSRC-TR-93-262, Rev. 1, “Savannah River Site Generic Data Base Development”, Westinghouse Safety Management Solution, May 1998.

75. NUREG/CR-4639 (EGG-2458), “Nuclear computerized Library for Assessing Reactor Reliability (NUCLARR),” May 1990.

76. U.S. Nuclear Regulatory Commission, SPAR Basic Event Unavailability Data and Results, 2010 Parameter Estimation Update, http://nrcoe.inel.gov/resultsdb/publicdocs/AvgPerf/TrainUA2010.pdf

77. EPRI 3002000709, Seismic Probabilistic Risk Assessment Implementation Guide, December, 2013

78. EPRI 1025287, Seismic Evaluation Guidance, February, 2013

79. Risk Assessment of Operational Events Handbook External Events, Volume 2, R.1.01, USNRC, January 2008

Table 19.1-4 (26 of 27)

No.	Insight	Disposition
	Risk Insights from PRA Models	
66	HCLPF capacity need to be equal to or exceed 1.67 times the GMRS for site-specific structures (ESWIS and CCW Hx Building) and HCLPF capacity is equal to or exceeds 1.67 times the CSDRS for BOP components, and is to complete the SEL.	COL 19.1(8)
	The HCLPF for turbine building and compound building need to be equal to or higher than 1.67 times the CSDRS.	COL 19.1(8)
	The HCLPF for test equipment including relay need to be equal to or higher than 1.67 times the CSDRS.	COL 19.1(8)
	HCLPF capacity for Inherently rugged items (such as valves, small instrumentation and distribution systems, etc.) is equal to or exceed 2.5 times the CSDRS.	COL 19.1(8)
	The HCLPF for NSSS needs to be equal to or higher than 2.5 times the CSDRS.	COL 19.1(8)
	The important operator action and random failure event for PRA-based SMA should be managed by COL holder to improve the human error.	

Table 19.1-41 (1 of 2)

Systems Considered for Seismic Equipment List

System	Description
Actuation	Reactor trip
	Safety Injection (SI)
	Containment isolation (CIS)
	Containment ventilation isolation (CVIS)
	Main steam line isolation
	Feedwater line isolation
	AFW start
	EDG start and load sequence
CRD	Control rods
RCS	Reactor Coolant System, including RC Pumps, SG, PZR, POSRVs
MS	Main Steam: MSSVs, MSIVs, MSADVs
AFW	Auxiliary Feedwater (MD and TD)
CVCS	Chemical Volume & Control System: Charging, pressurizer spray, and RCP seal injection
SC	Shutdown Cooling System
CS	Containment Spray
SI	Safety Injection
CCW	Component Cooling Water
ESW	Essential Service Water
ECW	Essential Chilled Water
EDG HVAC	Emergency Diesel Generator Area HVAC System
E-I&C HVAC	Electrical and I&C Equipment Areas HVAC System
ESW/CCW HVAC	ESW Pump Building / CCW HX Building HVAC System
Aux Bldg HVAC	Aux Building Controlled Area HVAC System
Aux Bldg HVAC	Aux Building Clean Area HVAC System

Table 19.1-41 (2 of 2)

System	Description
MCR	Main Control Room Consoles
ESF	ESF Cabinets
RX Trip	Reactor Trip Switchgear
DG Fuel	Diesel Fuel Oil Transfer System
EDG	Emergency Diesel Generators
EP	Electrical power

Table 19.1-42 (1 of 19)

Seismic Equipment List

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor[1)]
1	1-431-M-RV01	Reactor Pressure Vessel	69'-156'	Containment	1
2	-	Reactor Vessel Internals	69'-156'	Containment	1
3	1-431-M-SG01	Steam Generator #1	114'-136'	Containment	1
4	1-431-M-SG02	Steam Generator #2	114'-136'	Containment	
5	1-431-M-PZ01	Pressurizer	114'-156'	Containment	1
6	1-431-M-PP01A	Reactor Coolant Pump #1	114'-136'	Containment	1
7	1-431-M-PP01B	Reactor Coolant Pump #2	114'-136'	Containment	
8	1-431-M-PP01C	Reactor Coolant Pump #3	114'-136'	Containment	
9	1-431-M-PP01D	Reactor Coolant Pump #4	114'-136'	Containment	
10	1-441-M-TK01A	Safety Injection Tank 1	136'	Containment	1
11	1-441-M-TK01B	Safety Injection Tank 2	136'	Containment	
12	1-441-M-TK01C	Safety Injection Tank 3	136'	Containment	
13	1-441-M-TK01D	Safety Injection Tank 4	136'	Containment	
14	1-451-M-HE01	Regenerative Heat Exchanger	128'	Containment	1
15	1-451-M-PP01A	Charging Pumps #1	55'	Aux.	1
16	1-451-M-PP01B	Charging Pumps #2	55'	Aux.	
17	1-451-M-HE02	Letdown Heat Exchanger	100'	Containment	1

1) Fully Correlated equipment have "1" correlation factor

Table 19.1-42 (2 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
18	1-521-V-0012	Main Steam Isolation Valve	137'	Aux.	1
19	1-521-V-0011	Main Steam Isolation Valve	137'	Aux.	
20	1-521-V-0014	Main Steam Isolation Valve	137'	Aux.	
21	1-521-V-0013	Main Steam Isolation Valve	137'	Aux.	
22	1-521-V-0101	Main Steam Atmospheric Dump Valve	137'	Aux.	1
23	1-521-V-0102	Main Steam Atmospheric Dump Valve	137'	Aux.	
24	1-521-V-0104	Main Steam Atmospheric Dump Valve	137'	Aux.	
25	1-521-V-0103	Main Steam Atmospheric Dump Valve	137'	Aux.	
26	1-461-M-TK01A	Component Cooling Water Surge Tank	172'	Aux.	1
27	1-461-M-TK01B	Component Cooling Water Surge Tank	172'	Aux.	
28	1-633-M-CH01A	Essential Chiller (includes Compressor Condenser, Evaporator, controls, RVs, Tanks)	78'	Aux.	1
29	1-633-M-CH02A	Essential Chiller (includes Compressor Condenser, Evaporator, controls, RVs, Tanks)	78'	Aux.	
30	1-633-M-CH01B	Essential Chiller (includes Compressor Condenser, Evaporator, controls, RVs, Tanks)	78'	Aux.	
31	1-633-M-CH02B	Essential Chiller (includes Compressor Condenser, Evaporator, controls, RVs, Tanks)	78'	Aux.	
32	1-607-M-HV33A	MDAFW Pump Room Unit	78'	Aux.	1
33	1-607-M-CW33A	MDAFW Pump Room Cubical Cooler Cooling Coil	78'	Aux.	
34	1-607-M-HV33B	MDAFW Pump Room Unit	78'	Aux.	
35	1-607-M-CW33B	MDAFW Pump Room Cubical Cooler Cooling Coil	78'	Aux.	

Table 19.1-42 (3 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
36	1-431-V-0200	POSRV 200	136'	Containment	1
37	1-431-V-0201	POSRV 201	136'	Containment	
38	1-431-V-0132	MOV Control Valves (POSRV 201)	136'	Containment	
39	1-431-V-0133	MOV Control Valves (POSRV 201)	136'	Containment	
40	1-431-V-0202	POSRV 202	136'	Containment	
41	1-431-V-0134	MOV Control Valves (POSRV 202)	136'	Containment	
42	1-431-V-0135	MOV Control Valves (POSRV 202)	136'	Containment	
43	1-431-V-0203	POSRV 203	136'	Containment	
44	1-431-V-0136	MOV Control Valves (POSRV 203)	136'	Containment	
45	1-431-V-0137	MOV Control Valves (POSRV 203)	136'	Containment	
46	1-441-M-PP01A	SDC Pump 1	50'	Aux.	1
47	1-441-M-PP01B	SDC Pump 2	50'	Aux.	
48	1-441-M-PP02A	SI Pump 1	50'	Aux.	1
49	1-441-M-PP02B	SI Pump 2	50'	Aux.	
50	1-441-M-PP02C	SI Pump 3	50'	Aux.	
51	1-441-M-PP02D	SI Pump 4	50'	Aux.	
52	1-441-M-HE01A	SDC HX 1	50'	Aux.	1
53	1-441-M-HE01B	SDC HX 2	50'	Aux.	
54	1-441-M-HE02A	SDC Miniflow HX 1	50'	Aux.	1
55	1-441-M-HE02B	SDC Miniflow HX 2	50'	Aux.	

Table 19.1-42 (4 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
56	1-442-M-PP01A	Containment Spray Pump 1	50'	Aux.	1
57	1-442-M-PP01B	Containment Spray Pump 2	50'	Aux.	
58	1-442-M-HE01A	Containment Spray Heat Exchanger	55'	Aux.	1
59	1-442-M-HE01B	Containment Spray Line 2 Heat Exchanger	55'	Aux.	
60	1-442-M-HE02A	CS Pump 1 Miniflow Heat Exchanger	50'	Aux.	1
61	1-442-M-HE02B	CS Pump 2 Miniflow Heat Exchanger	50'	Aux.	
62	1-461-M-PP01A	CCW Pump 1A	55'	Aux.	1
63	1-461-M-PP02A	CCW Pump 2A	55'	Aux.	
64	1-461-M-PP01B	CCW Pump 1B	55'	Aux.	
65	1-461-M-PP02B	CCW Pump 2B	55'	Aux.	
66	1-461-M-HE01A	CCW Heat Exchanger 1A	100'	CCW HX Building	1
67	1-461-M-HE02A	CCW Heat Exchanger 2A	100'	CCW HX Building	
68	1-461-M-HE03A	CCW Heat Exchanger 3A	100'	CCW HX Building	
69	1-461-M-HE01B	CCW Heat Exchanger 1B	100'	CCW HX Building	
70	1-461-M-HE02B	CCW Heat Exchanger 2B	100'	CCW HX Building	
71	1-461-M-HE03B	CCW Heat Exchanger 3B	100'	CCW HX Building	

Table 19.1-42 (5 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
72	1-462-M-PP01A	ESW Pump 1A	69'	ESW building	1
73	1-462-M-PP02A	ESW Pump 2A	69'	ESW building	
74	1-462-M-PP01B	ESW Pump 1B	69'	ESW building	
75	1-462-M-PP02B	ESW Pump 2B	69'	ESW building	
76	1-542-M-PP01A	Aux Feedwater Pump C (Turbine Driven)	78'	Aux.	1
77	1-542-M-PP01B	Aux Feedwater Pump D (Turbine Driven)	78'	Aux.	
78	1-542-M-PP02A	Aux Feedwater Pump A (Motor Driven)	78'	Aux.	1
79	1-542-M-PP02B	Aux Feedwater Pump B (Motor Driven)	78'	Aux.	
80	1-591-M-PP22A	Fuel Oil Feed Pump	100'	EDG Building	1
81	1-591-M-PP22B	Fuel Oil Feed Pump	100'	EDG Building	
82	1-591-M-PP22C	Fuel Oil Feed Pump	100'	Aux.	1
83	1-591-M-PP22D	Fuel Oil Feed Pump	100'	Aux.	
84	1-595-M-TK01A	Diesel Fuel Oil Storage Tank A	63'	EDG Building	1
85	1-595-M-TK01B	Diesel Fuel Oil Storage Tank B	63'	EDG Building	
86	1-595-M-TK01C	Diesel Fuel Oil Storage Tank C	65'	Aux.	1
87	1-595-M-TK01D	Diesel Fuel Oil Storage Tank D	65'	Aux.	
88	1-595-M-PP01A	Diesel Fuel Oil Transfer Pump	63'	EDG Building	1
89	1-595-M-PP01B	Diesel Fuel Oil Transfer Pump	63'	EDG Building	
90	1-595-M-PP02A	Diesel Fuel Oil Transfer Pump	63'	EDG Building	
91	1-595-M-PP02B	Diesel Fuel Oil Transfer Pump	63'	EDG Building	

Table 19.1-42 (6 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
92	1-595-M-PP01C	Diesel Fuel Oil Transfer Pump	65'	Aux.	1
93	1-595-M-PP01D	Diesel Fuel Oil Transfer Pump	65'	Aux.	
94	1-595-M-PP02C	Diesel Fuel Oil Transfer Pump	65'	Aux.	
95	1-595-M-PP02D	Diesel Fuel Oil Transfer Pump	65'	Aux.	
96	1-595-M-TK02A	Diesel Fuel Oil Day Tank A	121'	EDG Building	1
97	1-595-M-TK02B	Diesel Fuel Oil Day Tank B	121'	EDG Building	
98	1-595-M-TK02C	Diesel Fuel Oil Day Tank C	120'	Aux.	1
99	1-595-M-TK02D	Diesel Fuel Oil Day Tank D	120'	Aux.	
100	1-601-V-Y0011A	Electro-Hydraulic Inlet Damper	172'	Aux.	1
101	1-601-V-Y0011B	Electro-Hydraulic Inlet Damper	172'	Aux.	
102	1-602-M-AH02A	EDG Room Exhaust Fan/Motor	100'	EDG Building	1
103	1-602-M-AH02B	EDG Room Exhaust Fan/Motor	100'	EDG Building	
104	1-602-M-AH02C	EDG Room Exhaust Fan/Motor	172'	Aux.	1
105	1-602-M-AH02D	EDG Room Exhaust Fan/Motor	172'	Aux.	
106	1-591-M-DG01A	4.16kV CLASS 1E DIESEL GENERATORS 1-591-M-DG01A	100'	EDG Building	1
107	1-591-M-DG01B	4.16kV CLASS 1E DIESEL GENERATORS 1-591-M-DG01B	100'	EDG Building	
108	1-591-M-DG01C	4.16kV CLASS 1E DIESEL GENERATORS 1-591-M-DG01C	100'	Aux.	1
109	1-591-M-DG01D	4.16kV CLASS 1E DIESEL GENERATORS 1-591-M-DG01D	100'	Aux.	

Table 19.1-42 (7 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
110	1-606-M-HV10A	CS PUMP & MINIFLOW HEAT EXCHANGER RM Aux Bld Controlled Area HVAC Fan/Motor	50'	Aux.	1
111	1-606-M-CW10A	CS (Quad C) Mini Flow HX Room Cubical Cooler Cooling Coil	50'	Aux.	
112	1-606-M-HV10B	CS PUMP & MINIFLOW HEAT EXCHANGER RM Aux Bld Controlled Area HVAC Fan/Motor	50'	Aux.	
113	1-606-M-CW10B	CS (Quad D) Mini Flow HX Room Cubical Cooler Cooling Coil	50'	Aux.	
114	1-606-M-HV11A	SI PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	50'	Aux.	1
115	1-606-M-CW11A	SI Pump (Quad C) Room Cubical Cooler Cooling Coil	50'	Aux.	
116	1-606-M-HV11B	SI PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	50'	Aux.	
117	1-606-M-CW11B	SI Pump (Quad D) Room Cubical Cooler Cooling Coil	50'	Aux.	
118	1-606-M-HV12A	SI PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	50'	Aux.	
119	1-606-M-CW12A	SI Pump (Quad A) Room Cubical Cooler Cooling Coil	55'	Aux.	
120	1-606-M-HV12B	SI PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	50'	Aux.	
121	1-606-M-CW12B	SI Pump (Quad B) Room Cubical Cooler Cooling Coil	50'	Aux.	
122	1-606-M-HV16A	SC PUMP & MINIFLOW HEAT EXCHANGER RM Cubical Cooler	50'	Aux.	1
123	1-606-M-CW16A	SC Pump & Mini Flow HX Room Cubical Cooler Cooling Coil	50'	Aux.	
124	1-606-M-HV16B	SC PUMP & MINIFLOW HEAT EXCHANGER RM Cubical Cooler	50'	Aux.	
125	1-606-M-CW16B	SC Pump & Mini Flow HX Room Cubical Cooler Cooling Coil	50'	Aux.	
126	1-606-M-HV18A	CHARGING PUMP RM Cubicle Cooler	55'	Aux.	1
127	1-606-M-HV18B	CHARGING PUMP RM Cubicle Cooler	55'	Aux.	

Table 19.1-42 (8 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
128	1-606-V-Y0001A	Aux Building Controlled Area (I) Emergency Exhaust ACU Outlet Damper	156'	Aux.	1
129	1-606-V-Y0001B	Aux Building Controlled Area (II) Emergency Exhaust ACU Outlet Damper	195'	Aux.	
130	1-606-V-Y0002A	Aux Building Controlled Area (I) Emergency Exhaust ACU Inlet Damper	156'	Aux.	
131	1-606-V-Y0002B	Aux Building Controlled Area (II) Emergency Exhaust ACU Inlet Damper	195'	Aux.	
132	1-607-M-HV31A	Ess. Chiller Room Cubical Cooler	78'	Aux.	1
133	1-607-M-CW31A	Ess. Chiller Room Cubical Cooler Cooling Coil	78'	Aux.	
134	1-607-M-HV31B	Ess. Chiller Room Cubical Cooler	78'	Aux.	
135	1-607-M-CW31B	Ess. Chiller Room Cubical Cooler Cooling Coil	78'	Aux.	
136	1-607-M-HV32A	Ess. Chiller Room Cubical Cooler	78'	Aux.	
137	1-607-M-CW32A	Ess. Chiller Room Cubical Cooler Cooling Coil	78'	Aux.	
138	1-607-M-HV32B	Ess. Chiller Room Cubical Cooler	78'	Aux.	
139	1-607-M-CW32B	Ess. Chiller Room Cubical Cooler Cooling Coil	78'	Aux.	

Table 19.1-42 (9 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
140	1-606-M-HV13A	CCW PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	1
141	1-606-M-CW13A	CCW Pump (Quad A) Room Cubical Cooler Cooling Coil	55'	Aux.	
142	1-606-M-HV13B	CCW PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	
143	1-606-M-CW13B	CCW Pump (Quad B) Room Cubical Cooler Cooling Coil	55'	Aux.	
144	1-606-M-HV14A	CCW PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	
145	1-606-M-CW14A	CCW Pump (Quad C) Room Cubical Cooler Cooling Coil	55'	Aux.	
146	1-606-M-HV14B	CCW PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	
147	1-606-M-CW14B	CCW Pump (Quad D) Room Cubical Cooler Cooling Coil	55'	Aux.	
148	1-606-M-HV21B	AUX. CHARGING PUMP RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	1
149	1-606-M-HV17A	SC HEAT EXCHANGER RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	1
150	1-606-M-CW17A	SC HX Room Cubical Cooler Cooling Coil	55'	Aux.	
151	1-606-M-HV17B	SC HEAT EXCHANGER RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	
152	1-606-M-CW17B	SC HX Room Cubical Cooler Cooling Coil	55'	Aux.	
153	1-606-M-HV15A	CS HEAT EXCHANGER RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	1
154	1-606-M-CW15A	CS HX Room Cubical Cooler Cooling Coil	55'	Aux.	
155	1-606-M-HV15B	CS HEAT EXCHANGER RM Aux Bld Controlled Area HVAC Fan/Motor	55'	Aux.	

Table 19.1-42 (10 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
156	1-607-M-HV33A	MDAFW Pump Room Cubical Cooler Cooling Coil	78'	Aux.	1
157	1-607-M-CW33A	MDAFW Pump Room Cubical Cooler Cooling Coil	78'	Aux.	
158	1-607-M-HV33B	MDAFW Pump Room Cubical Cooler Cooling Coil	78'	Aux.	
159	1-607-M-CW33B	MDAFW Pump Room Cubical Cooler Cooling Coil	78'	Aux.	
160	1-603-M-HV01A	CLASS 1E SWITCHGEAR 01C RM Cubical Cooler	78'	Aux.	1
161	1-603-M-HV01B	CLASS 1E SWITCHGEAR 01D RM Cubical Cooler	78'	Aux.	
162	1-603-M-HV02A	CLASS 1E LOADCENTER 01C RM Cubical Cooler	78'	Aux.	
163	1-603-M-HV02B	CLASS 1E LOADCENTER 01D RM Cubical Cooler	78'	Aux.	
164	1-603-M-HV03A	CHANNEL A DC&IP EQUIP. RM CC Cubical Cooler	78'	Aux.	1
165	1-603-M-HV03B	CHANNEL B DC&IP EQUIP. RM Cubical Cooler	78'	Aux.	
166	1-603-M-HV04A	CHANNEL C DC&IP EQUIP. RM Cubical Cooler	78'	Aux.	
167	1-603-M-HV04B	CHANNEL D DC&IP EQUIP. RM Cubical Cooler	78'	Aux.	
168	1-603-M-HV05A	MUX A RM Cubical Cooler	78'	Aux.	1
169	1-603-M-HV05B	MUX B RM Cubical Cooler	78'	Aux.	
170	1-603-M-HV07A	CLASS-1E SWITCHGEAR 01A RM Cubical Cooler	78'	Aux.	1
171	1-603-M-HV07B	CLASS-1E SWITCHGEAR 01B RM Cubical Cooler	78'	Aux.	
172	1-603-M-CW07B	Class 1E Switchgear 01B Room Cubical Cooler Cooling Coil	78'	Aux.	
173	1-603-M-CW01C	Class 1E Switchgear 01C Room Cubical Cooler Cooling Coil	78'	Aux.	
174	1-603-M-CW03A	Channel A DC&IP Equip Room Cubical Cooler Cooling Coil	78'	Aux.	1
175	1-603-M-CW04C	Channel C DC&IP Equip Room Cubical Cooler Cooling Coil	78'	Aux.	

Table 19.1-42 (11 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
176	1-603-M-CW02C	Class 1E Load Center 01C Room Cubical Cooler Cooling Coil	78'	Aux.	1
178	1-603-M-CW02D	Class 1E Load Center 01D Room Cubical Cooler Cooling Coil	78'	Aux.	
177	1-603-M-CW07A	Class 1E Switchgear 01A Room Cubical Cooler Cooling Coil	78'	Aux.	1
179	1-603-M-CW01D	Class 1E Switchgear 01D Room Cubical Cooler Cooling Coil	78'	Aux.	
180	1-603-M-CW03B	Channel B DC&IP Equip Room Cubical Cooler Cooling Coil	78'	Aux.	1
181	1-603-M-CW04D	Channel D DC&IP Equip Room Cubical Cooler Cooling Coil	78'	Aux.	
182	1-603-M-HV06B	480V CLASS 1-E MCC 01B RM Cubical Cooler	100'	Aux.	1
183	1-603-M-CW06B	480V Class 1E MCC 01B Room Cubical Cooler Cooling Coil	100'	Aux.	
184	1-603-M-CW06A	480V Class 1E MCC 01A Room Cubical Cooler Cooling Coil	100'	Aux.	
185	1-606-M-HV19A	Mechanical Pen Room HVAC Fan/Motor	100'	Aux.	1
186	1-606-M-HV19B	Mechanical Pen Room HVAC Fan/Motor	100'	Aux.	
187	1-602-M-HV12C	EDG Room Emergency Cubical Cooler	100'	Aux.	1
188	1-602-M-AH12C	EDG Room Emergency Cubical Cooler Fan/Motor	100'	Aux.	
189	1-602-M-HV13C	EDG Room Emergency Cubical Cooler	100'	Aux.	
190	1-602-M-AH13C	EDG Room Emergency Cubical Cooler Fan/Motor	100'	Aux.	
191	1-602-M-HV12D	EDG Room Emergency Cubical Cooler	100'	Aux.	
192	1-602-M-AH12D	EDG Room Emergency Cubical Cooler Fan/Motor	100'	Aux.	
193	1-602-M-HV13D	EDG Room Emergency Cubical Cooler	100'	Aux.	
194	1-602-M-AH13D	EDG Room Emergency Cubical Cooler Fan/Motor	100'	Aux.	

Table 19.1-42 (12 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
195	1-603-M-HV09A	ELECT. PENETRATION RM Cubical Cooler	120'	Aux.	1
196	1-603-M-HV09B	ELECT. PENETRATION (D) RM Cubical Cooler	120'	Aux.	
197	1-603-M-HV14B	480V CLASS-1E MCC 03B RM Cubical Cooler	120'	Aux.	1
198	1-603-M-CW14B	480V Class 1E MCC 03B Room Cubical Cooler Cooling Coil	120'	Aux.	
199	1-606-M-HV20A	Mechanical Pen Room HVAC Fan/Motor	120'	Aux.	1
200	1-606-M-HV20B	Mechanical Pen Room HVAC Fan/Motor	120'	Aux.	
201	1-606-M-CW20B	Mechanical Penetration Room Cubical Cooler Cooling Coil	120'	Aux.	
202	1-603-M-HV10A	480V CLASS-1E MCC 03C RM Cubical Cooler	137'	Aux.	1
203	1-603-M-HV10B	480V CLASS-1E MCC 03D RM Cubical Cooler	137'	Aux.	
204	1-603-M-CW10D	480V Class 1E MCC 03D Room Cubical Cooler Cooling Coil	137'	Aux.	
205	1-603-M-HV14A	480V CLASS-1E MCC 03A RM Cubical Cooler	137'	Aux.	
206	1-603-M-HV15A	480V CLASS-1E MCC 04A RM Cubical Cooler	137'	Aux.	
207	1-603-M-HV15B	480V CLASS-1E MCC 04B RM Cubical Cooler	137'	Aux.	
208	1-603-M-CW15B	480V Class 1E MCC 04B Room Cubical Cooler Cooling Coil	137'	Aux.	
209	1-603-M-CW10C	480V Class 1E MCC 03C Room Cubical Cooler Cooling Coil	137'	Aux.	
210	1-603-M-CW15A	480V Class 1E MCC 04A Room Cubical Cooler Cooling Coil	137'	Aux.	
211	1-603-M-CW14A	480V Class 1E MCC 03A Room Cubical Cooler Cooling Coil	137'	Aux.	
212	1-603-M-HV12A	PENETRATION MUX A RM Cubical Cooler	137'	Aux.	1
213	1-603-M-HV12B	PENETRATION MUX B RM Cubical Cooler	137'	Aux.	
214	1-603-M-CW12B	Pent. MUX B Room Cubical Cooler Cooling Coil	137'	Aux.	

Table 19.1-42 (13 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
215	1-603-M-HV11A	ELECT. PENETRATION RM Cubical Cooler	137'	Aux.	1
216	1-603-M-HV11B	ELECT. PENETRATION RM (D) Cubical Cooler	137'	Aux.	
217	1-603-M-HV13A	ELECTRICAL PENETRATION RM(A) Cubical Cooler	137'	Aux.	
218	1-603-M-HV13B	ELECTRICAL PENETRATION RM(B) Cubical Cooler	137'	Aux.	
219	1-603-M-CW13B	Elect Penetration Room B Cubical Cooler Cooling Coil	137'	Aux.	
220	1-603-M-HV18A	RSC RM Cubical Cooler	137'	Aux.	1
221	1-603-M-HV18B	RSC RM Cubical Cooler	137'	Aux.	
222	1-603-M-CW18B	RSC Room Cubical Cooler Cooling Coil	137'	Aux.	
223	1-603-M-HV16A	I&C Equipment Room (A) Cubical Cooler	157'	Aux.	1
224	1-603-M-HV16B	I&C Equipment Room (B) Cubical Cooler	157'	Aux.	
225	1-603-M-CW16B	I&C Equip Room B Cubical Cooler Cooling Coil	157'	Aux.	
226	1-603-M-HV17A	I&C Equipment Room (C) Cubical Cooler	157'	Aux.	
227	1-603-M-HV17B	I&C Equipment Room (D) Cubical Cooler	157'	Aux.	
228	1-603-M-CW17D	I&C Equip Room D Cubical Cooler Cooling Coil	157'	Aux.	
229	1-603-M-CW16A	I&C Equip Room A Cubical Cooler Cooling Coil	157'	Aux.	
230	1-603-M-CW17C	I&C Equip Room C Cubical Cooler Cooling Coil	157'	Aux.	
231	1-601-M-CW01A	Control Room Supply AHU Cooling Coil	172'	Aux.	1
232	1-601-M-CW01B	Control Room Supply AHU Cooling Coil	172'	Aux.	

Table 19.1-42 (14 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
233	1-602-M-HV12A	EDG Room Emergency Cubical Cooler	100'	EDG Building	1
234	1-602-M-HV12B	EDG Room Emergency Cubical Cooler	100'	EDG Building	
235	1-602-M-HV13A	EDG Room Emergency Cubical Cooler	135'	EDG Building	1
236	1-602-M-HV13B	EDG Room Emergency Cubical Cooler	135'	EDG Building	
237	1-605-M-AH01A	ESW Pump Room Supply Fan	90'	ESW building	1
238	1-605-M-AH02A	ESW Pump Room Supply Fan	90'	ESW building	
239	1-605-M-AH01B	ESW Pump Room Supply Fan	90'	ESW building	
240	1-605-M-AH02B	ESW Pump Room Supply Fan	90'	ESW building	
241	1-633-M-PP01A	Essential Chilled Water Pump	78'	Aux.	1
242	1-633-M-PP01B	Essential Chilled Water Pump	78'	Aux.	
243	1-633-M-PP02A	Essential Chilled Water Pump	78'	Aux.	
244	1-633-M-PP02B	Essential Chilled Water Pump	78'	Aux.	
245	1-751-J-PM01	RO Console (Frame)	157'	Aux.	1
246	1-751-J-PM02	TO/EO Console (Frame)	157'	Aux.	
247	1-751-J-PM03	SS Console (Frame)	157'	Aux.	
248	1-751-J-PM04	STA Console (Frame)	157'	Aux.	
249	1-751-J-PM05	Safety Console (Frame)	157'	Aux.	1
250	1-752-J-PA03A	ESF-CCS Cabinet(A, B, C, D)	157'	Aux.	1
251	1-752-J-PA03B	ESF-CCS Group Controller Cabinet (Ch.BE)	157'	Aux.	
252	1-752-J-PA03C	ESF-CCS Group Controller Cabinet (Ch.CE)	157'	Aux.	
253	1-752-J-PA03D	ESF-CCS Group Controller Cabinet (Ch.DE)	157'	Aux.	

Table 19.1-42 (15 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
254	1-752-J-PA14A	Plant Protection System Cabinet(A)	157'	Aux.	1
255	1-752-J-PA14B	PPS Cabinet Ch.B-1	157'	Aux.	
256	1-752-J-PA14C	Plant Protection System Cabinet(C)	157'	Aux.	
257	1-752-J-PA14D	PPS Cabinet Ch.D-1	157'	Aux.	
258	1-772-E-SW01A	Reactor Trip Switchgear	137'	Aux.	1
259	1-772-E-SW01B	Reactor Trip Switchgear	137'	Aux.	
260	1-772-E-SW01C	Reactor Trip Switchgear	137'	Aux.	
261	1-772-E-SW01D	Reactor Trip Switchgear	137'	Aux.	
262	1-823-E-SW01A	CLASS 1E AB 4.16kV SWGR 01A	78'	Aux.	1
263	1-823-E-SW01B	CLASS 1E AB 4.16kV SWGR 01B	78'	Aux.	
264	1-823-E-SW01C	CLASS 1E AB 4.16kV SWGR 01C	78'	Aux.	
265	1-823-E-SW01D	CLASS 1E AB 4.16kV SWGR 01D	78'	Aux.	
266	1-825-E-LC01A	CLASS 1E AUX. BLDG 480V LOAD CENTER 1-825-E-LC01A	78'	Aux.	1
267	1-825-E-TR01A	480V LOAD CENTER XFMR	78'	Aux.	
268	1-825-E-LC01B	CLASS 1E AUX. BLDG 480V LOAD CENTER 1-825-E-LC01B(DIV.II)	78'	Aux.	
269	1-825-E-TR01B	480V LOAD CENTER XFMR	78'	Aux.	
270	1-825-E-LC01C	CLASS 1E AUX. BLDG 480V LOAD CENTER 1-825-E-LC01C	78'	Aux.	
271	1-825-E-TR01C	480V LOAD CENTER XFMR	78'	Aux.	
272	1-825-E-LC01D	CLASS 1E AUX. BLDG 480V LOAD CENTER 1-825-E-LC01D	78'	Aux.	
273	1-825-E-TR01D	480V LOAD CENTER XFMR	78'	Aux.	

Table 19.1-42 (16 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
274	1-827-E-MC01C	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC01C	78'	Aux.	1
275	1-827-E-MC01C-3	120/208V AC DIST. PNL	78'	Aux.	
276	1-827-E-MC01D	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC01D	78'	Aux.	
277	1-827-E-MC01D-3	120/208V AC DIST. PNL	78'	Aux.	
278	1-827-E-MC02C	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC02C	78'	Aux.	
279	1-827-E-MC02C-3	120/208V AC DIST. PNL	78'	Aux.	
280	1-827-E-MC02D	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC02D	78'	Aux.	
281	1-827-E-MC02D-3	120/208V AC DIST. PNL	78'	Aux.	
282	1-827-E-MC01A	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC01A	100'	Aux.	1
283	1-827-E-MC01A-3	120/208V AC DIST. PNL	100'	Aux.	
284	1-827-E-MC01B	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC01B	100'	Aux.	
285	1-827-E-MC01B-3	120/208V AC DIST. PNL	100'	Aux.	
286	1-827-E-MC04C	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC04C	100'	Aux.	
287	1-827-E-MC04C-3	120/208V AC DIST. PNL	100'	Aux.	
288	1-827-E-MC04D	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC04D(DIV. II)	100'	Aux.	
289	1-827-E-MC04D-3	120/208V AC DIST. PNL	100'	Aux.	
290	1-827-E-MC03B	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC03B	120'	Aux.	1
291	1-827-E-MC03B-3	120/208V AC DIST. PNL	120'	Aux.	

Table 19.1-42 (17 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
292	1-827-E-MC03A	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC03A	137'	Aux.	1
293	1-827-E-MC03A-3	120/208V AC DIST. PNL	137'	Aux.	
294	1-827-E-MC03C	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC03C	137'	Aux.	
295	1-827-E-MC03C-3	120/208V AC DIST. PNL	137'	Aux.	
296	1-827-E-MC03D	CLASS 1E A/B 480V MCC 1-827-E-MC03D	137'	Aux.	
297	1-827-E-MC03D-3	120/208V AC DIST. PNL	137'	Aux.	
298	1-827-E-MC04A	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC04A	137'	Aux.	
299	1-827-E-MC04A-3	120/208V AC DIST. PNL	137'	Aux.	
300	1-827-E-MC04B	CLASS 1E AUX. BLDG 480V MCC 1-827-E-MC04B	137'	Aux.	
301	1-827-E-MC04B-3	120/208V AC DIST. PNL	137'	Aux.	
302	1-827-E-MC02A	CLASS 1E ESW STRUCTURE AREA 480V MCC 1-827-E-MC02A	100'	ESW building	1
303	1-827-E-MC02A-3	120/208V AC DIST. PNL	100'	ESW building	
304	1-827-E-MC02B	CLASS 1E ESW STRUCTURE AREA 480V MCC 1-827-E-MC02B	100'	ESW building	
305	1-827-E-MC02B-3	120/208V AC DIST. PNL	100'	ESW building	
306	1-827-E-MC05A	CLASS 1E EDG-A BLDG 480V MCC 1-827-E-MC05A	100'	EDG Building	
307	1-827-E-MC05A-3	120/208V AC DIST. PNL	100'	EDG Building	
308	1-827-E-MC05B	CLASS 1E EDG-B BLDG 480V MCC 1-827-E-MC05B	100'	EDG Building	
309	1-827-E-MC05B-3	120/208V AC DIST. PNL	100'	EDG Building	

Table 19.1-42 (18 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
310	1-841-E-MC01A	CLASS 1E 125V DC CONTROL CENTER (A/B)	78'	Aux.	1
311	1-841-E-MC01A-C1	CLASS 1E 125V DC DISTR. PNL 1	78'	Aux.	
312	1-841-E-MC01A-D1	CLASS 1E 125V DC DISTR. PNL 2	78'	Aux.	
313	1-841-E-MC01B	CLASS 1E 125V DC CONTROL CENTER (A/B)	78'	Aux.	
314	1-841-E-MC01B-C1	CLASS 1E 125V DC DISTR. PNL 1	78'	Aux.	
315	1-841-E-MC01B-D1	CLASS 1E 125V DC DISTR. PNL 2	78'	Aux.	
316	1-841-E-MC01C	CLASS 1E 125V DC CONTROL CENTER (A/B)	78'	Aux.	
317	1-841-E-MC01C-D1	CLASS 1E 125V DC DISTR. PNL	78'	Aux.	
318	1-841-E-MC01D	CLASS 1E 125V DC CONTROL CENTER (A/B)	78'	Aux.	
319	1-841-E-MC01D-D1	CLASS 1E 125V DC DISTR. PNL 2	78'	Aux.	
320	1-841-E-BC01A	CLASS 1E BATT. CHARGER (A/B)	78'	Aux.	1
321	1-841-E-BC01B	CLASS 1E BATT. CHARGER (A/B)	78'	Aux.	
322	1-841-E-BC01C	CLASS 1E BATT. CHARGER (A/B)	78'	Aux.	
323	1-841-E-BC01D	CLASS 1E BATT. CHARGER (A/B)	78'	Aux.	
324	1-841-E-BC02A	CLASS 1E BATT. CHARGER (STAND-BY) (A/B)	78'	Aux.	
325	1-841-E-BC02B	CLASS 1E BATT. CHARGER (STAND-BY) (A/B)	78'	Aux.	
326	1-841-E-BC02C	CLASS 1E BATT. CHARGER (STAND-BY) (A/B)	78'	Aux.	
327	1-841-E-BC02D	CLASS 1E BATT. CHARGER (STAND-BY) (A/B)	78'	Aux.	

Table 19.1-42 (19 of 19)

No.	Equipment ID	Equipment Description	Floor Elevation	Building	Correlation Factor
328	1-841-E-BT01A	CLASS 1E 125V DC BATTERY	100'	Aux.	1
329	1-841-E-BT01B	CLASS 1E 125V DC BATTERY	100'	Aux.	
330	1-841-E-BT01C	CLASS 1E 125V DC BATTERY	78'	Aux.	1
331	1-841-E-BT01D	CLASS 1E 125V DC BATTERY	78'	Aux.	
332	1-842-E-IN01A	CLASS 1E CH.A 40KVA INVERTER (A/B)	78'	Aux.	1
333	1-842-E-IN01B	CLASS 1E CH.A 40KVA INVERTER (A/B)	78'	Aux.	
334	1-842-E-IN01C	CLASS 1E CH.C 40KVA INVERTER (A/B)	78'	Aux.	
335	1-842-E-IN01D	CLASS 1E CH.C 40KVA INVERTER (A/B)	78'	Aux.	
336	1-842-E-IN02A	CLASS 1E SAFETY MOV INVERTER (RC SYS ONLY)	78'	Aux.	1
337	1-842-E-IN02B	CLASS 1E SAFETY MOV INVERTER 30KVA	78'	Aux.	
338	1-842-E-IN02C	CLASS 1E SAFETY MOV INVERTER	78'	Aux.	
339	1-842-E-IN02D	CLASS 1E SAFETY MOV INVERTER 30KVA	78'	Aux.	
340	1-842-E-TR01A	CLASS 1E REGULATING TRANSFORMER	78'	Aux.	1
341	1-842-E-TR01B	CLASS 1E REGULATING TRANSFORMER	78'	Aux.	
342	1-842-E-TR01C	CLASS 1E REGULATING TRANSFORMER	78'	Aux.	
343	1-842-E-TR01D	CLASS 1E REGULATING TRANSFORMER	78'	Aux.	

Table 19.1-43 (1 of 5)

Seismic Fragility Analysis Results Summary

Component	Location	Failure mode	HCLPF (g)
Buildings			
Reactor Containment building	CTMT	Tan. shear fail near the base	0.94
Stability of NI Structure	CTMT basemat	Sliding toward the turbine building	0.52
Reactor Containment Internal	CTMT	Tan. shear fail near the base	1.09
Auxiliary Building	Auxiliary Building	Shear fail of shear wall at the basemat	0.51
Emergency Diesel Generator Building	Emergency Diesel Generator Building	Shear fail of shear wall at the basemat	0.87
Diesel Fuel Oil Tank Building	Diesel Fuel Oil Tank Building	Shear fail of shear wall at the basemat	0.73
Turbine Building	Turbine Building	Collapse into Aux BLDG	[1]
Compound Building	Compound Building	Collapse into Aux BLDG	[1]
CCW HX Building	CCW HX Building	Generic	[5]
ESW IS	ESW Building	Generic	[5]
RCS Components			
Reactor Pressure Vessel	CTMT El. 69'~156'	Column support	0.92
Reactor Vessel Internal	CTMT El. 69'~156'	Core Sup. Barrel lower flange	0.51
CEDM (Control Element Drive Mechanism)	CTMT	Binding of Cntrl. extension shaft	0.64
Steam Generator	CTMT El. 114'~136'06”	Anch. fail of snubber lever support asm.	0.6
Steam Generator Nozzle	CTMT El. 114'~136'06”	Economizer nozzle	0.54
Pressurizer	CTMT El. 114'~156'	Skirt support	0.63
Pressurizer nozzle	CTMT El. 114'~156'	Spray nozzle	0.51
Reactor Coolant System Piping	CTMT	Surge line nozzle	0.55
Reactor Coolant Pumps	CTMT El. 114'~136'06”	Upper horiz. column support	1.31
BOP (mechanical, electrical and I&C components)			
Charging Pumps	Aux. BLDG El. 55'	Generic	[1]
Regenerative Heat Exchanger	CTMT El. 114'	Generic	[1]
Letdown Heat Exchanger	CTMT El. 100'	Generic	[1]
Auxiliary Charging Pump	Aux. BLDG El. 55'	Generic	[1]

Table 19.1-43 (2 of 5)

Component	Location	Failure mode	HCLPF (g)
Safety Injection Tanks	CTMT. El. 136' 06"	Generic	[1]
Shutdown Cooling Pumps	Aux. BLDG El. 50'	Generic	[1]
Shutdown Cooling Heat Exchanger	Aux. BLDG El. 50'	Generic	[1]
SC Pump Miniflow Heat Exchanger	Aux. BLDG El. 50'	Generic	[1]
Safety Injection Pump	Aux. BLDG El. 50'	Generic	[1]
Containment Spray Pump	Aux. BLDG El. 50'	Generic	[1]
CS Miniflow Heat Exchanger	Aux. BLDG El. 50'	Generic	[1]
Containment Spray Heat Exchanger	Aux. BLDG El. 55'	Generic	[1]
Main Steam Isolation Valves	Aux. BLDG El. 137'06"	Generic	[1]
Main Steam Atmospheric Valves(ADV)	Aux. BLDG El. 137'06"	Generic	[1]
Main Steam Safety Valves	Aux. BLDG El. 137'06"	Generic	[1]
AFW Pump-Motor Driven	Aux. BLDG El. 78'	Generic	[1]
AFW Pump-Turbine Driven	Aux. BLDG El. 78'	Generic	[1]
Emergency Diesel Generators	EDG El. 100' Aux. BLDG El. 100'	Generic	[1]
Emergency Diesel Generators (Aux. Building)	AB El. 100'	Generic	[1]
Emergency Diesel Fuel Oil transfer pump	EDG El. 65' Aux. BLDG El. 63'	Generic	[1]
Emergency Diesel Fuel Oil transfer pump (Aux. Building)	AB El. 63'	Generic	[1]
Starting Air Tank	Aux. BLDG El. 100'	Generic	[1]
Diesel Fuel Oil Day Tank	EDG El. 121' Aux. BLDG El. 120'	Generic	[1]
Diesel Fuel Oil Day Tank (Aux. Building)	AB El. 120'	Generic	[1]
Diesel Fuel Oil Storage Tank	EDG El. 63' Aux. BLDG El. 65'	Generic	[1]
Diesel Fuel Oil Storage Tank (Aux.Building)	Aux. El. 65'	Generic	[1]
Silencer	Aux. BLDG El. 100'	Generic	[1]
Air Intake Filter	Aux. BLDG El. 109'	Generic	[1]

Table 19.1-43 (3 of 5)

Component	Location	Failure mode	HCLPF (g)
Lube Oil Water Hx	Aux. BLDG El. 100'	Generic	[1]
Motor Driven Fuel Oil Feed Pump	EDG El. 100' Aux. BLDG El. 100'	Generic	[1]
Motor Driven Fuel Oil Feed Pump (Aux. Building)	AB El. 100'	Generic	[1]
Essential Service Water Pump	ESW IS. El. 69'	Generic	[1]
CCW Heat Exchangers	CCW HX BLDG El. 100'	Generic	[1]
CCW Pump	Aux. BLDG El. 55'	Generic	[1]
CCW Surge Tank	Aux. BLDG El. 172'	Generic	[1]
Essential Chilled Water Pumps	Aux. BLDG. El. 78'	Generic	[1]
Essential Chillers	Aux. BLDG El. 78'	Generic	[1]
ECW Compression Tank	Aux. BLDG El. 172'	Generic	[1]
ECW Air Separator	Aux. BLDG El. 78'	Generic	[1]
Essential Chilled Water System Control Panel	Aux. BLDG El. 78'	Generic	[1]
AFWP Room Cubicle Cooler-MD	Aux. BLDG El. 78'	Generic	[1]
CCWP Room Cubicle Cooler	Aux. BLDG El. 55'	Generic	[1]
SI Room Cubicle Cooler	Aux. BLDG El. 50' Aux. BLDG El. 55'	Generic	[1]
SC Pump & Mini-flow Hx. Room Cubicle Cooler	Aux. BLDG El. 50' Aux. BLDG El. 55'	Generic	[1]
Mech. Pen. Room Cubicle Cooler	Aux. BLDG El. 100' Aux. BLDG El. 120'	Generic	[1]
CS Pump Room Cubicle Cooler	Aux. BLDG El. 50' Aux. BLDG El. 55'	Generic	[1]
Aux Charging Pump Room Cubicle Cooler	Aux. BLDG El. 55'	Generic	[1]
Charging Pump Room Cubicle Cooler	Aux. BLDG El. 55'	Generic	[1]
Elect. Pen. Room Area Cubicle Cooler	Aux. BLDG El. 120' Aux. BLDG El. 137'6"	Generic	[1]
Elect. Pen. Room Area Cubicle Cooler (El. 137')	AB El. 137'	Generic	[1]
I&C Equipment RooM Cubical Cooler	AB El. 157'	Generic	[1]

Table 19.1-43 (4 of 5)

Component	Location	Failure mode	HCLPF (g)
EDG Room Emergency Cubicle Cooler	EDG El. 100'	Generic	[1]
EDG Room Emergency Cubicle Cooler	EDG El. 135'	Generic	[1]
Essential Chiller & Pump Cubicle Cooler	Aux. BLDG El. 78'	Generic	[1]
CCW HX. Room Supply Fans	CCW HX B El. 100' CCW HX El. 126'	Generic	[1]
ESW Pump Room Supply Fan	ESW IS. El. 90'	Generic	[1]
EDG Room Emergency Exhaust Fan	EDG El. 100' Aux. BLDG El. 172'	Generic	[1]
EDG Room Emergency Exhaust Fan (Aux. Building)	AB El. 172'	Generic	[1]
Control Room Emergency Makeup ACU	Aux. BLDG El. 172'	Generic	[1]
ESF-CCS GC Cabinet	Aux. BLDG El. 156'	Generic	[1]
ESF-CCS LC Cabinet	Aux. BLDG El. 156' Aux. BLDG El. 137'6"	Generic	[1]
Plant Protection System Cabinet	Aux. BLDG El. 156'	Generic	[1]
Reactor Trip Switchgear	Aux. BLDG El. 137'6"	Generic	[1]
MCR Operator Consoles	Aux. BLDG El. 156'	Generic	[1]
MCR Safety Consoles	Aux. BLDG El. 156'	Generic	[1]
125V DC Battery Chargers	Aux. BLDG El. 78'	Generic	[1]
SI Inverter	Aux. BLDG El. 78'	Generic	[1]
120V AC Inverter(VBPSS)	Aux. BLDG El. 78'	Generic	[1]
Regulating Transformer	Aux. BLDG El. 78'	Generic	[1]
125V DC Control Center	Aux. BLDG El. 78'	Generic	[1]
4.16kV MCSG	Aux. BLDG El. 78'	Generic	[1]
480V Load Center	Aux. BLDG El. 78'	Generic	[1]
480V MCC(Aux. EL.137'06")	Aux. BLDG El. 137'06"	Generic	[1]
480V MCC(Aux. EL.120')	Aux. BLDG El. 120'	Generic	[1]
480V MCC(Aux. EL.100')	Aux. BLDG El. 100'	Generic	[1]
480V MCC(Aux. EL.78')	Aux. BLDG El. 78'	Generic	[1]
480V MCC(ESW IS EL.100')	ESW IS. El. 90'	Generic	[1]
Batteries & Racks	Aux. BLDG El. 78' Aux. BLDG El. 100'	Generic	[1]

Table 19.1-43 (5 of 5)

Component	Location	Failure mode	HCLPF (g)
Off-Site Power	various	Generic	0.09[3]
Reactor Coolant System	various	Generic	0.3[4]
BOP Piping & Supports	various	Generic	0.75g[2]
HVAC Ducting & Dampers	various	Generic	0.75g[2]
Cable Trays & Supports	various	Generic	0.75g[2]
Motor Operated Valves	various	Generic	0.75g[2]
Air Operated Valves	various	Generic	0.75g[2]
Electrical Conduit	various	Generic	0.75g[2]
Relief and Check Valves	various	Generic	0.75g[2]
Resistance Temperature Detectors	various	Generic	0.75g[2]
Pressure Transmitters	various	Generic	0.75g[2]

Key Assumptions

[1] The component is assigned to COL item (COL 19.1.(8)) and HCLPF value is assumed to be equal to or exceed 1.67 times CSDRS

[2] Inherently Ruggedness Item were assumed as CSDRS x 2.5 = 0.75g

- EPRI-1025287 (Reference 78) COL item (COL 19.1.(8))

[3] HCLPF based on generic value from Risk Assessment of Operational Events Handbook Volume 2 - External Events, R.1.01, January 2008, USNRC (Reference 79).

[4] HCLPF based on Option 2 in "SPRA implementation guide", EPRI 3002000709 (Reference 77)

[5] ESW IS and CCW HX Building are assigned to COL item (COL 19.1(8)) and HCLPF value is assumed to be equal to or exceed 1.67 times GMRS.

Table 19.1-44A (1 of 11)

At-Power Seismic Event Direct Core Damage Initiator Cutsets

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
1	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-480V-LC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 480V Load Center	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
2	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-480V-MCC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 480V MCC	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
3	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-4KV-BUS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 4.16kV MCSG	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
4	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCHX-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Heat Exchangers	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
5	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-ACVPP-0.5G	SEISMIC INDUCED FAILURE OF THE Aux Charging Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
6	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
7	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-137-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler (EL.137')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44A (2 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
8	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-IC-0.5G	SEISMIC INDUCED FAILURE OF THE I&C Eq. Room Cubicle Cooler (EL.157')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
9	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-100-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.100')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
10	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-135-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.135')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
11	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-MPR-0.5G	SEISMIC INDUCED FAILURE OF THE Mech. Pen. Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
12	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
13	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Surge Tank	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
14	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCW-BLDG-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Hx Building	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44A (3 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
15	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CPD-FAIL-0.5G	SEISMIC FAILURE OF COMPOUND BUILDING COLLAPE INTO AUXILIARY BLDG	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
16	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSHX01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Heat Exchanger	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
17	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSHX02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CS Miniflow Hx	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
18	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DC-BC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 125V DC Battery Chargers	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
19	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DC-BT-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Batteries & Racks	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
20	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DC-MCC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 125V DC Control Center	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	

Table 19.1-44A (4 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
21	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DG-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Generators	
	0.5g	SEIS-DG-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Generators (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
22	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGFT-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Air Intake Filter	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
23	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGHX-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Lube Oil Water Hx	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
24	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Motor Driven Fuel Oil Feed Pump	
	0.5g	SEIS-DGPP-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Motor Driven Fuel Oil Feed Pump (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
25	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGSL-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Silencer	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
26	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGTK40-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Starting Air Tank	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	

Table 19.1-44A (5 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
27	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DOMPS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Fuel Oil transfer pump	
	0.5g	SEIS-DOMPS-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Fuel Oil transfer pump (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
28	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DOTK01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Storage Tank	
	0.5g	SEIS-DOTK01-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Storage Tank (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
29	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DOTK02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Day Tank	
	0.5g	SEIS-DOTK02-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Day Tank (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
30	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-ESF-RPS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESF-CCS GC Cabinet	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
31	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-ESWIS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESWIS	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44A (6 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
32	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-IPINV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 120V AC Inverter(VBPSS)	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
33	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-IPREGTR-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Regulating Transformer	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
34	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-MSADV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Main Steam Atmospheric Valves(ADV)	
	1.00E+00	SIE-FLAG-MSLB	FLAG FOR Seismic-Induced MSLB	
35	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-MSIV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Main Steam Isolation Valves	
	1.00E+00	SIE-FLAG-MSLB	FLAG FOR Seismic-Induced MSLB	
36	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-MSSV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Main Steam Safety Valves	
	1.00E+00	SIE-FLAG-MSLB	FLAG FOR Seismic-Induced MSLB	
37	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-RP-PM05-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE MCR SAFETY CONSOLE	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
38	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIHX01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Heat Exchanger	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44A (7 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
39	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIHX02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SC Pump Miniflow Heat Exchanger	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
40	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SXPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Service Water Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
41	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-TB-FAIL-0.5G	SEISMIC FAILURE OF THE TURBINE BUILDING COLLAPE INTO AUXILIARY BLDG	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
42	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VGAH02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Exhaust Fan	
	0.5g	SEIS-VGAH02-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Exhaust Fan (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
43	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VGAH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESW Pump Room Supply Fan	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
44	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV10-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CS Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44A (8 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
45	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV11/12-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
46	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV13/14-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCWP Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
47	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV16-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SC Pump & Mini-flow Hx. Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
48	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV18-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Charging Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
49	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VOHV32-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chiller & Pump Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
50	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VOHV33-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFWP Room Cubicle Cooler-MD	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
51	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOCH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chillers	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44A (9 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
52	1.00E+00	%SEISMIC		0.5g
	0.5g	SEIS-WOLP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water System Control Panel	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
53	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water Pumps	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
54	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOTK02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Air Separator	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
55	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Compression Tank	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
56	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.51g
	0.51g	SEIS-AB-FAIL-0.51G	SEISMIC FAILURE OF AUXILIARY BUILDING	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
57	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.51g
	0.51g	SEIS-RVI-RCS-0.51G	SEISMIC INDUCED RX VESSESL INTERNAL FAILURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
58	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.51g
	0.51g	SEIS-PZRNOZZ-RCS-FAIL-0.51G	SEISMICALLY-INDUCED MEDIUM LOCA DUE TO PZR NOZZ FAILURE	
	1.00E+00	SIE-FLAG-MLOCA	FLAG FOR SEISMICALLY-INDUCED MEDIUM LOCA	

Table 19.1-44A (10 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
59	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.52g
	0.52g	SEIS-NI-FAIL-0.52G	SEISMIC INDUCED FAILURE OF Nuclear Island failure	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
60	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.54g
	0.54g	SEIS-SGNOZZ-RCS-FAIL-0.54G	SEISMIC INDUCED FAILURE OF Steam Generator Nozzle	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
61	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.55g
	0.55g	SEIS-PIPE-RCS-FAIL-0.55G	SEISMICALLY-INDUCED LARGE LOCA DUE TO RCS PIPE FALURE	
	1.00E+00	SIE-FLAG-LLOCA	FLAG FOR SEISMICALLY-INDUCED LARGE LOCA	
62	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.6g
	0.6g	SEIS-SG-RCS-FAIL-0.6G	SEISMICALLY-INDUCED SG SUPPORT FALURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
63	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.63g
	0.63g	SEIS-PZR-RCS-FAIL-0.63G	SEISMICALLY-INDUCED PZR SKIRT FAILURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
64	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.64g
	0.64g	SEIS-CEDM-RCS-FAIL-0.64G	SEISMIC INDUCED FAILURE OF THE CEDM (Control Element Drive Mechanism)	
	1.00E+00	SIE-FLAG-ATWS	FLAG FOR Seismic-Induced ATWS	

Table 19.1-44A (11 of 11)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
65	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.75g
	0.75g	SEIS-ALL-SSC-0.75G	Generic Seismic Equipment Failure all eqiupment correlated to failure at 0.75g HCLPF	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
66	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.92g
	0.92g	SEIS-RV-RCS-FAIL-0.92G	SEISMICALLY-INDUCED REACTOR VESSEL FALURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
67	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.94g
	0.94g	SEIS-CTS-EX-FAIL-0.94G	SEISMIC FAILURE OF CONTAINMENT EXTERIOR	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
68	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	1.09g
	1.09g	SEIS-CTS-IN-FAIL-1.09G	SEISMIC FAILURE OF CONTAINMENT INTERNAL STRUCTURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
69	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	1.31g
	1.31g	SEIS-RCP-RCS-FAIL-1.31G	SEISMICALLY-INDUCED RCP SUPPORT FALURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	

Table 19.1-44B (1 of 36)

At-power Seismic Event Top 100 core damage cutsets of Non-Direct Core Damage Initiator

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
1	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
2	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
3	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	

Table 19.1-44B (2 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
4	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
5	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
6	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
7	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	

Table 19.1-44B (3 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
8	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
9	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
10	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
11	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (4 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
12	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
13	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
14	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-SIT-FAIL-0.5G	SEISMIC FAILURE OF SITS	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
15	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (5 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
16	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
17	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
18	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	MSOPH-S-ASC-SLOCA	Operator Fails to Perform Aggressive Secondary Cooling After SLOCA	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
19	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	

Table 19.1-44B (6 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
20	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
21	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
22	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
23	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
	1.00E-01	SIOPH-S-IRWSTCOOL	Operator Fails to Cool IRWST Water Using SCS Pump	

Table 19.1-44B (7 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
24	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	1.00E-01	SIOPH-S-IRWSTCOOL	Operator Fails to Cool IRWST Water Using SCS Pump	
25	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
	1.00E-01	SIOPH-S-IRWSTCOOL	Operator Fails to Cool IRWST Water Using SCS Pump	
26	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	1.00E-01	SIOPH-S-IRWSTCOOL	Operator Fails to Cool IRWST Water Using SCS Pump	

Table 19.1-44B (8 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
27	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	1.00E-01	SIOPH-S-IRWSTCOOL	Operator Fails to Cool IRWST Water Using SCS Pump	
28	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	1.00E-01	SIOPH-S-INJ	Operator Fails to Align SCS for Injection	
29	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	1.00E-01	RCOPH-S-SDSL	OPERATOR FAILS TO OPEN 1 OF 4 SDS VALVE LATE PHASE	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
30	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	1.00E-01	RCOPH-S-SDSL	OPERATOR FAILS TO OPEN 1 OF 4 SDS VALVE LATE PHASE	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (8 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
31	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	1.00E-01	SIOPH-S-IRWSTCOOL	Operator Fails to Cool IRWST Water Using SCS Pump	
32	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
33	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (9 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
34	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
35	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
36	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (10 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
37	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
38	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (11 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
39	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
40	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (12 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
41	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
42	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (13 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
43	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
44	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
45	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (14 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
46	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
47	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (15 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
48	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
49	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
50	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (16 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
51	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
52	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (17 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
53	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
54	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (18 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
55	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
56	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (19 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
57	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
58	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
59	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.10E-04	RCPVWQ4-200/1/2/3	4/4 CCF OF RC PV V200/201/202/203 FAIL TO OPEN	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	

Table 19.1-44B (20 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
60	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.10E-04	RCPVWQ4-200/1/2/3	4/4 CCF OF RC PV V200/201/202/203 FAIL TO OPEN	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
61	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.10E-04	RCPVWQ4-200/1/2/3	4/4 CCF OF RC PV V200/201/202/203 FAIL TO OPEN	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
62	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.10E-04	RCPVWQ4-200/1/2/3	4/4 CCF OF RC PV V200/201/202/203 FAIL TO OPEN	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (21 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
63	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
64	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (22 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
65	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
66	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
67	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-A-DGA	DG 01A UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-B-DGB	DG 01B UNAVAILABLE DUE TO T&M	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (23 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
68	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
69	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

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No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
70	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
71	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.44E-02	DGDGM-C-DGC	DG 01C UNAVAILABLE DUE TO T&M	
	1.44E-02	DGDGM-D-DGD	DG 01D UNAVAILABLE DUE TO T&M	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (25 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
72	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2A-PP01A	CS PUMP 1 PP01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
73	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2A-PP01A	CS PUMP 1 PP01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (26 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
74	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2A-PP01A	CS PUMP 1 PP01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
75	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2A-PP01A	CS PUMP 1 PP01A UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-D-DGD	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01D	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (27 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
76	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2B-PP01B	CS PUMP PP01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
77	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2B-PP01B	CS PUMP PP01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (28 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
78	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2B-PP01B	CS PUMP PP01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
79	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	7.12E-03	CSMPM2B-PP01B	CS PUMP PP01B UNAVAILABLE DUE TO T&M	
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (29 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
80	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
	7.12E-03	SIMPM1B-SCPP01B	SC PUMP PP01B UNAVAILABLE DUE TO T&M	
81	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	7.12E-03	SIMPM1B-SCPP01B	SC PUMP PP01B UNAVAILABLE DUE TO T&M	

Table 19.1-44B (30 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
82	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
	7.12E-03	SIMPM1B-SCPP01B	SC PUMP PP01B UNAVAILABLE DUE TO T&M	
83	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	7.12E-03	SIMPM1B-SCPP01B	SC PUMP PP01B UNAVAILABLE DUE TO T&M	
84	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	7.12E-03	SIMPM1B-SCPP01B	SC PUMP PP01B UNAVAILABLE DUE TO T&M	

Table 19.1-44B (30 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
85	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
	7.12E-03	SIMPM1A-SCPP01A	SC PUMP PP01A UNAVAILABLE DUE TO T&M	
86	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	7.12E-03	SIMPM1A-SCPP01A	SC PUMP PP01A UNAVAILABLE DUE TO T&M	

Table 19.1-44B (31 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
87	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
	7.12E-03	SIMPM1A-SCPP01A	SC PUMP PP01A UNAVAILABLE DUE TO T&M	
88	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	7.12E-03	SIMPM1A-SCPP01A	SC PUMP PP01A UNAVAILABLE DUE TO T&M	
89	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
	7.12E-03	SIMPM1A-SCPP01A	SC PUMP PP01A UNAVAILABLE DUE TO T&M	

Table 19.1-44B (32 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
90	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	6.66E-03	PFHBO1B-SW01B-H2	PCB SW01B-H2 4.16KV SWGR SW01B FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
91	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	6.66E-03	PFHBO1B-SW01B-H2	PCB SW01B-H2 4.16KV SWGR SW01B FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (33 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
92	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	6.66E-03	PFHBO1B-SW01B-H2	PCB SW01B-H2 4.16KV SWGR SW01B FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
93	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	6.66E-03	PFHBO1B-SW01B-H2	PCB SW01B-H2 4.16KV SWGR SW01B FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
94	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-A-DGA	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01A	
	6.66E-03	PFHBO1B-SW01B-H2	PCB SW01B-H2 4.16KV SWGR SW01B FROM UAT FAILS TO OPEN	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (34 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
95	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	6.66E-03	PFHBO1A-SW01A-H2	PCB SW01A-H2 4.16KV SWGR SW01A FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
96	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	6.66E-03	PFHBO1A-SW01A-H2	PCB SW01A-H2 4.16KV SWGR SW01A FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (35 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
97	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	6.66E-03	PFHBO1A-SW01A-H2	PCB SW01A-H2 4.16KV SWGR SW01A FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
98	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	6.66E-03	PFHBO1A-SW01A-H2	PCB SW01A-H2 4.16KV SWGR SW01A FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
99	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-B-DGB	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01B	
	6.66E-03	PFHBO1A-SW01A-H2	PCB SW01A-H2 4.16KV SWGR SW01A FROM UAT FAILS TO OPEN	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44B (36 of 36)

No.	BE. Prob.	Basic Event	Cutset Description	Sequence Level HCLPF
100	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	2.50E-02	DGDGR-C-DGC	FAILS TO RUN EMERGENCY DIESEL GENERATOR DG01C	
	6.66E-03	PFHBO2B-SW01D-G2	PCB SW01D-G2 4.16KV SWGR SW01D FROM UAT FAILS TO OPEN	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	

Table 19.1-44C (1 of 7)

At-power Direct Containment Failure cutsets

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
1	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-480V-LC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 480V Load Center	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
2	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-480V-MCC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 480V MCC	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
3	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-4KV-BUS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 4.16kV MCSG	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
4	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DC-BC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 125V DC Battery Chargers	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
5	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DC-BT-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Batteries & Racks	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
6	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DC-MCC-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 125V DC Control Center	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
7	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DG-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Generators	
	0.5g	SEIS-DG-FAIL-CD-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Generators (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	

Table 19.1-44C (2 of 7)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
8	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGFT-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Air Intake Filter	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
9	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGHX-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Lube Oil Water Hx	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
10	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Motor Driven Fuel Oil Feed Pump	
	0.5g	SEIS-DGPP-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Motor Driven Fuel Oil Feed Pump (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
11	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGSL-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Silencer	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
12	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DGTK40-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Starting Air Tank	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
13	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DOMPS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Fuel Oil transfer pump	
	0.5g	SEIS-DOMPS-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Emergency Diesel Fuel Oil transfer pump (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	

Table 19.1-44C (3 of 7)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
14	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DOTK01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Storage Tank	
	0.5g	SEIS-DOTK01-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Storage Tank (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
15	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-DOTK02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Day Tank	
	0.5g	SEIS-DOTK02-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Diesel Fuel Oil Day Tank (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
16	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-ESF-RPS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESF-CCS GC Cabinet	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
17	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-IPINV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE 120V AC Inverter(VBPSS)	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
18	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-IPREGTR-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Regulating Transformer	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
19	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-MSADV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Main Steam Atmospheric Valves(ADV)	
	1.00E+00	SIE-FLAG-MSLB	FLAG FOR Seismic-Induced MSLB	

Table 19.1-44C (4 of 7)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
20	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-MSIV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Main Steam Isolation Valves	
	1.00E+00	SIE-FLAG-MSLB	FLAG FOR Seismic-Induced MSLB	
21	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-MSSV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Main Steam Safety Valves	
	1.00E+00	SIE-FLAG-MSLB	FLAG FOR Seismic-Induced MSLB	
22	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-RP-PM05-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE MCR SAFETY CONSOLE	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
23	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VGAH02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Exhaust Fan	
	0.5g	SEIS-VGAH02-CD-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Exhaust Fan (Aux. Building)	
	1.00E+00	SIE-FLAG-SBO	FLAG FOR Seismic-Indiced SBO	
24	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CPD-FAIL-0.5G	SEISMIC FAILURE OF COMPOUND BUILDING COLLAPE INTO AUXILIARY BLDG	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
25	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-TB-FAIL-0.5G	SEISMIC FAILURE OF THE TURBINE BUILDING COLLAPE INTO AUXILIARY BLDG	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	

Table 19.1-44C (5 of 7)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
26	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.52g
	0.52g	SEIS-NI-FAIL-0.52G	SEISMIC FAILURE OF Nuclear Island	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
27	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.51g
	0.51g	SEIS-AB-FAIL-0.51G	SEISMIC FAILURE OF AUXILIARY BUILDING	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
28	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.51g
	0.51g	SEIS-RVI-RCS-0.51G	SEISMIC INDUCED RX VESSESL INTERNAL FAILURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
29	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.51g
	0.51g	SEIS-PZRNOZZ-RCS-FAIL-0.51G	SEISMICALLY-INDUCED MEDIUM LOCA DUE TO PZR NOZZ FAILURE	
	1.00E+00	SIE-FLAG-MLOCA	FLAG FOR SEISMICALLY-INDUCED MEDIUM LOCA	
30	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.54g
	0.54g	SEIS-SGNOZZ-RCS-FAIL-0.54G	SEISMIC INDUCED FAILURE OF Steam Generator Nozzle	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
31	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.55g
	0.55g	SEIS-PIPE-RCS-FAIL-0.55G	SEISMICALLY-INDUCED LARGE LOCA DUE TO RCS PIPE FALURE	
	1.00E+00	SIE-FLAG-LLOCA	FLAG FOR SEISMICALLY-INDUCED LARGE LOCA	

Table 19.1-44C (6 of 7)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
32	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.6g
	0.6g	SEIS-SG-RCS-FAIL-0.6G	SEISMICALLY-INDUCED SG SUPPORT FALURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
33	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.63g
	0.63g	SEIS-PZR-RCS-FAIL-0.63G	SEISMICALLY-INDUCED PZR SKIRT FAILURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
34	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.64g
	0.64g	SEIS-CEDM-RCS-FAIL-0.64G	SEISMIC INDUCED FAILURE OF THE CEDM (Control Element Drive Mechanism)	
	1.00E+00	SIE-FLAG-ATWS	FLAG FOR Seismic-Induced ATWS	
35	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.75g
	0.75g	SEIS-ALL-SSC-0.75G	Generic Seismic Equipment Failure all eqiupment correlated to failure at 0.75g HCLPF	
	1.00E+00	SIE-FLAG-IC	FLAG FOR Loss of All Instrumentation and Control	
36	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.92g
	0.92g	SEIS-RV-RCS-FAIL-0.92G	SEISMICALLY-INDUCED REACTOR VESSEL FALURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
37	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.94g
	0.94g	SEIS-CTS-EX-FAIL-0.94G	SEISMIC FAILURE OF CONTAINMENT EXTERIOR	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	

Table 19.1-44C (7 of 7)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		BasicEvent	Cutset Description	
38	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	1.09g
	1.09g	SEIS-CTS-IN-FAIL-1.09G	SEISMIC FAILURE OF CONTAINMENT INTERNAL STRUCTURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	
39	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	1.31g
	1.31g	SEIS-RCP-RCS-FAIL-1.31G	SEISMICALLY-INDUCED RCP SUPPORT FALURE	
	1.00E+00	SIE-FLAG-DMG-CF	FLAG FOR Seismic Events Leading to Direct Core Damage with Containment Structural Damage	

Table 19.1-44D (1 of 24)

At-power Seismic event Top 100 containment failure cutsets of Non-Direct Containment Failure Initiator

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
1	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
2	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
3	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44D (2 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
4	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
5	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
6	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44D (3 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
7	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
8	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
9	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44D (4 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
10	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
11	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
12	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
13	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCHX-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Heat Exchangers	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (5 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
14	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCHX-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Heat Exchangers	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
15	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCHX-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Heat Exchangers	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
16	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-ACVPP-0.5G	SEISMIC INDUCED FAILURE OF THE Aux Charging Pump Room Cubicle Cooler	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
17	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-ACVPP-0.5G	SEISMIC INDUCED FAILURE OF THE Aux Charging Pump Room Cubicle Cooler	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
18	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-ACVPP-0.5G	SEISMIC INDUCED FAILURE OF THE Aux Charging Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (6 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
19	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-100-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.100')	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
20	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-100-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.100')	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
21	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-100-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.100')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
22	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-135-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.135')	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (7 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
23	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-135-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.135')	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
24	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EDG-135-0.5G	SEISMIC INDUCED FAILURE OF THE EDG Room Emergency Cubicle Cooler (EL.135')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
25	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
26	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
27	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (8 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
28	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-137-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler (EL.137')	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
29	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-137-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler (EL.137')	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
30	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-EPA-137-0.5G	SEISMIC INDUCED FAILURE OF THE Elect. Pen. Room Area Cubicle Cooler (EL.137')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
31	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-IC-0.5G	SEISMIC INDUCED FAILURE OF THE I&C Eq. Room Cubicle Cooler (EL.137')	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (9 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
32	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-IC-0.5G	SEISMIC INDUCED FAILURE OF THE I&C Eq. Room Cubicle Cooler (EL.137')	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
33	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-IC-0.5G	SEISMIC INDUCED FAILURE OF THE I&C Eq. Room Cubicle Cooler (EL.137')	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
34	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-MPR-0.5G	SEISMIC INDUCED FAILURE OF THE Mech. Pen. Room Cubicle Cooler	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
35	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-MPR-0.5G	SEISMIC INDUCED FAILURE OF THE Mech. Pen. Room Cubicle Cooler	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
36	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCLR-MPR-0.5G	SEISMIC INDUCED FAILURE OF THE Mech. Pen. Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (10 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
37	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Pump	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
38	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Pump	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
39	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
40	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Surge Tank	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
41	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Surge Tank	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (11 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
42	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Surge Tank	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
43	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCW-BLDG-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Hx Building	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
44	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCW-BLDG-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Hx Building	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
45	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CCW-BLDG-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCW Hx Building	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
46	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-ESWIS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESWIS	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (12 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
47	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-SXPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Service Water Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
48	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VGAH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESW Pump Room Supply Fan	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
49	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VKHV10-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CS Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
50	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VKHV11/12-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (13 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
51	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VKHV13/14-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCWP Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
52	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VKHV16-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SC Pump & Mini-flow Hx. Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
53	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VKHV18-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Charging Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
54	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VOHV32-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chiller & Pump Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (14 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
55	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-VOHV33-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFWP Room Cubicle Cooler-MD	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
56	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-WOCH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chillers	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
57	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-WOLP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water System Control Panel	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
58	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-WOPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water Pumps	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
59	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-WOTK02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Air Separator	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

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No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
60	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.5g	SEIS-WOTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Compression Tank	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
61	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-ESWIS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESWIS	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
62	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-ESWIS-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESWIS	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
63	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44D (16 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
64	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-SIT-FAIL-0.5G	SEISMIC FAILURE OF SITS	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
65	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-SXPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Service Water Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
66	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VGAH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESW Pump Room Supply Fan	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
67	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VKHV10-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CS Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (17 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
68	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VKHV11/12-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
69	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VKHV13/14-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCWP Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
70	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VKHV16-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SC Pump & Mini-flow Hx. Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
71	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VKHV18-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Charging Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (18 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
72	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VOHV32-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chiller & Pump Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
73	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-VOHV33-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFWP Room Cubicle Cooler-MD	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
74	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-WOCH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chillers	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
75	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-WOLP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water System Control Panel	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (19 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
76	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-WOPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water Pumps	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
77	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-WOTK02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Air Separator	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
78	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	0.5g	SEIS-WOTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Compression Tank	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
79	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-SXPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Service Water Pump	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
80	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VGAH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ESW Pump Room Supply Fan	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (20 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
81	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV10-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CS Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
82	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV11/12-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
83	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV13/14-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE CCWP Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
84	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV16-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SC Pump & Mini-flow Hx. Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
85	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VKHV18-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Charging Pump Room Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
86	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VOHV32-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chiller & Pump Cubicle Cooler	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (21 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
87	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-VOHV33-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFWP Room Cubicle Cooler-MD	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
88	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOCH-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chillers	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
89	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOLP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water System Control Panel	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
90	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOPP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Essential Chilled Water Pumps	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
91	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOTK02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Air Separator	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	
92	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-WOTK-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE ECW Compression Tank	
	1.00E+00	SIE-FLAG-TLOCCW	FLAG FOR Seismic-Induced TLOCCW	

Table 19.1-44D (22 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
93	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SI-INV-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE SI INVERTER	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
94	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	AFOPH-S-ALT-LT	Operator Fails to Transfer AFW Source From AFWST to RWT	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Shutdown Cooling Pumps	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
95	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	MSOPH-S-ASC-SLOCA	Operator Fails to Perform Aggressive Secondary Cooling After SLOCA	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	0.5g	SEIS-SIPP02-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Safety Injection Pump	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	

Table 19.1-44D (23 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
96	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
97	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
98	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	

Table 19.1-44D (24 of 24)

No.	BE. Prob.	Cutsets		Sequence Level HCLPF
		Basic Event	Cutset Description	
99	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	1.00E-01	RCOPH-S-SDSE-FW	Operator Fails to Open POSRVs in Early Phase for F&B Operation	
	0.5g	SEIS-AFTP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Turbine Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.3g	SEIS-RCS-LEAK-0.3G	SEISMICALLY-INDUCED SMALL LOCA	
	1.00E+00	SIE-FLAG-SLOCA	FLAG FOR SEISMICALLY-INDUCED SMALL LOCA	
100	1.00E+00	%SEISMIC	DUMMY SEISMIC EVENT	0.5g
	0.5g	SEIS-AFMP-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE AFW Pump-Motor Driven	
	0.5g	SEIS-CSPP01-FAIL-0.5G	SEISMIC INDUCED FAILURE OF THE Containment Spray Pump	
	0.09g	SEIS-LOOP-0.09G	SEISMICALLY-INDUCED LOOP	
	1.00E+00	SIE-FLAG-LOOP	FLAG FOR SEISMICALLY-INDUCED LOOP	
	1.00E-01	SIOPH-S-IRWSTCOOL	Operator Fails to Cool IRWST Water Using SCS Pump	

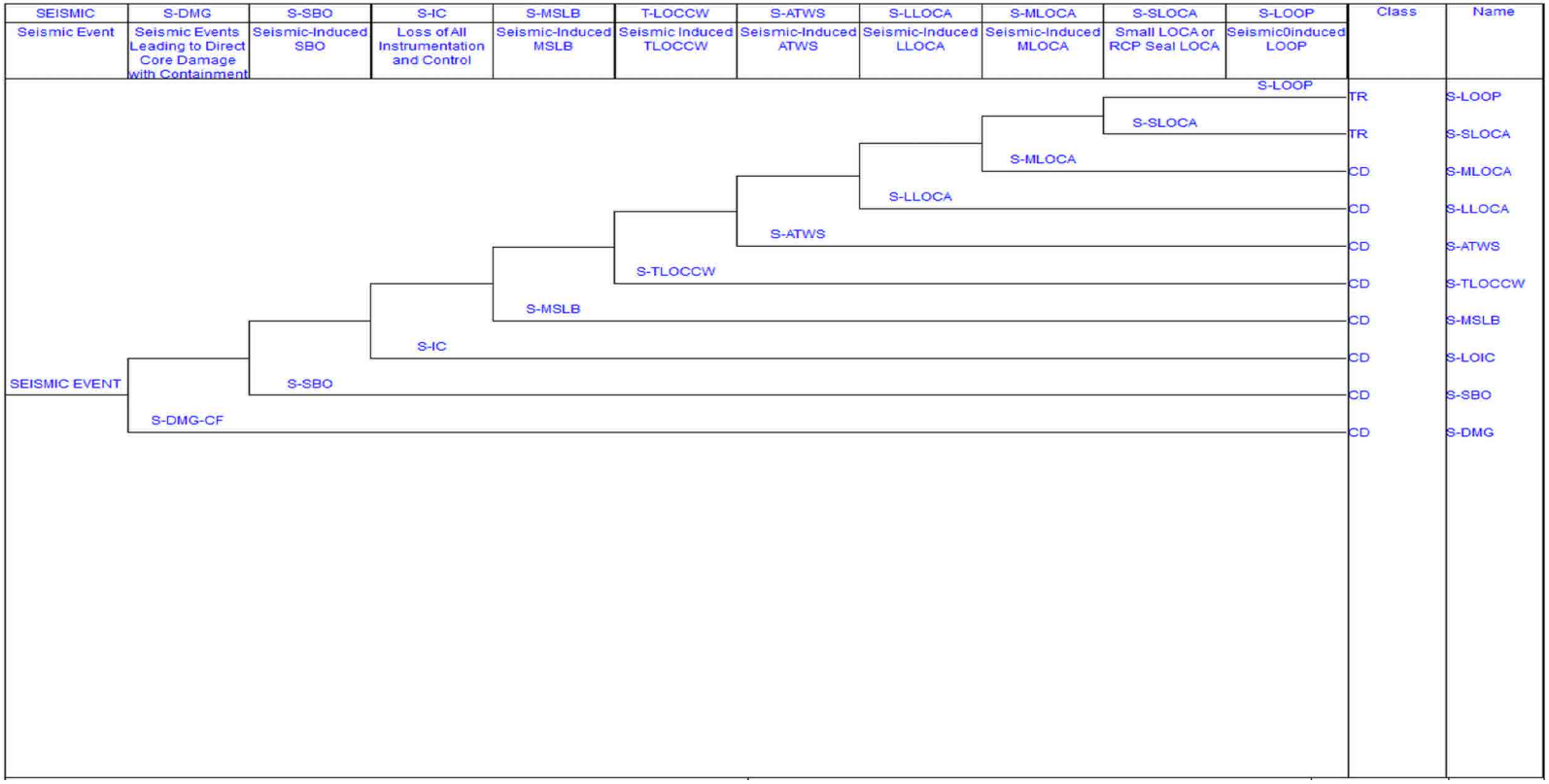

Figure 19.1-48A At-Power Seismic Event Tree

1. At-Power Seismic Event Tree for Core Damage

Seismic event trees for core damage were developed to represent the accident progression and significant equipment failures that can be expected following a seismic event at-power operation. A series of three event trees was developed to model all significant accident sequences. Modeling of all accident sequences begins with the S-LOOP event tree where the initiating event represents any seismic event that causes a loss of offsite power (LOOP). The other one event tree is entered by a transfer from sequences on the first event tree. Multiple event trees are used to reduce the number of sequences shown on any one tree resulting in easier viewing of the pictorial representation. The three event trees are shown in Figures 1 through 3. The accident sequences and top events represented are described below.

1.1 Primary Seismic Event Tree for Core Damage

Modeling of all seismic-initiated accident sequences begins with the S-LOOP event tree, shown in Figure 1. Seismic accident sequences that result in a LOOP are considered in this analysis. Top events shown on the event tree are arranged, from left to right, by decreasing severity. Each top event is described in Table 1. The initiating event S-LOCA and S-LOOP is transferred to secondary Event tree to represent the accident sequence. The other 8 initiating event is treated as direct core damage. Thus, the secondary Event trees for 8 initiating event is not considered.

Table 1 Primary Seismic Event Tree for Core Damage Top Event

Top Event	Top Event Description	Consequence of Sequence
SEISMIC EVENT	Seismic Event	-
S-DMG	Seismic Events Leading to Direct Core Damage with Containment Structural Damage	Direct to Core Damage
S-SBO	Seismic-Indiced SBO	Direct to Core Damage
S-IC	Loss of All Instrumentation and Control	Direct to Core Damage
S-MLSB	Seismic-Induced MSLB	Direct to Core Damage
S-TLOCCW	Seismic Induced TLOCCW	Direct to Core Damage
S-ATWS	Seismic-Induced ATWS	Direct to Core Damage
S-LLOCA	Seismic-Induced LLOCA	Direct to Core Damage
S-MLOCA	Seismic-Induced MLOCA	Direct to Core Damage
S-SLOCA	Small LOCA or RCP Seal LOCA	Transferred to ET “S-SLOCA”
S-LOOP	Seismic Event Causes LOOP	Transferred to ET “S-LOOP”

1.2 S-SLOCA Event Tree

Each top event on the S-SLOCA event tree is described in Table 2.

Table 2 S-SLOCA Event Tree Top Event

Top Event	Top Event Description	Success Criteria
S-SIS	SAFETY INJECTION	1 of 4 SI pumps provides DVI injection
S-SHR	DEL. AFW AND REM. STEAM	1 of 4 AF pumps to 1 of 2 SGs, and 1 MSADV or 1 MSSV on associated SG
S-ASC	AGGRESSIVE SECONDARY COOLING	1 of 4 AF pumps provides AFW to 1 of 2 SGs, 1 of 4 SITs injects borated water into RCS, and RCS is rapidly depressurized using 1 of 2 MSADVs on associated SG on associated SG
S-SCSI	SCS Injection	1 of 2 SCS pumps provides injection from IRWST
S-BLEED	SAFETY DEPRESSURIZATION	2 of 4 POSRVs need to open
S-LHR	CONTAINMENT HEAT REMOVAL	1 of 2 CS pumps provides containment cooling or 1 of 2 SC pumps provides IRWST cooling

1.3 S-LOOP Event Tree

Each top event on the S-LOOP event tree is described in Table 3.

Table 3 S-LOOP Event Tree Top Event

Top Event	Top Event Description	Success Criteria
S-RPC	POSRV STUCK OPEN RECLOSE AFTER RCS PRESS. CHALLENGE	Primary pressure transient limited by steam relief using one MSSV to below POSRV lift setting or all opened POSRV must reclose.
S-SHR	DEL. AFW AND REM. STEAM	1 of 4 AF pumps to 1 of 2 SGs, and 1 MSADV or 1 MSSV on associated SG
S-BLEED	SAFETY DEPRESSURIZATION	2 of 4 POSRVs need to open
S-FEED	SAFETY INJECTION FOR FEED	1 of 4 SI pumps provides DVI injection
S-LHR	CONTAINMENT HEAT REMOVAL	1 of 2 CS pumps provides containment cooling or 1 of 2 SC pumps provides IRWST cooling

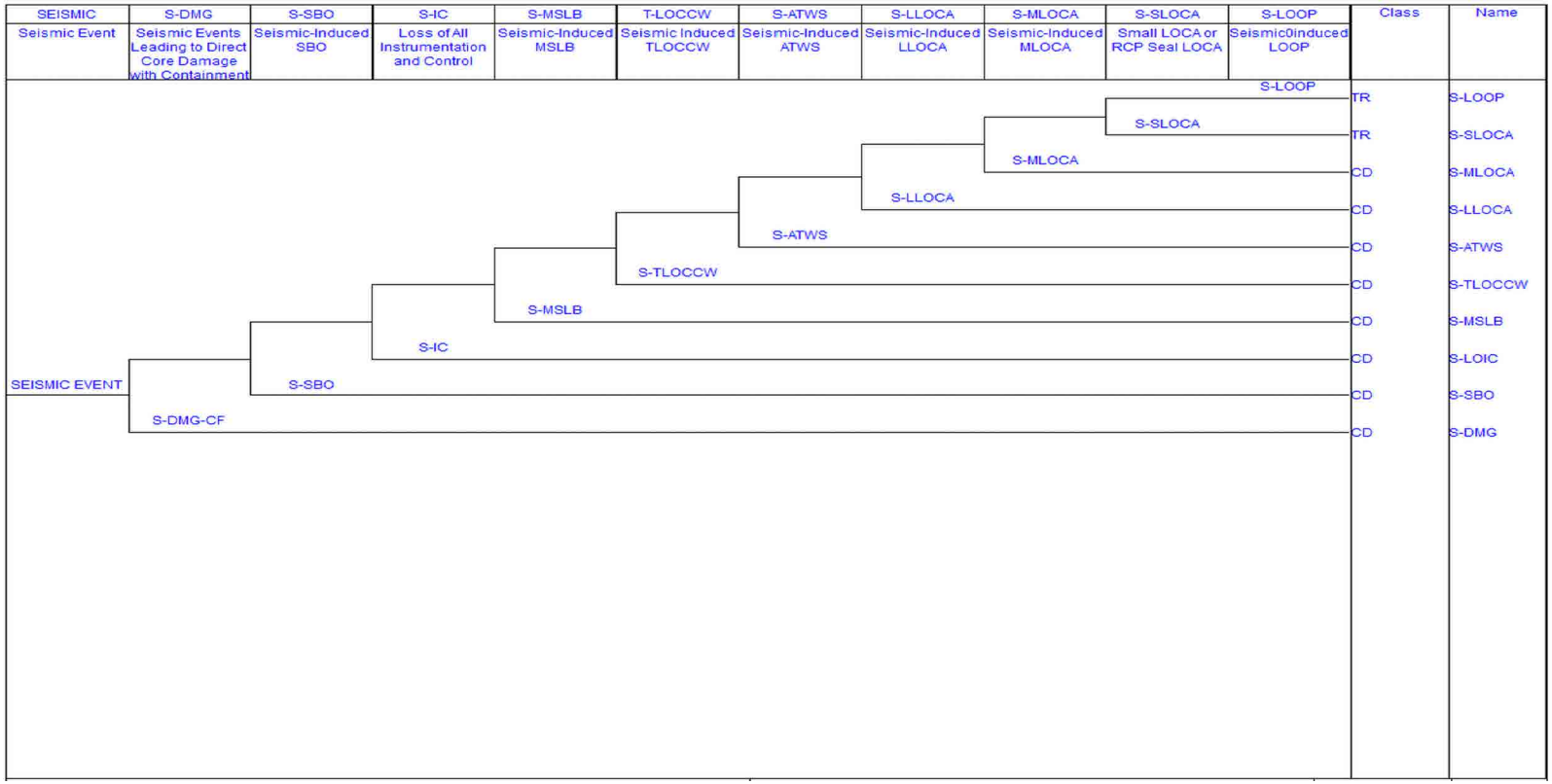

Figure 1 Primary At-Power Seismic Event Tree

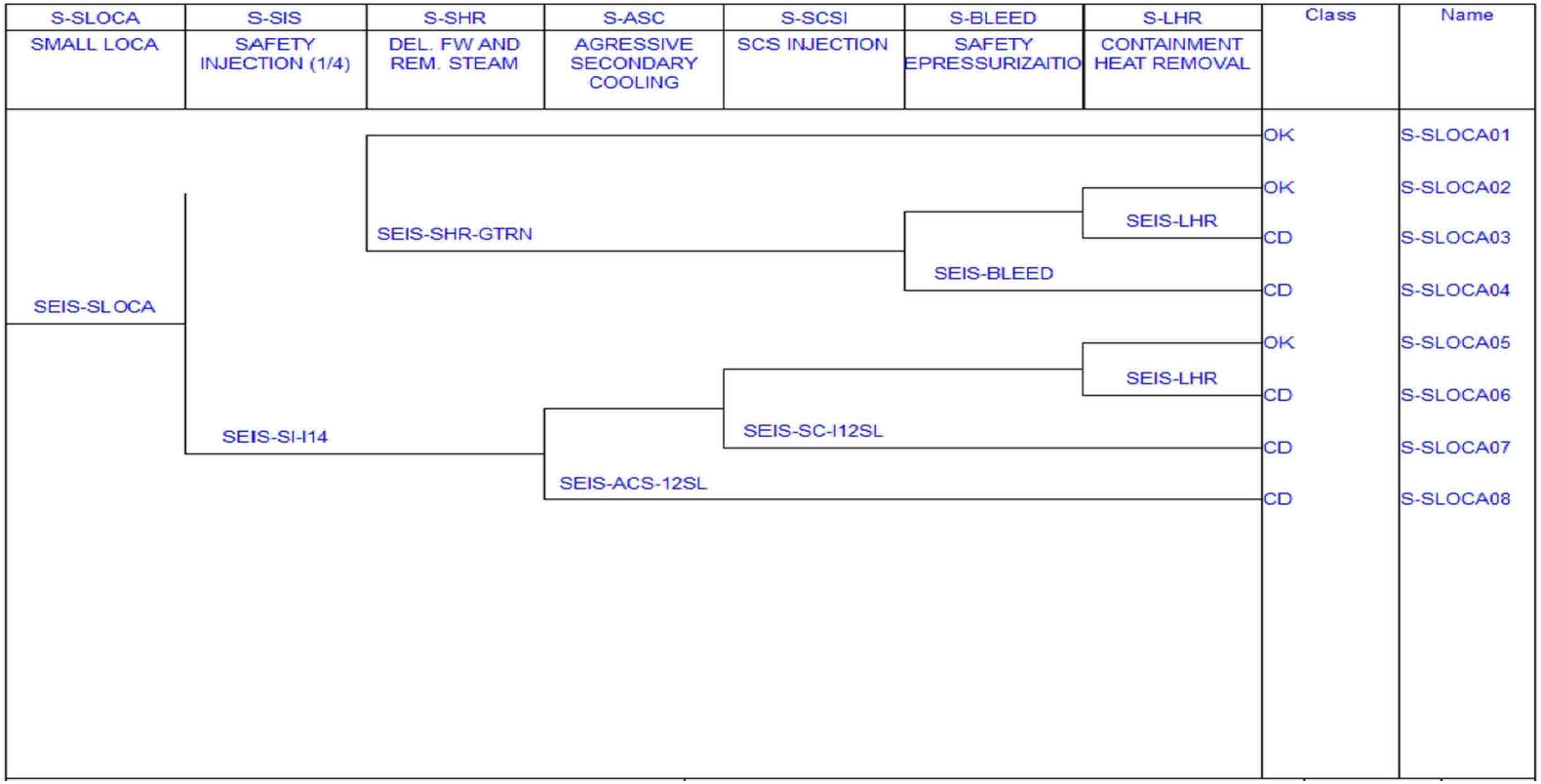

Figure 2 S-SLOCA Event Tree

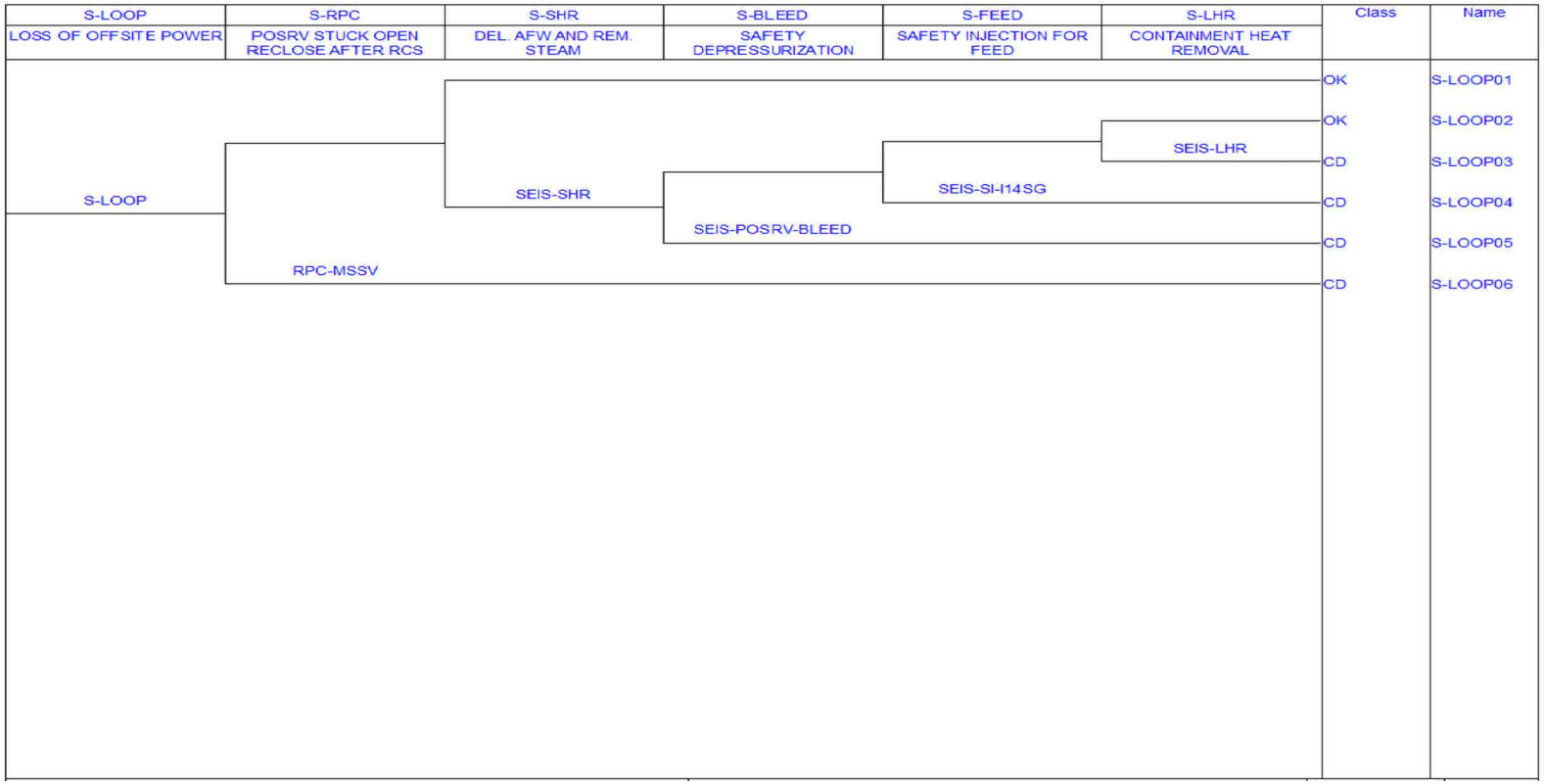

Figure 3 S-LOOP Event Tree

2. Seismic Event Tree for Containment failure

Seismic event trees for containment failure were developed to represent the accident progression and significant equipment failures that can be expected following a seismic event at-power operation. Seismic event trees for containment failure were developed by extending the Seismic event tree for core damage to incorporate containment isolation failure and late overpressure failures as the most probable containment failure modes. The seismic accident sequences for Containment failure are described in Table 4. The seven of total ten seismic initiating events lead to the direct containment failure, and three seismic initiating events are considered the mitigation feature and operator actions. The three event trees which dose not cuase the non direct containment failures are shown in Figures 4 through 6.

Table 4 Seismic Intiating Event for Containment failure

Seismic Initiating Event	Seismic Initiating Event Description	Consequence of Sequence
S-DMG	Seismic Events Leading to Direct Core Damage with Containment Structural Damage	Direct to Containment failure
S-SBO	Seismic-Induced SBO	Direct to Containment Isolation failure
S-IC	Loss of All Instrumentation and Control	Direct to Containment Isolation failure
S-MLSB	Seismic-Induced MSLB	Direct to Containment Isolation failure
S-TLOCCW	Seismic Induced TLOCCW	Containment Isolation and late overpressure failure
S-ATWS	Seismic-Induced ATWS	Direct to Containment failure
S-LLOCA	Seismic-Induced LLOCA	Direct to Containment failure
S-MLOCA	Seismic-Induced MLOCA	Direct to Containment failure
S-SLOCA	Small LOCA	Containment Isolation and late overpressure failure
S-LOOP	Seismic-Induced LOOP	Containment Isolation and late overpressure failure

The top event on the containment failure event tree is described in Table 5.

Table 5 Containment Failure Event Tree Top Event

Top Event	Top Event Description	Success Criteria
S-CIS	CONTAINMENT ISOLATION SYSTEM	Success of the containment isolation
S-CSR1	CONTIANMENT HEAT REMOVAL	1 of 2 CS pumps provides long-term heat removal in recirculation mode

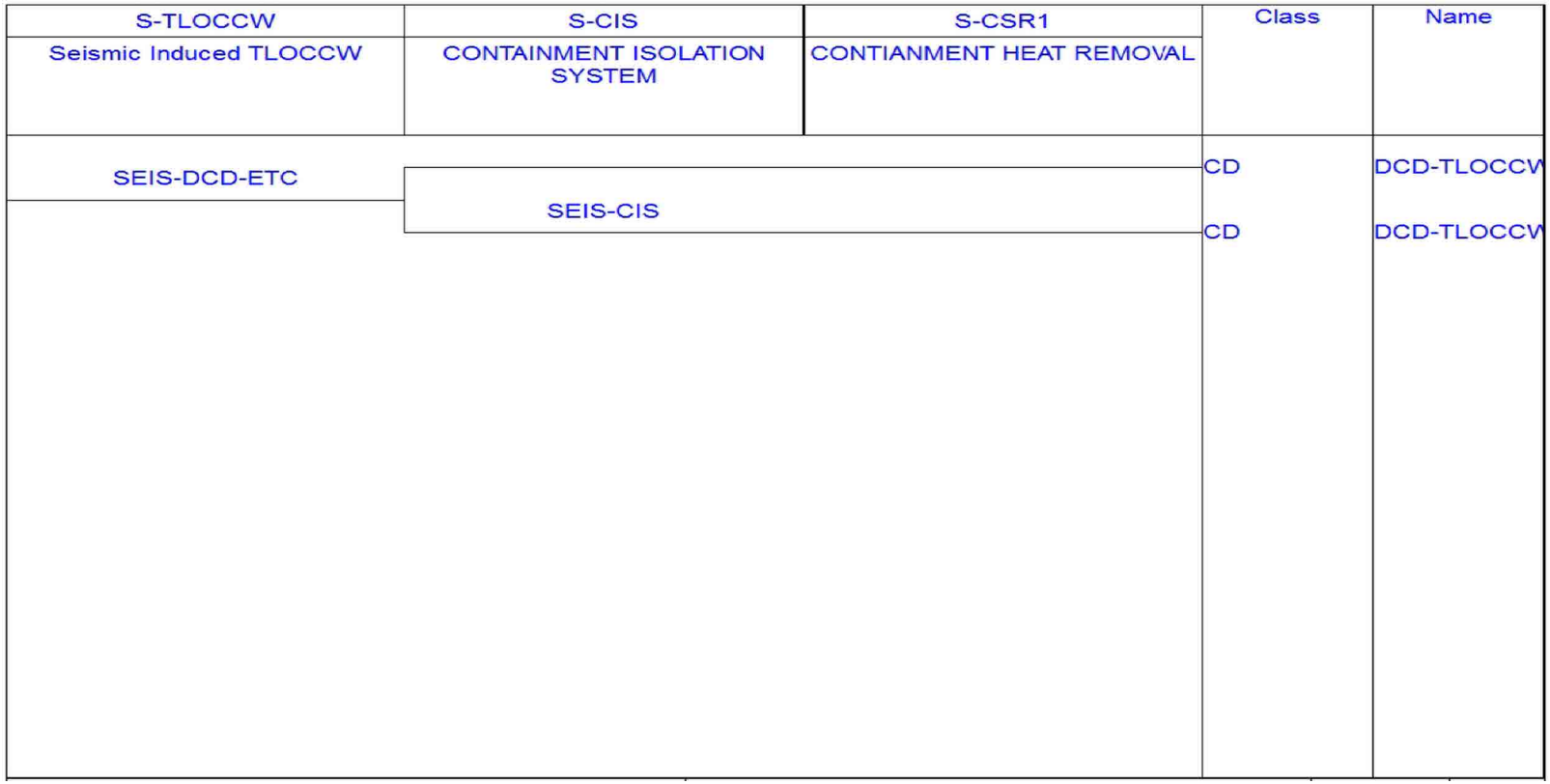

Figure 4 S-TLOCCW Containment Failure Event Tree

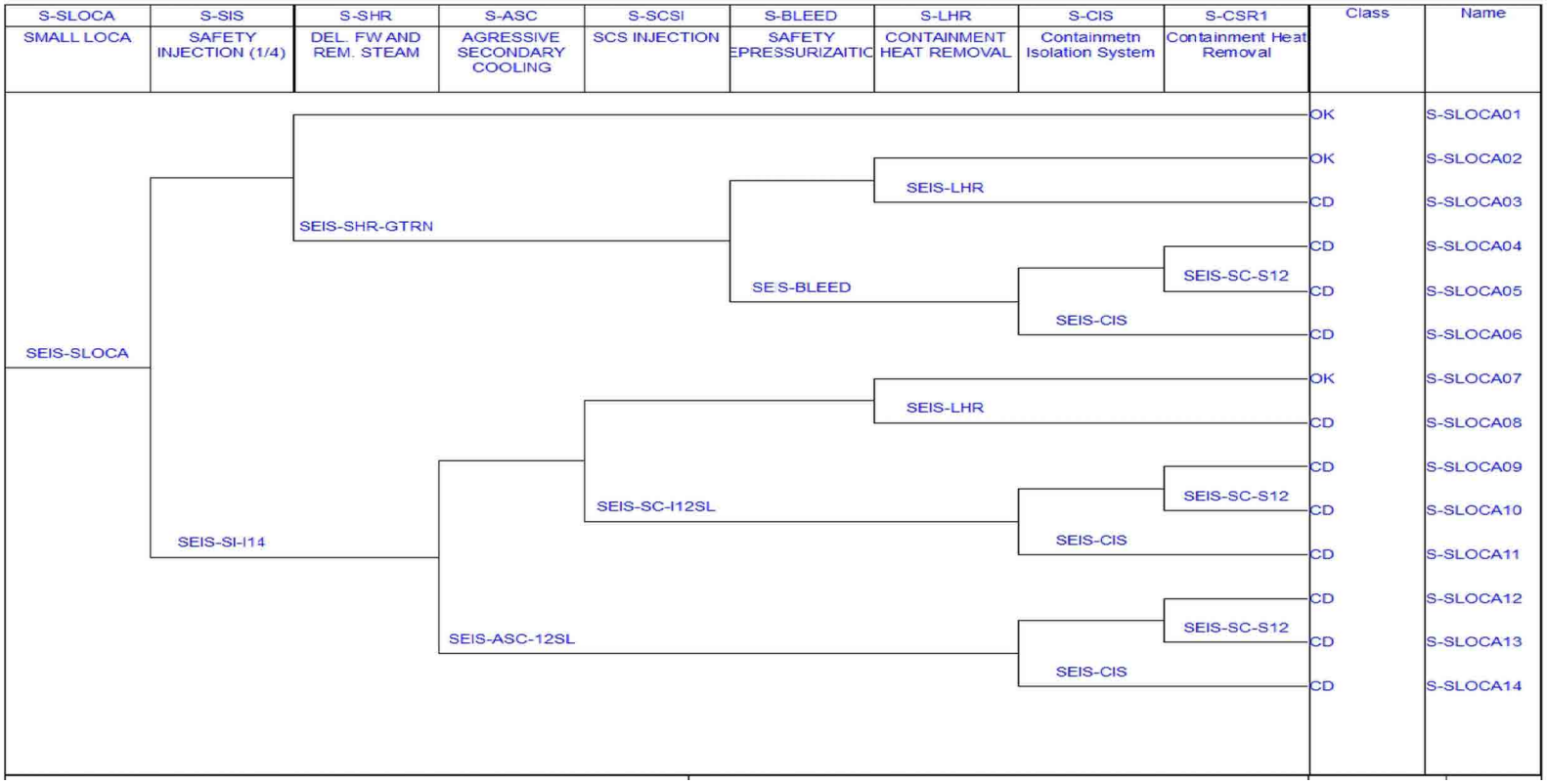

Figure 5 S-SLOCA Containment Failure Event Tree

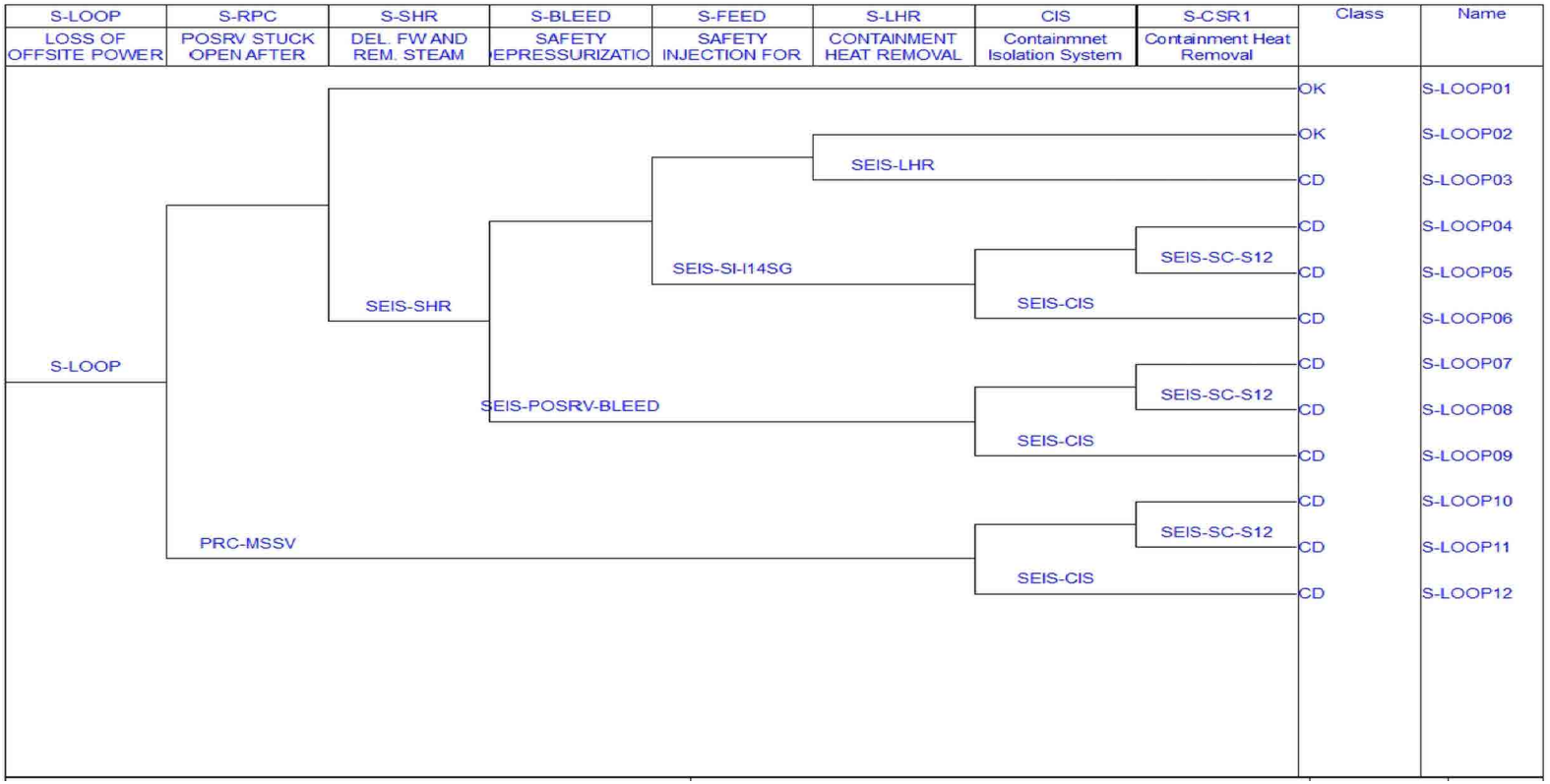

Figure 6 S-LOOP Containment Failure Event Tree

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Reactor Containment building	Reactor Containment building	Tan. shear fail near the base	0.94	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	Containment Bldg Structural Failure and Subsequent RCS Structural Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-CTS-EX-FAIL-0.94G
Reactor Containment Internal	Reactor Containment building	Tan. shear fail near the base	1.09	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	Containment Bldg Structural Failure and Subsequent RCS Structural Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-CTS-IN-FAIL-1.09G
Nuclear Island	CMNT Basement	Sliding toward the turbine building	0.52	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	Containment Bldg Structural Failure and Subsequent RCS Structural Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-NI-FAIL-0.52G
Auxiliary Building	Auxiliary Building	Shear fail of shear wall at the basemat	0.51	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	Aux bldg is assumed to collapse to containment bldg. Containment Bldg Structural Failure and Subsequent RCS Structural Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-AB-FAIL-0.51G
Emergency Diesel Generator Building	Emergency Diesel Generator Building	Shear fail of shear wall at the basemat	0.87	Mitigation Modeling is Required (Failure of EDG A&B Only)	Mitigation Modeling is Required (Failure of EDG A&B Only)	EDG C&D are installed in the Aux Bldg It is not modeled due to high seismic capacity greater than 0.75g.	N/A	-	SEIS-DG-BLDG-FAIL-0.87G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Diesel Fuel Oil Tank Building	Diesel Fuel Oil Tank Building	Shear fail of shear wall at the basemat	0.73	Mitigation Modeling is Required (Failure of EDG A&B Only)	Mitigation Modeling is Required (Failure of EDG A&B Only)	EDG C&D are installed in the Aux Bldg It is not modeled due to the relatively low failure impact (loss of 2 EDGs out of 4 EDGs) and higher HCLPF than EDG components which causes EDG unavailable.	N/A	-	SEIS-DG-FOTK-STRUCT-073G
Turbine Building	Turbine Building	Collapse into Aux Bldg	[1]	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	Turbine bldg is assumed to collapse to containment bldg. Impact to Rx Bldg and Subsequent RCS Catestrophic Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-TB-FAIL-0.5G
Compound Building	Compound Building	Collapse into Aux Bldg	[1]	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	Compound Bldg is assumed to collapse to containment bldg. Impact to Rx Bldg and Subsequent RCS Catestrophic Failure	S-DMG	SIE-FLAG-DMG-CF	SEISMIC-CPD-FAIL-0.5G
Reactor Pressure Vessel	CTMT El. 69'~156'	Column support	0.92	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	RCS Catestrophic Failure is assumed to lead to Containment Structrual Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-RV-RCS-FAIL-0.92G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Reactor Vessel Internal	CTMT El. 69'~156'	Core Sup. Barrel lower flange	0.51	DIRECT CORE DAMAGE due to Loss of Flow through Core	The Direct Containment failure is assumed conservatively considering the relatively high HCLPF	RCS flow through the core is assumed to be blocked due to the Rx Internal Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-RVI-RCS-FAIL-0.51G
CEDM (Control Element Drive Mechanism)	CTMT	Binding of cntrl. extension shaft	0.64	DIRECT CORE DAMAGE is assumed conservatively considering the relatively high HCLPF ATWS	DIRECT Containment Failure is assumed conservatively considering the relatively high HCLPF ATWS	RCS Pressure spike is assumed not supressed for the ATWS	S-ATWS	SIE-FLAG-ATWS	SEIS-CEDM-RCS-FAIL-0.64G
Steam Generator	CTMT El. 114'~136'06"	Anch. fail of snubber lever support asm.	0.6	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	RCS Catestrophic Failure is assumed to lead to Containment Structrual Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-SG-RCS-FAIL-0.6G
Steam Generator Nozzle	CTMT El. 114'~136'06"	Enconomizer nozzle	0.54	DIRECT CORE DAMAGE dut to the very short available operator action time	The Direct Containment failure is assumed conservatively considering the relatively high HCLPF	SG Economizer nozzle failure leads to FWLB. It rapidlly drains S/G secondary side thus operator action time for feed and bleed is very short. Therefore DIRECT CORE DAMAGE is assumed.	S-DMG	SIE-FLAG-DMG-CF	SEIS-SGNOZZ-RCS-FAIL-0.54G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Pressurizer	CTMT El. 114'~156'	Skirt support	0.63	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	RCS Catestrophic Failure is assumed to lead to Containment Structrual Failure	S-DMG	SIE-FLAG-DMG-CF	SEIS-PZR-RCS-FAIL-0.63G
Pressurizer nozzle	CTMT El. 114'~156'	Spray nozzle	0.51	MLOCA	MLOCA	4 inch diameter for PZR spray nozzle	S-MLOCA	SIE-FLAG-MLOCA	SEIS-PZRNOZZ-RCS-FAIL-0.51G
Reactor Coolant System Piping	CTMT	Surge line nozzle	0.55	LLOCA	LLOCA	12 inch diameter for PZR Surge Line Nozzle	S-LLOCA	SIE-FLAG-LLOCA	SEIS-PIPE-RCS-FAIL-0.55G
Reactor Coolant Pumps	CTMT El. 114'~136'06"	Upper horiz.column support	1.31	DIRECT CORE DAMAGE due to RCS Catestrophic Failure i.e. Excessive LOCA	LOSS of CONTAINMENT INTEGRITY is assumed due to Containment Structure Failure	RCS Catestrophic Failure Causes Containment Structrual Failure.	S-DMG	SIE-FLAG-DMG-CF	SEIS-RCP-RCS-FAIL-1.31G
ESWIS	ESW Building	Generic	[5]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-ESWIS-FAIL-0.5G
CCW Hx Building	CCW Hx Building	Generic	[5]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCW-BLDG-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Charging Pumps	AB El. 55'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	Loss of CVCS	N/A	-	SEIS-CVPP01-FAIL-0.5G
Regenerative Heat Exchanger	CTMT El. 114'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	Loss of CVCS	N/A	-	SEIS-CVHX01-FAIL-0.5G
Letdown Heat Exchanger	CTMT El. 100'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	Loss of CVCS	N/A	-	N/A
Auxiliary Charging Pump	AB El. 55'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	Loss of Aux Charging PP	N/A	-	SEIS-CVPP03-FAIL-0.5G
Safety Injection Tanks	CTMT. El. 136' 06"	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	RCS Catestrophic Failure Causes Containment Structrual Failure	N/A	-	SEIS-SIT-FAIL-0.5G
Shutdown Cooling Pumps	AB El. 50'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A	-	SEIS-SIPP01-FAIL-0.5G
Shutdown Cooling Heat Exchanger	AB El. 50'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A	-	SEIS-SIHX01-FAIL-0.5G
SC Pump Miniflow Heat Exchanger	AB El. 50'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A	-	SEIS-SIHX02-FAIL-0.5G
Safety Injection Pump	AB El. 50'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A	-	SEIS-SIPP02-FAIL-0.5G
Containment Spray Pump	AB El. 50'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A	-	SEIS-CSPP01-FAIL-0.5G
CS Miniflow Hx	AB El. 50'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A	-	SEIS-CSHX02-FAIL-0.5G
Containment Spray Heat Exchanger	AB El. 55'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A	-	SEIS-CSHX01-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Main Steam Isolation Valves	AB El. 137'06"	Generic	[1]	DIRECT CORE DAMAGE MSLB	Containment Isolation Failure is assumed due to the steamline break outside containment	No assurance for subcriticality after MSLB. This leads to DIRECT CORE DAMAGE. Broken Steam Line is Considered as Isolation Failure	S-MSLB	SIE-FLAG-MSLB	SEIS-MSIV-FAIL-0.5G
Main Steam Atmospheric Valves(ADV)	AB El. 137'06"	Generic	[1]	DIRECT CORE DAMAGE MSLB	Containment Isolation Failure is assumed due to the steamline break outside containment	No assurance for subcriticality after MSLB. This leads to DIRECT CORE DAMAGE. Isolation of ADV blocik MOV is assumed failed in a very short time after I.E. Broken Steam Line is Considered as Isolation Failure	S-MSLB	SIE-FLAG-MSLB	SEIS-MSADV-FAIL-0.5G
Main Steam Safety Valves	AB El. 137'06"	Generic	[1]	DIRECT CORE DAMAGE MSLB	Containment Isolation Failure is assumed due to the steamline break outside containment	No assurance for subcriticality after MSLB. This leads to DIRECT CORE DAMAGE. Broken Steam Line is Considered as Isolation Failure	S-MSLB	SIE-FLAG-MSLB	SEIS-MSSV-FAIL-0.5G
AFW Pump-Motor Driven	AB El. 78'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A		SEIS-AFMP-FAIL-0.5G
AFW Pump-Turbine Driven	AB El. 78'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	N/A		SEIS-AFTP-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Emergency Diesel Generators	EDG El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DG-FAIL-0.5G
Emergency Diesel Generators (Aux. Building)	AB El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DG-CD-FAIL-0.5G
Emergency Diesel Fuel Oil transfer pump	EDG El. 65'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DOMPS-FAIL-0.5G
Emergency Diesel Fuel Oil transfer pump (Aux. Building)	AB El. 63'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DOMPS-CD-FAIL-0.5G
Starting Air Tank	AB El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DGTK40-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Diesel Fuel Oil Day Tank	EDG El. 121'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DOTK02-FAIL-0.5G
Diesel Fuel Oil Day Tank (Aux. Building)	AB El. 120'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DOTK02-CD-FAIL-0.5G
Diesel Fuel Oil Storage Tank	EDG El. 63'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DOTK01-FAIL-0.5G
Diesel Fuel Oil Storage Tank (Aux.Building)	Aux. El. 65'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DOTK01-CD-FAIL-0.5G
Silencer	AB El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DGSL-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Air Intake Filter	AB El. 109'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DGFT-FAIL-0.5G
Lube Oil Water Hx	AB El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DGHX-FAIL-0.5G
Motor Driven Fuel Oil Feed Pump (EDG Building)	EDG El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DGPP-FAIL-0.5G
Motor Driven Fuel Oil Feed Pump (Aux. Building)	AB El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DGPP-CD-FAIL-0.5G
Essential Service Water Pump	ESW IS. El. 69'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-SXPP-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
CCW Heat Exchangers	CCW Hx Bldg El. 100'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCHX-FAIL-0.5G
CCW Pump	AB El. 55'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCPP-FAIL-0.5G
CCW Surge Tank	AB El. 172'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCTK-FAIL-0.5G
Essential Chilled Water Pumps	AB. El. 78'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-WOPP-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Essential Chillers	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-WOCH-FAIL-0.5G
ECW Compression Tank	AB El. 172'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-WOTK-FAIL-0.5G
ECW Air Separator	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-WOTK02-FAIL-0.5G
Essential Chilled Water System Control Panel	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-WOLP-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
AFWP Room Cubicle Cooler-MD	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VOHV33-FAIL-0.5G
CCWP Room Cubicle Cooler	AB El. 55'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VKHV13/14-FAIL-0.5G
SI Room Cubicle Cooler	AB El. 50' AB El. 55'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VKHV11/12-FAIL-0.5G
SC Pump & Mini-flow Hx. Room Cubicle Cooler	AB El. 50' AB El. 55'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VKHV16-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Mech. Pen. Room Cubicle Cooler	AB El. 100'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCLR-MPR-0.5G
CS Pump Room Cubicle Cooler	AB El. 50' AB El. 55'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VKHV10-FAIL-0.5G
Aux Charging Pump Room Cubicle Cooler	AB El. 55'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCLR-ACVPP-0.5G
Charging Pump Room Cubicle Cooler	AB El. 55'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VKHV18-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Elect. Pen. Room Area Cubicle Cooler	AB El. 120'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCLR-EPA-0.5G
Elect. Pen. Room Area Cubicle Cooler (El. 137')	AB El. 137'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCLR-EPA-137-0.5G
I&C Equipment RooM Cubical Cooler	AB El. 157'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCLR-IC-0.5G
EDG Room Emergency Cubicle Cooler	EDG El. 100'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCLR-EDG-100-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
EDG Room Emergency Cubicle Cooler	EDG El. 135'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-CCLR-EDG-135-0.5G
Essential Chiller & Pump Cubicle Cooler	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VOHV32-FAIL-0.5G
CCW Hx. Room Supply Fans	CCW Hx B El. 100' CCW Hx El. 126'	Generic	[1]	No Impact	No Impact	-	N/A		N/A
ESW Pump Room Supply Fan	ESW IS. El. 90'	Generic	[1]	DIRECT CORE DAMAGE TLOCCW	Mitigation Modeling is Required	It is highly unlikely of long term operation of SI Pumps under seismic event thus DIRECT CORE DAMAGE is assumed	S-TLOCCW	SIE-FLAG-TLOCCW	SEIS-VGAH-FAIL-0.5G
EDG Room Emergency Exhaust Fan (EDG Building)	EDG El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-VGAH02-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
EDG Room Emergency Exhaust Fan (Aux. Building)	AB El. 172'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-VGAH02-CD-FAIL-0.5G
Control Room Emergency Makeup ACU	AB El. 172'	Generic	[1]	No Impact	No Impact	-	N/A		N/A
ESF-CCS GC Cabinet	AB El. 156'	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	ESF-CCS GC, LC and PPS Cabinet Failure is Seismically Correlated. Modleled as a single Event	S-IC	SIE-FLAG-IC	SEIS-ESF-RPS-FAIL-0.5G
ESF-CCS LC Cabinet	AB El. 156' AB El. 137'6"	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	ESF-CCS GC, LC and PPS Cabinet Failure is Seismically Correlated. Modleled as a single Event	S-IC	SIE-FLAG-IC	SEIS-ESF-RPS-FAIL-0.5G
Plant Protection System Cabinet	AB El. 156'	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	ESF-CCS GC, LC and PPS Cabinet Failure is Seismically Correlated. Modleled as a single Event	S-IC	SIE-FLAG-IC	SEIS-ESF-RPS-FAIL-0.5G
Reactor Trip Switchgear	AB El. 137'6"	Generic	[1]	No Impact	No Impact	-	-	-	N/A
MCR Operator Consoles	AB El. 156'	Generic	[1]	No Impact	No Impact	-	-	-	

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
MCR Safety Consoles	AB El. 156'	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-IC	SIE-FLAG-IC	SEIS-RP-PM05-FAIL-0.5G
125V DC Battery Chargers	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-IC	SIE-FLAG-IC	SEIS-DC-BC-FAIL-0.5G
SI Inverter	AB El. 78'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-			SEIS-RC-INV-FAIL-0.5G
120V AC Inverter(VBPSS)	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-IC	SIE-FLAG-IC	SEIS-IPINV-FAIL-0.5G
Regulating Transformer	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-IC	SIE-FLAG-IC	SEIS-IPREGTR-FAIL-0.5G
125V DC Control Center	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by Station Blackout	-	S-SBO	SIE-FLAG-SBO	SEIS-DC-MCC-FAIL-0.5G

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
4.16kV MCSG	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by Station Blackout	-	S-SBO	SIE-FLAG-SBO	SEIS-4KV-BUS-FAIL-0.5G
480V Load Center	AB El. 78'	Generic	[1]	DIRECT CORE DAMAGE LOSS of Control	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-IC	SIE-FLAG-IC	SEIS-480V-LC-FAIL-0.5G
480V MCC(Aux. EL.137'06")	AB El. 137'06"	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	-	-	SEIS-480V-MCC-FAIL-0.5G
480V MCC(Aux. EL.120')	AB El. 120'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	-	-	SEIS-480V-MCC-FAIL-0.5G
480V MCC(Aux. EL.100')	AB El. 100'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	-	-	SEIS-480V-MCC-FAIL-0.5G
480V MCC(Aux. EL.78')	AB El. 78'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	-	-	SEIS-480V-MCC-FAIL-0.5G
480V MCC(ESW IS EL.100')	ESW IS. El. 90'	Generic	[1]	Mitigation Modeling is Required	Mitigation Modeling is Required	-	-	-	SEIS-480V-MCC-FAIL-0.5G
Batteries & Racks	AB El. 78' AB El. 100'	Generic	[1]	DIRECT CORE DAMAGE Station Blackout	Containment Isolation Failure is assumed due to the isolation system failure caused by loss of all control	-	S-SBO	SIE-FLAG-SBO	SEIS-DC-BT-FAIL-0.5G
Off-Site Power	various	Generic	0.09[3]	LOOP is asumed failed	LOOP is assumed failed	-	S-LOOP	SIE-FLAG-LOOP	SEIS-LOOP-0.09g

Table. At-Power PRA-based SMA FMEA Results

SSCs	Location	Failure mode	HCLPF (g)	FMEA for Core Damage	FMEA for Containment Failure	Remark	IE ID in Seismic ET	IE FLAG in Seismic ET	Basic Event ID
Reactor Coolant System	various	Generic	0.3[4]	SLCOA Small Leak from RCS is assumed at SSE	SLCOA Small Leak from RCS is assumed at SSE	-	S-SLOCA	SIE-FLAG-SLOCA	SEIS-RCS-LEAK-0.3g
BOP Piping & Supports	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
HVAC Ducting & Dampers	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
Cable Trays & Supports	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
Motor Operated Valves	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
Air Operated Valves	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
Electrical Conduit	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
Relief and Check Valves	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
Resistance Temperature Detectors	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to high HCLPF	-	-	SEIS-ALL-SSC-0.75g
Pressure Transmitters	various	Generic	> 0.75g[2]	S/O due to high seismic ruggedness	S/O due to high seismic ruggedness	SSCs Screened out due to HCLPF	-	-	SEIS-ALL-SSC-0.75g

Key Assumptions

[1] The component is assigned to COL item (COL 19.1.(8)) and HCLPF value is assumed to be equal to or exceed 1.67 times CSDRS

[2] Inherently Ruggedness Item were assumed as CSDRS x 2.5 = 0.75g

- EPRI-1025287 (Reference 78) COL item (COL 19.1.(8))

[3] HCLPF based on generic value from Risk Assessment of Operational Events Handbook Volume 2 - External Events, R.1.01, January 2008, USNRC (Reference 79).

[4] HCLPF based on Option 2 in "SPRA implementation guide", EPRI 3002000709 (Reference 77)

[5] ESW IS and CCW HX Building are assigned to COL item (COL 19.1(8)) and HCLPF value is assumed to be equal to or exceed 1.67 times GMRS.

APR1400 SMA – ISG-020 Implementation (At-Power)

DC-COL ISG-020 Guidance	Implementation	Met
(1) seismic accident initiation events;	Seismic Accident initiating event are selected based on FMEA in Section 19.1.5.1.1.4 of the DCD Markup	Yes
(2) a summary of the operating modes, accident sequences and event/fault trees, and damage levels considered in the analysis;	a summary of the operating modes, accident sequences and event/fault trees, and damage levels considered in Section 19.1.5.1.1.4 of the DCD Markup	Yes
(3) the definition of the response spectrum shape used for the fragility analysis of SSCs, accident sequences, and the plant;	For the APR1400, the RLE is selected based on the design response spectra of the site-independent SSE which is developed from the certified seismic design response spectra (CSDRS) in Section 19.1.5.1.1 a of the DCD Markup	Yes
(4) identification of the methods used to calculate sequence-level and plant-level HCLPFs for the sequences, operating modes, and damage levels considered;	The methodology of the seismic risk evaluations are described in Section 19.1.5.1.1 f of the DCD Markup	Yes
(5) a table with the capacities (e.g., in terms of the median and logarithmic standard deviation of the fragilities) for the SSCs in the SEL;	It is shown in Table 19.1-43	Yes
(6) a summary description of the methods used for the derivation of the component fragilities, including a summary of how the component probability of failure is related to the ground motion parameter;	The methodology of the seismic risk evaluations are described in Section 19.1.5.1.1 of the DCD Markup	Yes

APR1400 SMA – ISG-020 Implementation (At-Power)

DC-COL ISG-020 Guidance	Implementation	Met
(7) for equipment in the SEL which is qualified via tests, a description of the procurement specifications including the enhanced RRS as described in Section 5.1.2 of this ISG to ensure appropriate HCLPF capacity of the procured equipment;	The methodology of the seismic risk evaluations are described in COL 19.1(8) of the DCD Markup	Yes
(8) risk-significant SSCs, dominant cut-sets and sequences, and seismic event/fault trees;	The results of the seismic risk evaluations are described in Section 19.1.5.1.2.4 and table 19.1-44A/B/C/D of the DCD Markup	Yes
(9) sequence-level and plant-level HCLPF capacities for the operating modes and damage levels;	The results of the seismic risk evaluations are described in Section 19.1.5.1.2.4 and table 19.1-44A/B/C/D of the DCD Markup	Yes
(10) a summary of independent peer reviews; and,	Given the limited information available at the DC stage for the PRA-based SMA, a peer review will be conducted after a plant specific Seismic PRA by COL holder. [1)]	Yes
(11) analysis assumptions, COL action items, interface items, and post licensing activities.	These related items are described in Section 19.1.5.1.1.4.9 for analysis assumption and 19.0.1 for COL items of the DCD Markup	Yes

Note 1): In order to review the PRA technical adequacy, a self-assessment was performed for the PRA-based SMA. Any findings and observations from self-assessment are dispositioned to provide reasonable assurance that issues are capture and addressed. Any changes required or affecting PRA model and associated documentation are conducted in a manner consistent with DCD section 19.1.2.4.