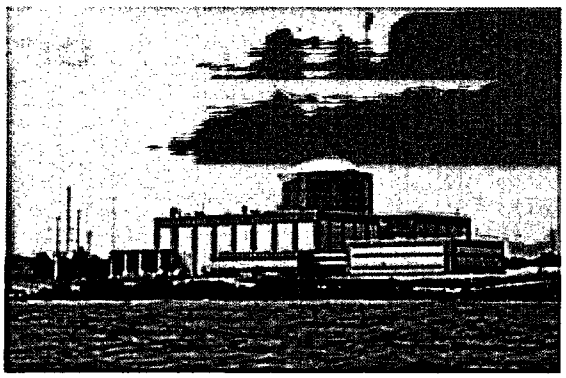

Safety Significance Evaluation of Kewaunee Power Station Turbine Building Internal Floods

Volume 2

Revision 1

December 1, 2005

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Appendix D

Accident Sequence Analysis

Accident Sequence Analysis

Owner's Acceptance: THOMAS G HOOK — THOMAS G. HOOK

Signature — Print Name

12/01/05

Date

Kewaunee Power Station

Accident Sequence Analysis for Turbine Building Floods

Effective Date: November 2005

R. SHARPE VIA EMAIL — 12/01/05

Prepared By: Russell Sharpe — Date

R. J. DREMEL VIA EMAIL — 12/01/05

Reviewed By: R. J. Dremel — Date

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1.0 PURPOSE

The purpose of the internal flooding accident sequence analysis is to define, analyze, and document the potential flooding scenario results at Kewaunee Power Station (KPS) for initiating events caused by breaks of non-safety-related piping in the Turbine Building before February 2005. That is, the analysis considers the plant prior to installation of the flood mitigation modifications in and around safeguards alley. Flooding events caused by earthquakes are considered separately.

The following information is identified, correlated, and developed as part of this analysis:

- Initiating events for breaks caused by failures of non-safety-related piping in the Turbine Building
- Equipment susceptible to flood damage for each initiating event
- Propagation pathways for each initiating event
- Accident progression and sequence timing

2.0 MODEL DEVELOPMENT

Internal flooding analysis encompasses the effects from the accumulation of fluids arising from the rupture, cracking or incorrect operation of components within the station. In practice, major internal floods have occurred in nuclear power plants, for example, from the rupture of pipes, valves and expansion joints as well as from operator errors during plant maintenance activities. Potential internal flood sources from non-safety-related piping located in the Turbine Building are considered in this analysis. Flooding events caused by safety-related piping or piping located outside of the Turbine Building are outside the scope of this analysis.

The steps for conducting the internal flooding accident sequence analysis are described in the following section.

2.1 Steps for Turbine Building Internal Flooding Accident Sequence Analysis

The analysis of the Turbine Building internal flooding accident sequences consists of the following steps:

1. Review information collected from the internal flooding walkdown, including flood areas, possible flood sources, critical flood heights for equipment modeled in the PRA, drainage capacities and paths, flood detection instrumentation, interconnecting areas, and potential barriers (curbs, dikes, doors, etc.)

2. Collect other necessary information, including the floor area of the flood areas, and identification of which system trains have piping in each flood area.

3. Determine the potential damage scenarios presented in each flood area (e.g., submergence, humidity or temperature, flood egress or ingress, etc.).

4. Identify any areas that may be easily screened from further analysis.

5. Determine the potential flood scenarios for each flood area, including damage within the area, flood egress from the area, damage to connecting areas and associated flood heights, detection of the flood, potential means of isolation, and potential for unisolated floods to fill multiple flood areas.

6. Identify the initiating event that could occur due to the flood (e.g., manual trip, loss of a service water train, loss of main feedwater, etc.) and associated equipment damage, and the corresponding accident sequence progression.

7. Calculate the timing associated with flood detection and isolation, based on break flow rate, location of detection instrumentation and PRA equipment, floor area of the associated areas, flood level alarm depths, and equipment critical flood heights.

The results from each of these steps are presented in Section 5.0 of this appendix.

Following development of the flood scenarios and corresponding accident progression, the event trees and system fault trees are then developed and quantified in order to evaluate the effects of Turbine Building flooding events in each flood area in terms of the resulting accident sequence frequencies. The new models and resultant quantification are documented in a separate report.

2.2 Turbine Building Internal Flooding Major Assumptions

The key assumptions that were made during the internal flooding accident sequence analysis are discussed in Section 5 for each of the specific flooding scenarios. In addition, the following general assumptions apply:

1. Analysis of equipment in the Auxiliary Building, with the exceptions of Bus 1 and Bus 2 and the water level in the vicinity of the safety injection pumps, was not performed as part of this

study. This assumption is valid because no other equipment in the Auxiliary Building was credited in the analysis.

2. While some of the supporting documentation for this flooding analysis states that no safety-related equipment is damaged by flooding events, this flooding analysis makes no such assumption. Much of the equipment analyzed in this flooding study is safety-related and is modeled as failed due to a flooding event.

3. Analyses [CALC03] show that the bottom row of circuit breakers on buses 51, 52, 61, and 62 will fail open when level on them reaches 2.75 inches. For all accident scenarios, it is assumed there is no time to isolate a flood before this depth is reached, and that these loads will be lost. The most important PRA equipment that is powered by these breakers includes Fire Pump A (Breaker 15106), both Motor Driven AFW Pump auxiliary lube oil pumps (Breakers 15206 and 16206), both Safety Related Battery Chargers (Breakers 15206 and 16206), Battery Room Exhaust Fan A (Breaker 15206), and Battery Room Exhaust Fan B (16206). These analyses also show that other loads on the buses are not impacted until level reaches a much higher flood level.

4. Analyses [CALC03] show that when the water level reaches 4 inches on buses 5 and 6, the circuit breakers for all motor loads on the bus could fail open. However, the transformers from the 4 kV buses to the 480 V buses are not affected. Therefore, although all motor loads on buses 5 and 6 will be failed at a flood depth of 4 inches, there could still be power available to buses 51, 52, 61, and 62.

5. With the exception of the circuit breakers on the bottom row of buses 51, 52, 61, and 62, and the motor load breakers on buses 5 and 6 the flood-induced failure of a bus or MCC is assumed to fail all associated circuit breakers at the same time. For all other buses, no distinction is made between the failure of a circuit breaker within a bus and failure of the bus itself. Therefore, explicit consideration of circuit breakers, other than the bottom row on buses 51, 52, 61, and 62, and the motor load breakers on buses 5 and 6, is not needed.

6. The critical flood heights (CFH) for the PRA equipment were obtained from outside analysis [CALC03]. The CFH is the water depth at which a piece of equipment will become disabled due to submergence. The following flood heights were obtained from outside analysis:

Component	Critical Flood Height (inches)
4 kVAC Bus 5	18
4 kVAC Bus 5 Motor Loads	4
4 kVAC Bus 6	18

Component	Critical Flood Height (inches)
4 kVAC Bus 6 Motor Loads	4
480 VAC Bus 51 Bottom Breakers	2.75
480 VAC Bus 51	11
480 VAC Bus 52 Bottom Breakers	2.75
480 VAC Bus 52	11
480 VAC Bus 61 Bottom Breakers	2.75
480 VAC Bus 61	11
480 VAC Bus 62 Bottom Breakers	2.75
480 VAC Bus 62	11
Turbine Driven AFW Pump (Fail to Start)	9
Turbine Driven AFW Pump (Fail to Run)	18
Motor Driven AFW Pump A (Fail to Start)	9
Motor Driven AFW Pump A (Fail to Run)	13
Motor Driven AFW Pump B (Fail to Start)	9
Motor Driven AFW Pump B (Fail to Start)	13

7. The isolation times required to prevent reaching the CFH for various pieces of equipment during each flood scenario are determined from a separate GOTHIC analysis [CALC01]. The following isolation times were obtained from the analysis:

Flood Scenario	Time (min)	Water Level Prevented / Component Saved	GOTHIC Case
CX – 14,000 gpm Circulating Water Break	N/A	2.75 inches 480 V Bus 51/52, 61/62	

INTERNAL FLOODING – Accident Sequence Analysis for Turbine Building Floods

Flood Scenario	Time (min)	Water Level Prevented / Component Saved	GOTHIC Case
	13	4 inches 4 kV Bus 5	14kC
	19	9 inches TDAFP ALOP	14kC, 14kA
	22	11 inches 480 V Bus 61/62	14kC, 14kA
	22	4 inches 4 kV Bus 6	14kC, 14kA
	25	13 inches MDAFP	14kC, 14kA
	25	18 inches Turbine Bldg	14kC, 14kA
	33	18 inches TDAFP	14kC, 14kA
SI – 6000 gpm Service Water Break	N/A	2.75 inches 480 V Bus 51/52, 61/62	
	29	4 inches 4 kV Bus 5	6000A
	45	9 inches TDAFP ALOP	6000B1
	52.5	11 inches 480 V Bus 61/62	6000B1, 6000C
	51	4 inches 4 kV Bus 6	6000B1, 6000C
	60	13 inches MDAFP	6000C
	66	18 inches Turbine Bldg	6000C, 6000D
	78	18 inches TDAFP	6000C, 6000D
FI – 6000 Fire Protection Water Break	N/A	2.75 inches 480 V Bus 51/52, 61/62	
	29	4 inches 4 kV Bus 5	6000A, 18
	45	9 inches TDAFP ALOP	6000B1, 18
	56	11 inches 480 V Bus 61/62	6000B1, 18
	62	4 inches 4 kV Bus 6	6000B1, 18
	68	13 inches MDAFP	6000B1, 18
	N/A	18 inches Turbine Bldg	
	N/A	18 inches TDAFP	
TI – 6000 gpm Steamline Break (sprinkler discharge)	N/A	2.75 inches 480 V Bus 51/52, 61/62	
	29	4 inches 4 kV Bus 5	6000A, 18
	45	9 inches TDAFP ALOP	6000B1, 18
	56	11 inches 480 V Bus 61/62	6000B1, 18
	62	4 inches 4 kV Bus 6	6000B1, 18
	68	13 inches MDAFP	6000B1, 18
	N/A	18 inches Turbine Bldg	
	N/A	18 inches TDAFP	
WX – 2000 gpm Feedwater Break (sprinkler discharge)	N/A	2.75 inches 480 V Bus 51/52, 61/62	
	55	4 inches 4 kV Bus 5	16
	97	9 inches TDAFP ALOP	16, 19
	120	11 inches 480 V Bus 61/62	19
	120	4 inches 4 kV Bus 6	19

Flood Scenario	Time (min)	Water Level Prevented / Component Saved	GOTHIC Case
	N/A	13 inches MDAFP	
	N/A	18 inches Turbine Bldg	
	N/A	18 inches TDAFP	
TX – 2000 gpm Steamline Break (sprinkler discharge)	N/A	2.75 inches 480 V Bus 51/52, 61/62	
	100	4 inches 4 kV Bus 5	2000D
	150	9 inches TDAFP ALOP	
	170	11 inches 480 V Bus 61/62	
	170	4 inches 4 kV Bus 6	
	N/A	13 inches MDAFP	
	N/A	18 inches Turbine Bldg	
	N/A	18 inches TDAFP	
WI – 6000 gpm Feedwater Break (sprinkler discharge)	N/A	2.75 inches 480 V Bus 51/52, 61/62	
	18	4 inches 4 kV Bus 5	10
	33	9 inches TDAFP ALOP	9,11
	40	11 inches 480 V Bus 61/62	11
	41	4 inches 4 kV Bus 6	11
	54	13 inches MDAFP	7, 11
	N/A	18 inches Turbine Bldg	
	N/A	18 inches TDAFP	

8. No credit is taken for the 6-inch curb that used to protect DG 1B and 4 kVAC Bus 6. This is a conservatism in the analysis since the curb would afford the operator more time to isolate the break before 4 inches of water accumulates resulting in the tripping of the breakers associated with the motor loads. A longer isolation time would in turn result in a lower human error probability (HEP) for that isolation event. A lower HEP could then result in a lower core damage frequency.

9. It is assumed that the flood-induced loss of Reserve Auxiliary Transformer (RAT) Auxiliaries powered from 480 VAC MCC-42A will not cause a failure of the RAT during the postulated flooding events. The RAT Auxiliaries provide oil circulation and fans for transformer cooling. These auxiliaries are powered from MCC-42A, which is located in the southeast corner area of the Turbine Building Basement. MCC-42A and MCC-42G share a common breaker on 480V Bus 42. MCC-42G is located on the west side of Turbine Mezzanine between the Feedwater heaters.

   The loss of the RAT auxiliaries reduces the RAT capacity from 40 MVA to 24 MVA. The stopping of the Main Feedwater (5000 hp) or Reactor Coolant (6000 hp) Pumps would

reduce the load with in this limit. The flooding event will cause a loss of Main Feedwater Pumps early in the event thus reducing load on the RAT to less than 24 MVA. In general, as the flood causes breakers to trip the load on the RAT is reduced. See Attachment 4 for a detailed explanation.

10. It is assumed that the postulated flooding events will not cause a lockout of the RAT. In the event that power was lost to MCC 42A as a result of a Turbine Building flooding event, the only impact on the Reserve Auxiliary Transformer would be the loss of its associated cooling fans. This is shown on drawing XK-108-8 [DWG01]. The loss of the supplemental cooling fans does not cause a transformer lockout. A loss of the fans only reduces the rated output of the transformer.

    There is a contact off of a lockout auxiliary relay that is used in the fan control circuit. However, this only results in the tripping of the fans in the event of a transformer lockout. It will not cause a transformer lockout

11. It is assumed that sufficient fuel oil is normally present in the fuel oil storage tanks to support 24 hours of operation of the Technical Support Center (TSC) diesel generator. See Attachment 6 for a detailed explanation.

12. It is assumed that the pressurizer heaters are not required during accident mitigation. During a natural circulation cooldown, two procedures can be used. The first procedure, ES-0.2 - Natural Circulation Cooldown [PROC01], is used assuming pressure control is available. Pressure control would be available via the Pressurizer Heaters since Pressurizer Spray requires forced circulation (Reactor Coolant Pumps) to work. The second procedure, ES-0.3 - Natural Circulation Cooldown with Steam Void in Vessel [PROC02], is used if pressure control has been lost. Steam voids in the Reactor Vessel head form when Pressurizer pressure control is lost, which would include the loss of Pressurizer Heaters. Both of these procedures are in accordance with the WOG emergency operating procedure guidelines.

13. It is assumed that it is possible to manually operate the steam generator PORV without electric power or compressed air. See Attachment 5 for a detailed explanation.

14. No fire protection water, service water, circulating water, condensate, or feedwater piping included in the initiating event frequency is located in the vicinity of Buses 3 and 4. Therefore, failure of the buses from these sources is not credible, except in that case of a high-energy line break (HELB) as discussed in the following assumption.

15. For feedwater and steam line breaks, Buses 3 and 4 are assumed to be unavailable to supply loads credited in accident mitigation. Following a steam line or feedwater line break, the steam atmosphere expected in the Turbine Building in conjunction with the spray flow from

the actuated fire protection system is expected to render these buses unreliable. See Attachment 3 for a detailed explanation.

16. Loss of offsite power from the RAT is considered to have a negligible contribution to overall risk and is not considered in the accident sequence analysis.

17. If flow from a break is not stopped before water level in the Turbine Building reaches 18-inches, then core damage is assumed. At a level of 18-inches in the Turbine Building, water level in the safeguards alley will eventually fail all equipment located there along with both electrical safety trains.

18. The use of AFW crossover valves to control S/G level and the potential of grounds would have little impact on battery availability. See Attachment 1 for a detailed explanation.

19. Although analysis and subsequent testing conclude that there is a legitimate probability that such motor loads will remain available since the associated lockout relays might not be picked up, thereby failing to automatically isolate the motor loads when the water level reaches 4 inches, this analysis does not credit the motor loads powered from 4 kVAC Buses 5 and 6 when water level reaches 4 inches in the vicinity of the buses.

20. GOTHIC analysis [CALC01] indicates that a flooding event originating in the Turbine Building will not deposit enough water into the Auxiliary Building to threaten the Safety Injection pumps with submergence failure.

21. For HELB scenarios where operator action to isolate flow from fire protection system sprinklers is required, calculations [CALC01] have shown that isolation of the Turbine Oil Reservoir deluge system and Hydrogen Seal Oil deluge system flows in the turbine building basement can be delayed for at least 60 minutes after isolating flow from the four main sprinkler headers on the turbine building mezzanine. Case 27 of [CALC01] shows that if flow from the four main sprinkler headers is isolated at 33 minutes, then isolating flow from the two deluge systems in the basement can be delayed for an additional 60 minutes without changing the overall accident sequence timing. (Since the vast majority of flow from the basement deluge systems is from the Turbine Oil Reservoir deluge system, isolation of flow from the Seal Oil system could be delayed even longer.) Therefore, it can be assumed for timing in the HRA that isolation of sprinkler flow is successful if flow from the four main fire sprinkler headers is secured within 33 minutes. The additional human error probability (HEP) for isolating the deluge systems in the basement can be considered negligible, since the cognitive portion of that action comprises most of the HEP and would be successful when the action to isolate the four main sprinkler headers succeeds.

3.0 UNIT DIFFERENCES

Kewaunee Power Station is a single unit site so there are no unit differences.

4.0 RISK MONITOR CONSIDERATIONS

The risk monitor used at KPS is the Safety Monitor. Changes to the Safety Monitor model are outside the scope of this analysis.

5.0 ACCIDENT SEQUENCE ANALYSIS

The first step in the internal flooding PRA accident sequence analysis is to correlate and summarize pertinent information from other documents. Accident-specific progression is then developed.

5.1 Analysis of KPS Internal Flood Areas

Figure 5-1 presents the layout of the Turbine Building basement and Safeguards Alley including flood area designations. Table 5-1 consolidates and summarizes the pertinent information from the Flood Area Definitions (Appendix B), and other sources, in order to determine the possible internal flooding scenarios at KPS. Table 5-1 presents the following information:

- The Flood Area identifier for each area.
- The possible sources of flooding present in the flood area (obtained from KPS Internal Flooding Screening Assessment [NB01]), and the type of hazard each source presents. Hazards include submergence (su), temperature (temp), and humidity (hu). In addition, the table also indicates whether the source contains only a limited volume of fluid.
- The equipment contained in the flood area that is modeled in the internal events PRA.
- The potential damage scenario(s) for the flood area. Potential scenarios include whether the equipment contained in the area may be damaged due to submergence or spray.
- The flood detection method that exists for the flood scenario. Most flood areas do not contain detection instrumentation within the area; instead flood detection instrumentation is typically contained within the lower areas in a building to which the other areas are designed to drain.
- The propagation paths for fluid egress from the flood area. Egress paths may include propagation due to open communication via unsealed penetrations (pen), open stairwells, open doorways, open access ways (i.e., no wall separating flood areas), drains, gaps under

closed doors, etc. or via hazard barriers that fail due to sufficient accumulation of water.

- The connecting flood area, building, or plant area to which a flood may propagate.

- Whether equipment may be damaged in the connecting area due to flood ingress. If the connecting area does not contain PRA equipment, or the drainage capacity exceeds the flood ingress rate, no damage will occur. Similarly, if the flood source is of limited volume (i.e., all sources except Circulating Water (CW), Service Water (SW) and Fire Protection Water (Fire) are finite sources, although some are of sufficient volume to propagate, such as lines connecting to the CST and RWST, or may cause damage due to splashing) limited damage is expected due to propagation. For connecting areas where PRA equipment damage may occur due to flood ingress, the user is directed to the table entry for that area to determine the equipment that may be damaged.

Table 5-1
Summary of KPS Flood Areas

Area	Sources	PRA Equipment	Damage Scenario	Drainage Paths	Drainage Capacity (gpm)	Flood Detection	Propagation Paths	Connecting Area	Equipment Damage
TU-22-1	Fire SW CW FW Main Stm (su)	Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pmp 1A Plt Equip Wtr Pmp 1B MCC-32D MCC-42B MCC-42D AOV PW-52	Submergence Spray	Drains to Turb Bldg sump	200	Sump High-High-High Level Alarm	Door 4 Door 6 Door 401 Drains Drains	TU-95B-1 TU-95B-1 TU-94 TU-95B-1 TU-94	Yes Yes Yes Yes Yes
TU-90	SW Fire (su)	4 kVAC Bus 5 MCC 52A EDG 1A MOV SW-10A	Submergence	Drains to Turb Bldg sump	150	None present.	Door 136 Door 2	TU-95A SC-70A	Yes N/A
TU-92	SW Fire (su)	4 kVAC Bus 6 MCC 62A EDG 1B MOV SW-4B	Submergence	Drains to Turb Bldg Sump	150	None present.	Door 3 Door 1	TU-94 SC-70A	Yes N/A

Table 5-1
Summary of KPS Flood Areas

Area	Sources	PRA Equipment	Damage Scenario	Drainage Paths	Drainage Capacity (gpm)	Flood Detection	Propagation Paths	Connecting Area	Equipment Damage
TU-94	SW Fire (su)	Air Compressor 1A AOV SW-4A	Submergence	Drain to Turb Bldg sump	150	None present.	Door 401 Door 5 Door 3 Drains	TU-22-1 TU-95A TU-92 TU-22-1	Yes Yes Yes Yes
TU-95A	SW Fire (su)	480 VAC Swgr Bus 51 480 VAC Swgr Bus 52 AOV SA-200 Air Compressor 1C	Submergence	Drain to Turb Bldg sump	150	None present.	Door 263 Door 5 Door 136 Door 268	TU-95B-1 TU-94 TU-90 TU-95B-1	Yes Yes Yes Yes
TU-95B-1	SW Fire CST (limited) Steam (limited) (su, hu)	480 VAC Swgr Bus 61 480 VAC Swgr Bus 62 AOV SA-400 Air Compressor 1B AOV SA-60 AOV SA-121 MDAFP 1B (run) MDAFP 1B (start) MOV AFW-10B TB Bsmt Fan Coil 1B	Submergence	Drain to Turb Bldg sump	150	None present.	Door 4 Door 6 Door 8 Door 263 Door 243 Door 244 Door 261 Door 262 Door 268 Drains	TU-22-1 TU-22-1 Aux Bldg TU-95A TU-95B-2 TU-95B-2 TU-95C TU-95C TU-95A TU-22-1	Yes Yes N/A Yes Yes Yes Yes Yes Yes Yes
TU-95B-2	SW CST (limited) Steam (limited) (su, hu)	TDAFP (run) TDAFP (start) MCC 5262	Submergence	Drain to Turb Bldg sump	150	None present.	Door 243 Door 244	TU-95B-1 TU-95B-1	Yes Yes

Table 5-1
Summary of KPS Flood Areas

Area	Sources	PRA Equipment	Damage Scenario	Drainage Paths	Drainage Capacity (gpm)	Flood Detection	Propagation Paths	Connecting Area	Equipment Damage
TU-95C	SW CST (limited) (su)	MDAFP 1A (run) MDAFP 1A (start) MOV AFW-10A TB Bsmt Fan Coil 1A	Submergence	Drain to Turb Bldg sump	150	None present.	Door 261 Door 262	TU-95B-1	Yes

5.2 Description of KPS Turbine Building Internal Flooding Scenarios

Based on the information in Table 5-1, the following internal flooding scenarios have been identified for pipe breaks in the Turbine Building (TU-22-1). Table 5-2 lists all these scenarios as well as the equipment (and associated basic event identifier) in the Turbine Building that is immediately disabled by the pipe break (and/or sprinkler discharge), the flood areas to which the spilled water will first propagate, and any means of detection and isolation of the break.

A pipe break inside the Turbine Building is expected to cause failure of the condensate pumps and feedwater pumps, resulting in a Loss of Main Feedwater event as analyzed in the Internal Events PRA [NB02]. The accident response for such a flooding event is identical to that of a Loss of Main Feedwater given that the flood-induced failures are primarily limited to the area of the Turbine Building containing the feedwater and condensate equipment. The event trees developed for this internal flooding analysis include only those sequences that involve flood-induced failures in Safeguards Alley. The logic associated with a Loss of Feedwater without flood-induced failure of equipment in Safeguards Alley is not repeated in the event trees developed here.

Buses 1 and 2 power only the reactor coolant pumps and the main feedwater pumps. All flooding events in the Turbine Building are assumed to cause a non-recoverable loss of main feedwater. While forced circulation with the reactor coolant pumps is desired, use of the pumps is not required and is not credited in the PRA models. Therefore, loss of power from Buses 1 and 2 has no impact on the Turbine Building flooding PRA results and is not considered further in this analysis since the reactor coolant pumps and main feedwater pumps are never credited.

Pipe breaks in the Turbine Building are of concern because of the threat of propagation of water into Safeguards Alley where the Safeguards AC Power buses and the Auxiliary Feedwater System equipment is housed. Flood area TU-95A houses 480 VAC Buses 51/52 that provide power to the Chemical and Volume Control System (Normal Charging) and the Component Cooling Water System as well as one Fire Pump. Flood area TU-95B-1 houses Motor Driven AFW Pump B and 480 VAC Buses 61/62. Buses 61/62 also provide power to the Chemical and Volume Control System (Normal Charging) and the Component Cooling Water System as well as one Fire Pump. Flood area TU-95B-2 houses the Turbine Driven AFW Pump. Flood area TU-95C houses Motor Driven AFW Pump A. Flood area TU-90 houses Emergency Diesel Generator A and 4 kVAC Bus 5 which provides power to 480 VAC Buses 51/52, Motor Driven AFW Pump A, and Safety Injection Pump A. Flood area TU-92 houses Emergency Diesel Generator B and 4 kVAC Bus 6 which provides power to 480 VAC Buses 61/62, Motor Driven AFW Pump B, and Safety Injection Pump B.

This analysis includes discussion of the time to isolate breaks to prevent eventual failure of components and discussion of time to actually fail components. Because of the dynamic nature of the flow of water from the Turbine Building to Safeguards Alley, these two times can differ significantly. A pipe break might deposit several inches of water into the Turbine Building before

the break is isolated, however that same water level might never be realized in one of the other flood areas due to the flow of water out of that area via a door gap. At the instant in time that the break is isolated, there might be several inches of water in the Turbine Building and no water in the flood area of interest. However, due to the flow of water from the Turbine Building to that flood area, the water level might eventually reach a critical flood height in that area. Thus, timely isolation can prevent eventual failure of equipment.

Additionally, this analysis investigates the amount of time between the pipe break and the actual (not the eventual) failure of a component. This failure time typically is independent of the isolation of the pipe break.

5.2.1 Circulating Water Pipe Break (Condenser Inlet Expansion Joint Rupture – 58,000 gpm)

5.2.1.1 Introduction

The event tree for a Large Circulating Water Break (Figure 5-2) models the behavior of Kewaunee Power Station following a postulated 58,000-gpm condenser inlet expansion joint rupture. Normal mitigation of this event requires isolation of the break by tripping both Circulating Water pumps followed by auxiliary feedwater to remove core decay heat. However, the flow rate of this postulated break is so great that the operator is not expected to be able to isolate the rupture to avoid eventual failure of the auxiliary feedwater system. Therefore, this initiator is expected to result in core damage.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

CI06B - Large Circulating Water Pipe Break

I5 - Isolation of Break in Time to Prevent Failure of Mitigating Equipment

5.2.1.2 Accident Progression

After a successful reactor trip, decay heat must be removed. For decay heat removal to be successful, flow from the circulating water system to the Turbine Building must be terminated before flood-induced failure of required equipment occurs.

GOTHIC analysis indicates that the operator would have approximately 3 minutes to isolate such a rupture (by tripping the Circulating Water pumps) to prevent eventual damage to 4 kVAC Bus 5 and 4 kVAC Bus 6, and approximately 3 minutes to isolate the rupture to prevent eventual

damage to the 480 VAC buses in Safeguards Alley [CALC01]. Since it is expected that the operators will require more than 3 minutes to diagnose the flooding event and trip the Circulating Water pumps, the human error probability will be nearly 1.0. Further, the time available to isolate the rupture before eventual failure of the Turbine Driven AFW pump is not sufficient to support successful operator actions. Therefore, a rupture of a condenser inlet expansion joint is assumed to result in core damage.

The initiating event due to a large break in the Circulating Water System is named IE-CI06B.

5.2.2 Circulating Water Pipe Break (Condenser Outlet Expansion Joint Rupture – 14,000 gpm)

5.2.2.1 Introduction

The event tree for a Moderate Circulating Water Break (Figure 5-3) models the behavior of Kewaunee Power Station following a postulated 14,000-gpm condenser outlet expansion joint rupture. Normal mitigation of this event requires isolation of the break by tripping both Circulating Water pumps. After termination of break flow, decay heat removal and maintenance of reactor coolant pump (RXCP) seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

CX06B - Moderate Circulating Water Pipe Break

I5 - Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due to Excessive Water in Safeguards Alley

ITD - Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump

I6 - Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61 and 62 Due to Excessive Water in Safeguards Alley

IMD - Isolation of Break in Time to Prevent Submergence of Motor Driven AFW Pumps and Prevent 18 Inches of Water in the Turbine Building

AFS - Motor Driven AFW Pump Failure to Start (Automatic Start)

AFR - Motor Driven AFW Pump Failure to Run

AFZ - Operator Failure to Start Turbine Driven AFW Pump

AFT - Turbine Driven AFW Pump Failure (Hardware)

AFX - Operator Failure to Take Manual Control of AFW System

RCP - Reactor Coolant Pump (RXCP) Seal Cooling Failure

OCD - RCS Cooldown

SLC - Small RXCP Seal LOCA

HPI - ECCS Injection

RWC - Conservation of RWST Inventory per ECA-1.1

5.2.2.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

The Circulating Water system is designed to move over 400,000 gpm of water to the condenser water boxes and has the capability of placing extremely large amounts of water into the Turbine Building in a short amount of time. The probability of a random break in the circulating water piping is very small when compared to the probability of an expansion joint rupture. Therefore, a 14,000-gpm break is analyzed due to its higher likelihood. This flow rate represents a complete rupture of a condenser outlet expansion joint.

GOTHIC analysis [CALC01] indicates that the operator would have approximately 13 minutes to isolate such a rupture (by tripping the Circulating Water pumps) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Additionally, Bus 5 itself will not be impacted since its failure does not occur until the 18-inch water level. Further, the operator would have approximately 19 minutes to isolate the rupture to prevent eventual failure of the Turbine Driven AFW pump's ability to start due to submergence of the associated auxiliary lube oil pump (at 9 inches). Also, the operator would have approximately 22 minutes to isolate the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at 11 inches of water. Additionally, the operator would have approximately 22 minutes to isolate the rupture to prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by the 4-inch water level on bus 6, but in this scenario buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 22 minutes, approximately the same isolation time to prevent failure of bus 6 motor loads at 4 inches of water. The operator would have approximately 25 minutes to prevent submergence failure of the MDAFPs at 13 inches and to prevent the water level in the Turbine building from reaching 18 inches. [CALC01]

A Circulating Water pipe break would first be indicated by a Turbine Building sump high-high-high level alarm in the control room from level switch LA-16666 [REPORT02]. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room. Another indication would be low condenser vacuum, which likely would result in a reactor trip.

In this scenario, the expansion joint rupture will be isolated by manually tripping the Circulating

Water pumps. If this trip fails, water will continue to flow into Safeguards Alley via leakage under the doors and flow through the drain lines, causing failure of the electrical equipment housed there.

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around 4 kVAC Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall (constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90 [CALC04].

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

The initiating event due to a moderate break in the Circulating Water System is named IE-CX06B.

5.2.2.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved. The timeline for operator actions associated with this event is provided in Attachment 2.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is associated with a particular fault tree. These fault trees are logically combined during the later

fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

Moderate Circulating Water Pipe Break (CX06B)

This top event represents the initiator, a rupture of the condenser outlet expansion joint resulting in lake water being spilled into the Turbine Building Basement at a rate of 14,000 gpm. Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps from the control room within approximately 13 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 4-inch level in the vicinity of kVAC Bus 5. While the water level near the bus might be negligible 13 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will eventually result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps from the control room within approximately 19 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. While the water level near the TDAFP might be negligible 19 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to cause failure of the auxiliary lube oil pump and prevent normal, remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps

from the control room within approximately 22 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be significantly less than 11 inches 22 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that the 11-inch level and bus failure will occur fairly early. GOTHIC analysis also shows that tripping the Circulating Water pumps within approximately 22 minutes also will prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level (several hours later) in the vicinity of 4 kVAC Bus 6 that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump providing injection until water rises to 4 inches in the Bus 6 room. The isolation action for both Buses 61 and 62, and Bus 6 is represented by Top Event I6.

Isolation of Break in Time to Prevent Submergence Failure of the Motor Driven AFW Pumps and Prevent 18 Inches of Water in the Turbine Building (IMD)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps from the control room within approximately 25 minutes of the rupture to prevent submerging the motor driven AFW pumps at 13 inches and prevent the water level in the Turbine Building from reaching 18 inches. If water level reaches 18 inches in the Turbine Building, core damage is assumed for several reasons. First, it is assumed the flood will cause loss of Bus 5 because of the potential that the A-train motor-driven AFW pump could be running and become shorted. Therefore, Buses 51 and 52 become failed. Second, it is assumed that the electrical connections of the reserve auxiliary transformer (RAT) to Buses 1 and 2 will be submerged leading to a loss of offsite power and the eventual failure of all safety-related buses. Additionally, this water level in the Turbine Building will result in the failure of the diesel generators since the supply fans are powered from 480 VAC Buses 51 and 52 and 480 VAC Buses 61 and 62. Therefore, no credit is taken for operation of the B-Train AFW pump for the period prior to water level rising to 4 inches on Bus 6. Finally, if this isolation fails, then over 18 inches of water would have been released to the Turbine Building basement. Therefore, it is assumed that the TDAFW pump would become submerged and rendered unavailable even if running.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis

[CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending on the failures that occurred previously in the event tree. First, the operators may have recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 36 minutes of the initial break [CALC01]. Finally, if the turbine-driven pump is not restarted before 36 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will

start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition for the sequences where top event AFX is used the B-train electrical safety buses (4kVAC and 480 VAC) are available as well as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow controlled using AFW-2B. If air and power are available, then flow can be controlled from the control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA.

Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCA based on the NRC Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost, then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described

below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge Buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one half hour before electrical buses would submerge and fail the seal cooling systems. Provided that the break flow was isolated prior to level in the Turbine Building exceeding 18 inches, Bus 6 would be available to support safety injection pump operation for approximately 7 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow without refilling the RWST.

5.2.3 Service Water Pipe Break

5.2.3.1 Introduction

The event tree for a Service Water Break (Figure 5-4) models the behavior of Kewaunee Power Station following a postulated 6000-gpm break in the Service Water Turbine Building header. (A 6000-gpm break was deemed to be most representative of a Service Water pipe break because a 12,800-gpm break (a guillotine pipe break) is considered too improbable and a 1000-gpm break is considered too inconsequential.) Normal mitigation of this event requires isolation of both SW-4A and -4B. After termination of break flow, decay heat removal and maintenance of RXCP seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

SI06B - Service Water Pipe Break

I5 - Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due to Excessive Water in Safeguards Alley

ITD - Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump

I6 - Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61 and 62 Due to Excessive Water in Safeguards Alley

IMD - Isolation of Break in Time to Prevent Submergence of Motor Driven AFW Pumps

I18 - Isolation of Break in Time to Prevent 18 Inches of Water in the Turbine Building

AFS - Motor Driven AFW Pump Failure to Start (Automatic Start)

AFR - Motor Driven AFW Pump Failure to Run

AFZ - Operator Failure to Start Turbine Driven AFW Pump

AFT - Turbine Driven AFW Pump Failure (Hardware)

AFX - Operator Failure to Take Manual Control of AFW System

RCP - Reactor Coolant Pump Seal Cooling Failure

OCD - RCS Cooldown

SLC - Small RCP Seal LOCA

HPI - ECCS Injection

RWC - Conservation of RWST Inventory per ECA-1.1

5.2.3.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

The Service Water system is designed to supply approximately 12,800 gpm of water to the

various plant loads. Piping associated with the Service Water Turbine Building header constitutes the vast majority of Service Water piping that resides in the Turbine Building, therefore the piping associated with the Turbine Building header is the only Service Water piping considered. (Service Water piping not associated with the Turbine Building header is either very small or normally isolated.)

GOTHIC analysis indicates that the operator would have approximately 29 minutes to isolate a 6000-gpm Service Water pipe break (by isolating the Turbine Building header) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Bus 5 itself will not be impacted since its failure does not occur until the 18-inch water level. Isolating the break within approximately 45 minutes will prevent the water from ultimately reaching a level of 9 inches in the Turbine Driven AFW Pump room, a level which would cause failure of the Turbine Driven AFW pump's ability to start due to submergence of the associated auxiliary lube oil pump. Isolation within 51 minutes would prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by the 4-inch water level on Bus 6, but in this scenario buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 52 minutes, approximately the same isolation time to prevent failure of bus 6 motor loads at 4 inches of water. The operator would have approximately 60 minutes to prevent submergence failure of the MDAFPs at 13 inches. The operator would have approximately 66 minutes to prevent the water level in the Turbine Building from reaching 18 inches. [CALC01]

A Service Water pipe break would first be indicated by a Turbine Building sump high-high-high level alarm in the control room from level switch LA-16666 [REPORT02]. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room. Another indication would be Service Water low discharge pressure (if the pipe break is sufficiently large). The Abnormal Service Water System Operation procedure (A-SW-02) instructs the operator to isolate the Turbine Building header by closing both SW-4A and -4B. If this isolation fails, water will flow into Safeguards Alley via leakage under the doors and flow through the drain lines, causing failure of the electrical equipment housed there.

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the

Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 4 kVAC 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall (constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90 [CALC04].

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

For small SW pipe breaks (<2 inches), the operator would have approximately 2 hours to isolate the break before failure of the 4 kVAC buses in Safeguards Alley occurs. Since it is unreasonable to expect the operators to fail to isolate such a break in a two-hour period, small Service Water breaks are not analyzed any further.

The initiating event due to a large break in the Service Water System is named IE-SI06B.

5.2.3.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved. The timeline for operator actions associated with this event is provided in Attachment 2.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is associated with a particular fault tree. These fault trees are logically combined during the later fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

<u>Service Water Pipe Break (SI06B)</u>

This top event represents the initiator, a break in the Service Water Turbine Building header resulting in lake water being spilled into the Turbine Building Basement at a rate of 6000 gpm.

Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)

The operator must isolate the Service Water pipe break by closing valves SW-4A and SW-4B from the control room within approximately 29 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 4-inch level in the vicinity of 4 kVAC Bus 5. While the water level near the bus might be negligible 29 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the Service Water pipe break by closing valves SW-4A and SW-4B from the control room within approximately 45 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. While the water level near the TDAFP might be negligible 45 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to cause failure of the auxiliary lube oil pump and prevent normal remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the Service Water pipe break by closing valves SW-4A and SW-4B from the control room within approximately 51 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be negligible 51 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that this level and bus failure will occur fairly early. GOTHIC analysis also shows that closing SW-4A and -4B within approximately 51 minutes will prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level (several hours later) in the vicinity of 4 kVAC Bus 6. A 4-inch level on Bus 6 is sufficiently high to possibly trip the breakers

associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump providing injection until water rises to 4 inches in the Bus 6 room The isolation action for both Buses 61 and 62, and Bus 6 is represented by Top Event I6.

Isolation of Break in Time to Prevent Submergence Failure of the Motor Driven AFW Pumps (IMD)

The operator must isolate the Service Water pipe break by closing valves SW-4A and SW-4B from the control room within approximately 60 minutes of the rupture to prevent the water level from reaching the 13-inch failure height of the Motor Driven AFW pumps. This would leave only the Turbine Driven AFW pump to provide cooling of the steam generators, along with several hours of injection from the B-train SI pump as noted for Top Event I6. In addition, at this level, loss of Bus 5 will occur because of the potential that the A-train motor-driven AFW pump could be running and become shorted. Therefore, Buses 51 and 52 become failed. .

Isolation of Break in Time to Prevent 18 Inches of Water in the Turbine Building (I18)

The operator must isolate the Service Water pipe break by closing valves SW-4A and SW-4B from the control room within approximately 66 minutes of the rupture to prevent the water level in the Turbine Building from reaching 18 inches. If water level reaches this height, core damage is assumed since the electrical connections of the reserve auxiliary transformer (RAT) to Buses 1 and 2 will be submerged leading to a loss of offsite power and the eventual failure of all safety-related buses. Additionally, this water level in the Turbine Building will result in the failure of the diesel generators since the supply fans are powered from 480 VAC Buses 51 and 52 and 480 VAC Buses 61 and 62. Therefore, no credit is taken for operation of the B-Train AFW pump for the period prior to water level rising to 4 inches on Bus 6. Finally, if this isolation fails, then over 18 inches of water would have been released to the Turbine Building basement. Therefore, it is assumed that the TDAFW pump would become submerged and be rendered unavailable even if running.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis

[CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending on the failures that occurred previously in the event tree. First, the operators may have recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 61 minutes of the initial break [CALC01]. Finally, if the turbine-driven pump is not restarted before 61 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will

start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition of the sequences where top event AFX is used the B-train electrical safety buses (4kVAC and 480 VAC) are available as well as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow controlled using AFW 2B. If air and power are available, then flow can be controlled from the control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA.

Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCAs based on the NRC Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost, then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described

below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one hour [CALC01] before electrical buses would submerge and fail the seal cooling systems. Provided that the break flow was isolated prior to level in the Turbine Building exceeding 18 inches, bus 6 would be available to support safety injection pump operation for approximately 10 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow without refilling the RWST.

5.2.4 Fire Protection Water Pipe Break

5.2.4.1 Introduction

The event tree for a Fire Protection Water Break (Figure 5-5) models the behavior of Kewaunee Power Station following a postulated 6000-gpm break in the Fire Protection Water header. Normal mitigation of this event requires isolation of flow from both fire pumps. After termination of break flow, decay heat removal and maintenance of RXCP seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

FI06B - Fire Protection Water Pipe Break

I5 - Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due Excessive Water in Safeguards Alley

ITD - Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump

I6 - Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61 and 62 Due to Excessive Water in Safeguards Alley

IMD - Isolation of Break in Time to Prevent Submergence of Motor Driven AFW Pumps

AFS - Motor Driven AFW Pump Failure to Start (Automatic Start)

AFR - Motor Driven AFW Pump Failure to Run

AFZ - Operator Failure to Start Turbine Driven AFW Pump

AFT - Turbine Driven AFW Pump Failure (Hardware)

AFX - Operator Failure to Take Manual Control of AFW System

RCP - Reactor Coolant Pump Seal Cooling Failure

OCD - RCS Cooldown

SLC - Small RCP Seal LOCA

HPI - ECCS Injection

RWC - Conservation of RWST Inventory per ECA-1.1

5.2.4.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

The Fire Protection system is designed to supply approximately 4000 gpm of water to the various sprinklers and deluge systems throughout the plant. However, since the maximum system flow at pump runout is 6000 gpm, a 6000-gpm pipe break is analyzed. A break in the piping would cause a decrease in system pressure and automatically initiate one or both of the fire pumps. A Fire Protection pipe break would first be indicated by a FIRE PUMP RUNNING activation in the control room. Such a large pipe break will also result in a FIRE PROTECTION HDR PRESSURE LOW annunciator in the control room. If the pipe break is greater than 200 gpm (the capacity of the Turbine Building sump pumps), then a Turbine Building sump high-level

alarm in the control room from level switch LA-16666 will sound in the control room. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room.

GOTHIC analysis shows this event to be self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) of the associated 480 VAC buses. Fire Pump A is fed from breaker 15106 on 480 VAC Bus 51. The static trip unit associated with this breaker is 2.75 inches above the ground [CALC03]. Since the feed breaker for Fire Pump B is on the top row of 480 Bus 62, Fire Pump B will fail when Bus 62 fails at the 11-inch level [CALC03].

GOTHIC analysis [CALC01] indicates that the operator would have approximately 29 minutes to isolate a 6000-gpm Fire Protection pipe break (by isolating flow from the Fire Protection pumps) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Bus 5 itself will not be impacted since its failure does not occur until the 18-inch water level and the GOTHIC analyses show that water level can never reach 18-inches for a break in the fire protection system piping. Isolating the break within approximately 45 minutes will prevent the water from ultimately reaching a level of 9 inches in the Turbine Driven AFW Pump room. Also, isolating the break within approximately 56 minutes will prevent eventual failure of 480 VAC Buses 61 and 62 at 11 inches of water. Additionally, the operator would have approximately 62 minutes to isolate the rupture to prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by this 4-inch water level on Bus 6, but in this scenario Buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 56 minutes, close to the same isolation time of 62 minutes to prevent failure of Bus 6 motor loads at 4 inches of water. If isolation fails, the water level will reach 4 inches in the vicinity of the 4 kVAC Bus 6 in approximately 8.5 hours after the initial pipe break. [CALC01] The operator would have approximately 68 minutes to prevent submergence failure of the MDAFPs at 13 inches. The self-limiting nature of the event prevents the water level from exceeding 18 inches in the TDAFP area; therefore the TDAFP is not subject to submergence failure.

Upon discovery of the pipe break location, the operator would attempt to isolate the break by closing a valve. However, most of the valves in the Fire Protection System simply isolate a branch off the main header (such as a deluge valve or a hose station) and do not isolate the header itself. Therefore the operator must trip the fire pumps or close the manual pump discharge valves (located in the Screenhouse) to stop flow. The fire pumps, however, will continue to initiate automatically on low header pressure regardless of how many times the pumps are stopped. The only way to definitively stop the pump discharge coincident with a fire protection pipe break is to isolate the power supplies to the pumps by tripping the appropriate breakers on bus 51 and 62

located in the Safeguards Alley or close the manual discharge isolation valves.

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around 4 kVAC Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall (constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90 [CALC04].

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

For small Fire Protection pipe breaks (<2 inches), the operator would have approximately 2 hours to isolate the break before failure of the 4 kVAC buses in Safeguards Alley occurs. Since it is unreasonable to expect the operators to fail to isolate such a break in a two-hour period, small Fire Protection breaks are not analyzed any further.

The initiating event due to a large break in the Fire Protection Water System is named IE-FI06B. The timeline for operator actions associated with this event is provided in Attachment 2. This timeline is supported by Attachments 2 and 3 of the Fault Tree Analysis (Appendix C).

5.2.4.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is associated with a particular fault tree. These fault trees are logically combined during the later fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

Fire Protection Water Pipe Break (FI06B)

This top event represents the initiator, a break in the Fire Protection Water header resulting in lake water being spilled into the Turbine Building Basement at a rate of 6000 gpm. Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)

The operator must isolate the Fire Protection Water pipe break by stopping flow from both Fire Pumps by either tripping the 480 VAC breaker associated with each pump or locally closing each Fire Pump's manual discharge valve within approximately 29 minutes of the pipe break to prevent the water level in Safeguards Alley from eventually reaching the 4-inch level in the vicinity of 4 kVAC Bus 5. While the water level near the bus might be negligible 29 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the Fire Protection Water pipe break by stopping flow from both Fire Pumps by either tripping the 480 VAC breaker associated with each pump or locally closing each Fire Pump's manual discharge valve within approximately 45 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. While the water level near the TDAFP might be negligible 45 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to cause failure of the auxiliary lube oil pump and prevent normal remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the Fire Protection Water pipe break by stopping flow from both Fire Pumps by either tripping the 480 VAC breaker associated with each pump or locally closing each Fire Pump's manual discharge valve within approximately 56 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be negligible 56 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that this level and bus failure will occur fairly early. GOTHIC analysis also shows that stopping flow from the Fire Pumps within approximately 62 minutes will prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level (several hours later) in the vicinity of 4 kVAC Bus 6 that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump providing injection until water rises to 4 inches in the Bus 6 room. The isolation action for both Buses 61 and 62, and Bus 6 is represented by Top Event I6.

Isolation of Break in Time to Prevent Submergence Failure of the Motor Driven AFW Pumps (IMD)

The operator must isolate the Fire Protection Water pipe break by stopping flow from both Fire Pumps by either tripping the 480 VAC breaker associated with each pump or locally closing each Fire Pump's manual discharge valve within approximately 68 minutes of the rupture to prevent submerging the motor driven AFW pumps at 13 inches. In addition, at this level, loss of Bus 5 will occur because of the potential that the A-train motor-driven AFW pump could be running and become shorted. Therefore, Buses 51 and 52 become failed. This would leave only the Turbine Driven AFW pump to provide cooling of the steam generators, along with several hours of injection from the B-train SI pump as noted for Top Event I6. Note that for breaks involving flow from the Fire Protection Water system, flow from the fire pumps would be stopped when the fire pump power supplies are submerged. The first pump is lost at 2.75 inches on Bus 51. The second pump is lost at 11 inches on Bus 61. At this point, the level in the Turbine Building basement would be less than 18 inches and would not imperil the TDAFW pump or Buses 1 and 2. Therefore Top Event I18 (isolation in time to prevent 18 inches of water in the Turbine Building) is not modeled and successful mitigation is possible after failure of Top Event IMD.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water

level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis [CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending on the failures that occurred previously in the event tree. First, the operators may have recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 61 minutes of the initial break [CALC01]. Finally, if the turbine-driven pump is not restarted before 61 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition for the sequences where top event AFX is used the B-train electrical safety buses (4kVAC and 480 VAC) are available as well as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow controlled using AFW-2B. If air and power are available, then flow can be controlled from the control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA. Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCA based on the NRC Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost, then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a

probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one hour [CALC01] before electrical buses would submerge and fail the seal cooling systems. Because this event is self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses, the level in the Turbine Building will not reach 18 inches, and bus 6 would be available to support safety injection pump operation for approximately 8 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow

without refilling the RWST.

5.2.5 Feedwater Pipe Break (Large Fire Sprinkler Response)

5.2.5.1 Introduction

The event tree for a Feedwater Pipe Break resulting in a Large Fire Sprinkler Response (Figure 5-6) models the behavior of Kewaunee Power Station following a Feedwater pipe break that results in a fire sprinkler discharge of 6000 gpm. Normal mitigation of this event requires isolation of sprinkler flow. After termination of sprinkler flow, decay heat removal and maintenance of RXCP seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

WI06B	-	Feedwater Pipe Break (Large Fire Sprinkler Response)
I5	-	Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due to Excessive Water in Safeguards Alley
ITD	-	Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump
I6	-	Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61 and 62 Due to Excessive Water in Safeguards Alley
IMD	-	Isolation of Break in Time to Prevent Submergence of Motor Driven AFW Pumps
AFS	-	Motor Driven AFW Pump Failure to Start (Automatic Start)
AFR	-	Motor Driven AFW Pump Failure to Run
AFZ	-	Operator Failure to Start Turbine Driven AFW Pump
AFT	-	Turbine Driven AFW Pump Failure (Hardware)
AFX	-	Operator Failure to Take Manual Control of AFW System
RCP	-	Reactor Coolant Pump Seal Cooling Failure

OCD - RCS Cooldown

SLC - Small RCP Seal LOCA

HPI - ECCS Injection

RWC - Conservation of RWST Inventory per ECA-1.1

5.2.5.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

A pipe break in the Feedwater System will deposit approximately 80,000 gallons of water onto the Turbine Building floor and result in the room temperature increasing to the point that the fire protection sprinklers will discharge. This event will result in a rapid reactor trip due to steam generator low level. This initial volume of water released from the feedwater system also results in shorter required isolation times compared to other events with a 6000-gpm Fire Protection Water discharge. For example, a 6000-gpm discharge due to a random break in a Fire Protection Water line affords 68 minutes for isolation to prevent eventual submergence failure of the MDAFPs at 13 inches. A Feedwater line break that results in a 6000-gpm sprinkler discharge gives only 54 minutes to isolate in order to prevent MDAFP submergence.

Fire sprinkler actuation would cause a decrease in Fire Protection system pressure and automatically initiate one or both of the fire pumps. This would result in a FIRE PUMP RUNNING alarm in the control room. If the pipe break is of sufficient size and a large number of sprinklers actuate, the FIRE PROTECTION HDR PRESSURE LOW annunciator could sound in the control room. If the pipe break is greater than 200 gpm (the capacity of the Turbine Building sump pumps), then a Turbine Building sump high-level alarm in the control room from level switch LA-16666 will sound in the control room. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room. This investigation would be greatly hampered by the Turbine Building's steam environment and the hot water on the Turbine Building floor due to the Feedwater line break.

GOTHIC analysis shows this event to be self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses. Fire Pump A is fed from breaker 15106 on 480 VAC Bus 51. The static trip unit associated with this breaker will fail when the water level reaches 2.75 inches above the ground [CALC03]. Since the feed breaker for Fire Pump B is on the top row of 480 Bus 62, Fire Pump B will fail when water level reaches 11 inches and Bus 62 fails.

GOTHIC analysis [CALC01] indicates that the operator would have approximately 18 minutes to isolate a Feedwater pipe break with a 6000-gpm sprinkler discharge (by isolating flow from the Fire Protection pumps) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Additionally, the bus itself will not be impacted since its failure does not occur until the 18-inch water level. Isolating the break within approximately 33 minutes will prevent the water from ultimately reaching a level of 9 inches in the Turbine Driven AFW Pump room. The break must be isolated within approximately 40 minutes to prevent eventual failure of 480 VAC Buses 61 and 62 at 11 inches of water. Additionally, the operator would have approximately 41 minutes to isolate the rupture to prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by this 4-inch water

level on Bus 6, but in this scenario Buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 40 minutes which is approximately the same isolation time of 41 minutes to prevent failure of Bus 6 motor loads at 4 inches of water. If isolation fails, the water level will reach 4 inches in the vicinity of the 4 kVAC Bus 6 in approximately 8.5 hours after the initial pipe break. [CALC01] The operator would have approximately 54 minutes to prevent submergence failure of the MDAFPs at 13 inches. The self-limiting nature of the event prevents the water level from exceeding 18 inches in the Turbine Building or the TDAFP area, therefore the TDAFP is not subject to submergence failure. [CALC01]

Upon discovery of the sprinkler actuation location, the operator would attempt to isolate the sprinklers by closing a valve. The fire pumps, however, will continue to initiate automatically on low header pressure until all fire sprinkler and deluge system headers are isolated.

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 4 kVAC 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall (constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90 [CALC04].

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

The initiating event for a Feedwater break leading to a 6000-gpm sprinkler discharge is named IE-WI06B. The timeline for operator actions associated with this event is provided in Attachment 2. This timeline is supported by Attachments 2 and 3 of the Fault Tree Analysis (Appendix C).

5.2.5.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is associated with a particular fault tree. These fault trees are logically combined during the later fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

Feedwater Pipe Break (Large Fire Sprinkler Response) (WI06B)

This top event represents the initiator described as Feedwater Pipe Break that results in a fire sprinkler discharge of 6000 gpm into the Turbine Building. Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 18 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the pipe break to prevent the water level in Safeguards Alley from eventually reaching the 4-inch level in the vicinity of 4 kVAC Bus 5. While the water level near the bus might be negligible 18 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker

associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 33 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. While the water level near the TDAFP might be negligible 33 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to cause failure of the auxiliary lube oil pump and prevent normal remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 40 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be negligible 40 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that this level and bus failure will occur fairly early. GOTHIC analysis also shows that stopping the sprinkler flow within approximately 41 minutes will prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level (several hours later) in the vicinity of 4 kVAC Bus 6 that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump providing injection until water rises to 4 inches in the Bus 6 room. The isolation action for both Buses 61 and 62, and Bus 6 is represented by Top Event I6.

Isolation of Break in Time to Prevent Submergence Failure of the Motor Driven AFW Pumps (IMD)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 54 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent the water level from reaching the 13-inch failure height of the Motor Driven AFW pumps. In addition, at this level, loss of Bus 5 will occur because of the potential

that the A-train motor-driven AFW pump could be running and become shorted. Therefore, Buses 51 and 52 become failed. This would leave only the Turbine Driven AFW pump to provide cooling of the steam generators, along with several hours of injection from the B-train SI pump as noted for Top Event I6.

Note that for events involving flow from the Fire Protection Water system, flow from the fire pumps would be stopped when the fire pump power supplies are submerged. The first pump is lost at 2.75 inches on Bus 51. The second pump is lost at 11 inches on Bus 61. At this point, the level in the Turbine Building basement would be less than 18 inches and would not imperil the TDAFW pump or Buses 1 and 2. Therefore Top Event I18 (isolation in time to prevent 18 inches of water in the Turbine Building) is not modeled and successful mitigation is possible after failure of Top Event IMD.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis [CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending

on the failures that occurred previously in the event tree. First, the operators may have recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 49 minutes of the initial break. Finally, if the turbine-driven pump is not restarted before 49 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition for the sequences where top event AFX is used the B-train electrical safety buses (4kVAC and 480 VAC) are available as well as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow

controlled using AFW-2B. If air and power are available, then flow can be controlled from the control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA. Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCA based on the NRC

Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost, then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one hour [CALC01] before electrical buses would submerge and fail the seal cooling systems. Because this event is self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses, the level in the Turbine Building will not reach 18 inches, and bus 6 would be available to support safety injection pump operation for approximately 8 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss

of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow without refilling the RWST.

5.2.6 Feedwater Pipe Break (Moderate Fire Sprinkler Response)

5.2.6.1 Introduction

The event tree for a Feedwater Pipe Break resulting in a Moderate Fire Sprinkler Response (Figure 5-7) models the behavior of Kewaunee Power Station following a Feedwater pipe break that results in a fire sprinkler discharge of 2000 gpm. Normal mitigation of this event requires isolation of sprinkler flow. After termination of break flow, decay heat removal and maintenance of RXCP seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

WX06B - Feedwater Pipe Break (Moderate Fire Sprinkler Response)

I5 - Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due to Excessive Water in Safeguards Alley

ITD - Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump

I6 - Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads

Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61 and 62 Due to Excessive Water in Safeguards Alley

AFS - Motor Driven AFW Pump Failure to Start (Automatic Start)

AFR - Motor Driven AFW Pump Failure to Run

AFZ - Operator Failure to Start Turbine Driven AFW Pump

AFT - Turbine Driven AFW Pump Failure (Hardware)

AFX - Operator Failure to Take Manual Control of AFW System

RCP - Reactor Coolant Pump Seal Cooling Failure

OCD - RCS Cooldown

SLC - Small RCP Seal LOCA

HPI - ECCS Injection

RWC - Conservation of RWST Inventory per ECA-1.1

5.2.6.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat

removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

A pipe break in the Feedwater System will deposit approximately 80,000 gallons of water onto the Turbine Building floor and result in the room temperature increasing to the point that the fire protection sprinklers will discharge. This event will result in a rapid reactor trip due to steam generator low level. This initial volume of water also results in shorter isolation times compared to other events with a 2000-gpm Fire Protection Water discharge. For example, a 2000-gpm sprinkler discharge due to a steamline break affords 100 minutes for isolation to prevent an eventual water depth of 4 inches in the vicinity of 4 kVAC Bus 5. A Feedwater line break that results in a 2000-gpm sprinkler discharge gives only 55 minutes to isolate in order to prevent a 4-inch depth near Bus 5.

Fire sprinkler actuation would cause a decrease in Fire Protection system pressure and automatically initiate one or both of the fire pumps. This would result in a FIRE PUMP RUNNING alarm in the control room. If the pipe break is of sufficient size and large number of sprinklers actuate, the FIRE PROTECTION HDR PRESSURE LOW annunciator could sound in the control room. If the pipe break is greater than 200 gpm (the capacity of the Turbine Building sump pumps), then a Turbine Building sump high-level alarm in the control room from level switch LA-16666 will sound in the control room. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room. This investigation would be greatly hampered by the Turbine Building's steam environment and the hot water on the Turbine Building floor due to the Feedwater line break.

GOTHIC analysis shows this event to be self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses. Fire Pump A is fed from breaker 15106 on 480 VAC Bus 51. The static trip unit associated with this breaker will fail when the water level reaches 2.75 inches above the ground [CALC03]. Since the feed breaker for Fire Pump B is on the top row of 480 Bus 62, Fire Pump B will fail when the water level reaches 11 inches and Bus 62 fails.

GOTHIC analysis [CALC01] indicates that the operator would have approximately 55 minutes to isolate a Feedwater pipe break with a 2000 gpm sprinkler discharge (by isolating flow from the Fire Protection pumps) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Bus 5 itself will not be impacted since its failure does not occur until the 18-inch water level. Isolating the break within approximately 97 minutes will prevent the water from ultimately reaching a level of 9 inches in the Turbine Driven AFW Pump room (the TDAFP auxiliary lube oil pump will fail if water level reaches 9 inches). The break must be isolated within approximately 120 minutes to prevent eventual failure of 480 VAC Buses 61 and 62 at 11 inches of water. Additionally, the operator would have approximately 120 minutes to isolate the rupture to prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by this 4-inch water level on Bus 6, but in this scenario Buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 120 minutes, the same isolation time to prevent failure of Bus 6 motor loads at 4 inches of water. If isolation fails, the water level will reach 4 inches in the vicinity of the 4 kVAC Bus 6 in approximately 11 hours after the initial pipe break. [CALC01] The self-limiting nature of the event prevents the water level from exceeding 13 inches in the MDAFP area and 18 inches in the TDAFP area, therefore the MDAFPs and the TDAFP are not subject to submergence failure [CALC01].

Upon discovery of the sprinkler actuation location, the operator would attempt to isolate the sprinklers by closing a valve. The fire pumps, however, will continue to initiate automatically on low header pressure until the isolation valves for all actuated sprinkler headers and deluge systems are closed

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 4 kVAC 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall (constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90. [CALC04]

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

The Feedwater break leading to a 2000 gpm sprinkler discharge is named IE-WX06B. The timeline for operator actions associated with this event is provided in Attachment 2. This timeline is supported by Attachments 2 and 3 of the Fault Tree Analysis (Appendix C).

5.2.6.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is associated with a particular fault tree. These fault trees are logically combined during the later fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

Feedwater Pipe Break (Moderate Fire Sprinkler Response) (WX06B)

This top event represents the initiator described as Feedwater Pipe Break that results in a fire sprinkler discharge of 2000 gpm into the Turbine Building. Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 55 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 4-inch

level in the vicinity of 4 kVAC Bus 5. While the water level near the bus might be negligible 55 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 97 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. While the water level near the TDAFP might be negligible 97 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to eventually cause failure of the auxiliary lube oil pump and prevent normal remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 120 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be negligible 120 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that this level and bus failure will occur fairly early. GOTHIC analysis also shows that stopping the sprinkler flow within approximately 120 minutes will also prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level (several hours later) in the vicinity of 4 kVAC Bus 6 that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump

providing injection until water rises to 4 inches in the Bus 6 room. The isolation action for both Buses 61 and 62, and Bus 6 is represented by Top Event I6.

Note that for this event involving flow from the Fire Protection Water system, flow from the fire pumps would be stopped when the fire pump power supplies are submerged. The first pump is lost at 2.75 inches on Bus 51. The second pump is lost at 11 inches on Bus 61. At this point, the water level is less than 13 inches in the MDAFP area and 18 inches in the TDAFP area, therefore the MDAFPs, the TDAFP, and Buses 1 and 2 are not subject to submergence failure [CALC01]. Therefore Top Events IMD (isolation in time to prevent failure of MDAFPs) and I18 (isolation in time to prevent 18 inches of water in the Turbine Building) are not modeled and successful mitigation is possible after failure of Top Event I6.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis [CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending on the failures that occurred previously in the event tree. First, the operators may have

recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 109 minutes of the initial break [CALC01]. Finally, if the turbine-driven pump is not restarted before 109 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition of the sequences where top event AFX is used the B-train electrical safety buses (4kVAC and 480 VAC) are available as well as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow controlled using AFW-2B. If air and power are available, then flow can be controlled from the

control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA. Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCA based on the NRC Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost,

then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one hour [CALC01] before electrical buses would submerge and fail the seal cooling systems. Because this event is self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses, the level in the Turbine Building will not reach 18 inches, and bus 6 would be available to support safety injection pump operation for approximately 11 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the

accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow without refilling the RWST.

5.2.7 Steamline Pipe Break (Large Fire Sprinkler Response)

5.2.7.1 Introduction

The event tree for a Steamline Pipe Break resulting in a Large Fire Sprinkler Response (Figure 5-8) models the behavior of Kewaunee Power Station following a Steamline break that results in a fire sprinkler discharge of 6000 gpm. Normal mitigation of this event requires isolation of sprinkler flow. After termination of sprinkler flow, decay heat removal and maintenance of RXCP seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

TI06B - Steamline Pipe Break (Large Fire Sprinkler Response)

I5 - Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due to Excessive Water in Safeguards Alley

ITD - Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump

I6 - Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61

and 62 Due to Excessive Water in Safeguards Alley

IMD - Isolation of Break in Time to Prevent Submergence of Motor Driven AFW Pumps

AFS - Motor Driven AFW Pump Failure to Start (Automatic Start)

AFR - Motor Driven AFW Pump Failure to Run

AFZ - Operator Failure to Start Turbine Driven AFW Pump

AFT - Turbine Driven AFW Pump Failure (Hardware)

AFX - Operator Failure to Take Manual Control of AFW System

RCP - Reactor Coolant Pump Seal Cooling Failure

OCD - RCS Cooldown

SLC - Small RCP Seal LOCA

HPI - ECCS Injection

RWC - Conservation of RWST Inventory per ECA-1.1

5.2.7.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

A large pipe break in the Main Steam System will result in the room temperature increasing to the point that the fire protection sprinklers will discharge. Such a pipe break will cause high steam flow resulting in a cooldown of the RCS and subsequent addition of positive reactivity due to the negative moderator temperature coefficient. The RCS water volume also decreases due to the density change during this cooldown. This will generate an SI signal that will close the MSIVs and trip the reactor. Additionally, the SI signal will trip the Fire Protection pumps, which must be reset in the control room to be restarted. Thus, for Main Steam pipe breaks large enough to initiate an SI signal the Fire Protection pumps will not operate and water will not spill onto the Turbine Building floor. In essence, there will be no flooding event.

More moderately-sized Main Steam pipe breaks behave similarly to Feedwater breaks from the standpoint of flooding. Since no SI signal will be initiated the fire sprinklers will actuate due to the increased room temperature. This would cause a decrease in Fire Protection system pressure and automatically initiate one or both of the fire pumps. This would result in a FIRE PUMP RUNNING alarm in the control room. If the pipe break is of sufficient size and large number of sprinklers actuate, the FIRE PROTECTION HDR PRESSURE LOW annunciator could sound in the control room. If the sprinklers discharge more than 200 gpm (the capacity of the Turbine Building sump pumps), then a Turbine Building sump high level alarm in the control room from level switch LA-16666 will sound in the control room. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room. This investigation would be greatly hampered by the Turbine Building's steam environment due to the Steamline break.

GOTHIC analysis shows this event to be self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses. Fire Pump A is fed from breaker 15106 on 480 VAC Bus 51. The static trip unit associated with this breaker will fail

when the water level reaches 2.75 inches above the ground [CALC03]. Since the feed breaker for Fire Pump B is on the top row of 480 Bus 62, Fire Pump B will fail when water level reaches 11 inches and Bus 62 fails.

GOTHIC analysis [CALC01] indicates that the operator would have approximately 29 minutes to isolate a Steamline pipe break with a 6000-gpm sprinkler discharge (by isolating flow from the Fire Protection pumps) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Bus 5 itself will not be impacted since its failure does not occur until the 18-inch water level. Isolating the break within approximately 45 minutes will prevent the water from ultimately reaching a level of 9 inches in the Turbine Driven AFW Pump room. The break must be isolated within approximately 56 minutes to prevent eventual failure of 480 VAC Buses 61 and 62 at 11 inches of water. Additionally, the operator would have approximately 62 minutes to isolate the rupture to prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by this 4-inch water level on Bus 6, but in this scenario Buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 56 minutes which is close to the isolation time of 62 minutes to prevent failure of Bus 6 motor loads at 4 inches of water. If isolation fails, the water level will reach 4 inches in the vicinity of the 4 kVAC Bus 6 in approximately 8.5 hours after the initial pipe break. [CALC01]. The operator would have approximately 68 minutes to prevent submergence failure of the MDAFPs at 13 inches. The self-limiting nature of the event prevents the water level from exceeding the 18-inch failure height of the TDAFP. [CALC01]

Upon discovery of the sprinkler actuation location, the operator would attempt to isolate the sprinklers by closing a valve. The fire pumps, however, will continue to initiate automatically on low header pressure until the isolation valves for all actuated sprinkler headers and deluge systems are closed.

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate

that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall (constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90. [CALC04]

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

The Steamline break initiator leading to a 6000-gpm sprinkler discharge is named IE-TI06B. The timeline for operator actions associated with this event is provided in Attachment 2. This timeline is supported by Attachments 2 and 3 of the Fault Tree Analysis (Appendix C).

5.2.7.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is associated with a particular fault tree. These fault trees are logically combined during the later fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

<u>Steamline Pipe Break (Large Fire Sprinkler Response) (TI06B)</u>

This top event represents the initiator described as Steamline Pipe Break that results in a fire sprinkler discharge of 6000 gpm into the Turbine Building. Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

<u>Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)</u>

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker

associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 29 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 4-inch level in the vicinity of 4 kVAC Bus 5. While the water level near the bus might be negligible 29 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 45 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional TBD minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. While the water level near the TDAFP might be negligible 45 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to cause failure of the auxiliary lube oil pump and prevent normal remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 56 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be negligible 56 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that this level and bus failure will occur fairly early. GOTHIC analysis also shows that stopping the sprinkler flow within approximately 62 minutes will prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level

(several hours later) in the vicinity of 4 kVAC Bus 6 that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump providing injection until water rises to 4 inches in the Bus 6 room. The isolation action for both Buses 61 and 62, and Bus 6 is represented by Top Event I6.

Isolation of Break in Time to Prevent Submergence Failure of the Motor Driven AFW Pumps (IMD)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building and locally closing the isolation valve on the deluge valve supply line in the basement of the Turbine Building within approximately 68 minutes of the rupture to prevent the water level from reaching the 13-inch failure height of the Motor Driven AFW pumps. In addition, at this level, loss of Bus 5 will occur because of the potential that the A-train motor-driven AFW pump could be running and become shorted. Therefore, Buses 51 and 52 become failed. This would leave only the Turbine Driven AFW pump to provide cooling of the steam generators, along with several hours of injection from the B-train SI pump as noted for Top Event I6.

Note that for events involving flow from the Fire Protection Water system, flow from the fire pumps would be stopped when the fire pump power supplies are submerged. The first pump is lost at 2.75 inches on Bus 51. The second pump is lost at 11 inches on Bus 61. At this point, the level in the Turbine Building basement would be less than 18 inches and would not imperil the TDAFW pump or Buses 1 and 2. Therefore Top Event I18 (isolation in time to prevent 18 inches of water in the Turbine Building) is not modeled and successful mitigation is possible after failure of Top Event IMD.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis [CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending on the failures that occurred previously in the event tree. First, the operators may have recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 61 minutes of the initial break. Finally, if the turbine-driven pump is not restarted before 61 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition for the sequences where top event AFX is used, the B-train electrical safety buses (4kVAC and 480 VAC) are available as well as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow controlled using AFW-2B. If air and power are available, then flow can be controlled from the control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA. Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be

prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCA based on the NRC Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost, then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one hour [CALC01] before electrical buses would submerge and fail the seal cooling systems. Because this event is self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses, the level in the Turbine Building will not reach 18 inches, and bus 6 would be available to support safety injection pump operation for approximately 8 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow without refilling the RWST.

5.2.8 Steamline Pipe Break (Moderate Fire Sprinkler Response)

5.2.8.1 Introduction

The event tree for a Steamline Pipe Break resulting in a Moderate Fire Sprinkler Response (Figure 5-9) models the behavior of Kewaunee Power Station following a Steamline pipe break that results in a fire sprinkler discharge of 2000 gpm. Normal mitigation of this event requires isolation of sprinkler flow. After termination of break flow, decay heat removal and maintenance of RXCP seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

TX06B - Steamline Pipe Break (Moderate Fire Sprinkler Response)

I5 - Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due to Excessive Water in Safeguards Alley

ITD - Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump

I6 - Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61 and 62 Due to Excessive Water in Safeguards Alley

AFS - Motor Driven AFW Pump Failure to Start (Automatic Start)

AFR - Motor Driven AFW Pump Failure to Run

AFZ - Operator Failure to Start Turbine Driven AFW Pump

AFT - Turbine Driven AFW Pump Failure (Hardware)

AFX - Operator Failure to Take Manual Control of AFW System

RCP - Reactor Coolant Pump Seal Cooling Failure

OCD - RCS Cooldown

SLC - Small RCP Seal LOCA

HPI - ECCS Injection

RWC - Conservation of RWST Inventory per ECA-1.1

5.2.8.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

A large pipe break in the Main Steam System will result in the room temperature increasing to the point that the fire protection sprinklers will discharge. Such a pipe break will cause high steam flow resulting in a cooldown of the RCS and subsequent addition of positive reactivity due to the negative moderator temperature coefficient. The RCS water volume also decreases due to the density change during this cooldown. This will generate an SI signal, which will close the MSIVs and trip the reactor. Additionally, the SI signal will trip the Fire Protection pumps, which must be reset in the control room to be restarted. Thus, for Main Steam pipe breaks large enough to initiate an SI signal the Fire Protection pumps will not operate and water will not spill onto the Turbine Building floor. In essence, there will be no flooding event.

More moderately-sized Main Steam pipe breaks behave similarly to Feedwater breaks from the standpoint of flooding. Since no SI signal will be initiated the fire sprinklers will actuate due to the increased room temperature. This would cause a decrease in Fire Protection system pressure and automatically initiate one or both of the fire pumps. This would result in a FIRE PUMP RUNNING alarm in the control room. If the pipe break is of sufficient size and large number of sprinklers actuate, the FIRE PROTECTION HDR PRESSURE LOW annunciator could sound in the control room. If the sprinklers discharge more than 200 gpm (the capacity of the Turbine Building sump pumps), then a Turbine Building sump high level alarm in the control room from level switch LA-16666 will sound in the control room. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room. This investigation would be greatly hampered by the Turbine Building's steam environment due to the Steamline break.

GOTHIC analysis shows this event to be self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses. Fire Pump A is fed from breaker 15106 on 480 VAC Bus 51. The static trip unit associated with this breaker will fail when the water level reaches 2.75 inches above the ground [CALC03]. Since the feed breaker for Fire Pump B is on the top row of 480 Bus 62, Fire Pump B will fail when water level reaches 11 inches and Bus 62 fails.

GOTHIC analysis [CALC01] indicates that the operator would have approximately 100 minutes to isolate a 2000-gpm sprinkler discharge (by isolating flow from the Fire Protection pumps) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Bus 5 itself will not be impacted since its failure does not occur until the 18-inch water level. Isolating the break within approximately 150 minutes will prevent the water from ultimately reaching a level of 9 inches in the Turbine Driven AFW Pump room (the TDAFP auxiliary lube oil pump will fail if water level reaches 9 inches). The break must be isolated within approximately 170 minutes to prevent eventual failure of 480 VAC Buses 61 and 62 at 11 inches of water. Additionally, the operator would have approximately 170 minutes to isolate the rupture to prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by this 4-inch water level on Bus 6, but in this scenario Buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 170 minutes which is the same isolation time to prevent failure of Bus 6 motor loads at 4 inches of water. If isolation fails, the water level will reach 4 inches in the vicinity of the 4 kVAC Bus 6 in approximately 12 hours after the initial pipe break. [CALC01]. The self-limiting nature of the event prevents the water level from exceeding 13 inches in the MDAFP area or 18 inches in the TDAFP area, therefore the MDAFPs and the TDAFP are not subject to submergence failure. [CALC01].

Upon discovery of the sprinkler actuation location, the operator would attempt to isolate the sprinklers by closing a valve. The fire pumps, however, will continue to initiate automatically on low header pressure regardless of how many times the pumps are stopped until the isolation valves for all actuated sprinkler headers and delube systems are closed.

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall (constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90. [CALC04]

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

The Steamline break leading to a 2000 gpm sprinkler discharge is named IE-TX06B. The timeline for operator actions associated with this event is provided in Attachment 2. This timeline is supported by Attachments 2 and 3 of the Fault Tree Analysis (Appendix C).

5.2.8.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is

associated with a particular fault tree. These fault trees are logically combined during the later fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

Steamline Pipe Break (Moderate Fire Sprinkler Response) (TX06B)

This top event represents the initiator described as Steamline Pipe Break that results in a fire sprinkler discharge of 2000 gpm into the Turbine Building. Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 100 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 4-inch level in the vicinity of 4 kVAC Bus 5. While the water level near the bus might be negligible 100 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 150 minutes, then locally closing the isolation valves on the deluge valve supply lines in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent the water level in Safeguards Alley from reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. GOTHIC analysis [CALC01] indicates that a peak water level (will occur at nearly the same time (150 minutes)) that is sufficiently high to cause failure of the auxiliary lube oil pump and prevent

normal remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the sprinkler flow by either: 1) tripping the 480 VAC breaker associated with each pump or 2) locally closing each Fire Pump's manual discharge valve or 3) locally closing the Fire Protection Water header isolation valves on the mezzanine level of the Turbine Building within approximately 170 minutes, then locally closing the isolation valve on the deluge valve supply line in the basement of the Turbine Building within an additional 60 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be negligible 170 minutes after the pipe break, GOTHIC analysis [CALC01] indicates this level and bus failure will occur fairly early. GOTHIC analysis also shows that stopping the sprinkler flow within approximately 170 minutes will also prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level (several hours later) in the vicinity of 4 kVAC Bus 6 that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump providing injection until water rises to 4 inches in the Bus 6 room. The isolation action for both Buses 61 and 62, and Bus 6 is represented byTop Event I6.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis [CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW

pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending on the failures that occurred previously in the event tree. First, the operators may have recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 150 minutes of the initial break. Finally, if the turbine-driven pump is not restarted before 150 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition of the sequences where top

event AFX is used the B-train electrical safety buses (4kVAC and 480 VAC) are available as well as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow controlled using AFW-2B. If air and power are available, then flow can be controlled from the control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA. Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCA based on the NRC Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost, then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one hour [CALC01] before electrical buses would submerge and fail the seal cooling systems. Because this event is self-limiting due to the isolation of the fire pumps when water level reaches the failure height(s) on the associated 480 VAC buses, the level in the Turbine Building will not reach 18 inches, and bus 6 would be available to support safety injection pump operation for approximately 12 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of

CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow without refilling the RWST.

5.2.9 Circulating Water Pipe Break (Condenser Inlet/Outlet Expansion Joint Rupture – 6,000 gpm

5.2.9.1 Introduction

The event tree for a Small Circulating Water Break (Figure 5-10) models the behavior of Kewaunee Power Station following a postulated 6000-gpm break in a Condenser Expansion Joint. (A 6000-gpm break was deemed to be most representative of a small rupture since the rupture data defines a small rupture as between 2000 and 10,000 gpm.) Normal mitigation of this event requires isolation of the break by tripping both Circulating Water pumps. After termination of break flow, decay heat removal and maintenance of RXCP seal integrity is required.

The following descriptors are used to identify systems and operator actions modeled within the event tree structure as top events:

CY06B	-	Small Circulating Water Break
I5	-	Isolation of Break in Time to Prevent Eventual Loss of Motor Loads Associated with 4 kVAC Bus 5 Due to Excessive Water in Safeguards Alley
ITD	-	Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump
I6	-	Isolation of Break in Time to Prevent Eventual Isolation of Motor Loads Associated with 4 kVAC Bus 6 and Eventual Failure of 480 VAC Buses 61 and 62 Due to Excessive Water in Safeguards Alley
IMD	-	Isolation of Break in Time to Prevent Submergence of Motor Driven AFW Pumps
I18	-	Isolation of Break in Time to Prevent 18 Inches of Water in the Turbine Building
AFS	-	Motor Driven AFW Pump Failure to Start (Automatic Start)
AFR	-	Motor Driven AFW Pump Failure to Run
AFZ	-	Operator Failure to Start Turbine Driven AFW Pump
AFT	-	Turbine Driven AFW Pump Failure (Hardware)
AFX	-	Operator Failure to Take Manual Control of AFW System
RCP	-	Reactor Coolant Pump Seal Cooling Failure
OCD	-	RCS Cooldown
SLC	-	Small RCP Seal LOCA
HPI	-	ECCS Injection
RWC	-	Conservation of RWST Inventory per ECA-1.1

5.2.9.2 Accident Progression

After a successful reactor trip, decay heat must be removed. The first requirement for successful decay heat removal is reactor coolant flow. Reactor coolant flow ensures that a heat convection path exists between the core and the steam generators. Core heat removal by forced circulation is preferred over natural circulation since this minimizes pressurizer safety and relief valve challenges and results in rapid heat transport to the steam generators. Natural circulation flow nevertheless will also provide for effective decay heat removal. Since either method of coolant circulation will remove decay heat, reactor coolant pumps will not be explicitly modeled.

The heat removal path must be continued on the secondary side of the steam generators. This is accomplished with secondary steam release and feed from the AFW System since the MFW System is unavailable due to the pipe break. Since the steam dump valves are assumed to be unavailable due to the pipe break, initially the SG atmospheric relief valves automatically actuate to release steam to the condenser or the atmosphere and stabilize RCS temperature close to the no-load value of 547°F. Each SG has one atmospheric relief valve and five safety valves. If electric power to the SG PORV is unavailable, then the operator must open the valve manually.

Integrity of the reactor coolant system (RCS) must be maintained to ensure that decay heat removal can be accomplished. For the flooding scenarios, a short-term challenge to RCS integrity is the potential failure of RXCP seals. One of two means is available to maintain seal integrity: operation of a charging pump to ensure RXCP seal injection or operation of the CCW system to maintain thermal barrier cooling. For either of these methods, power must be available from one of the 480 VAC safety buses.

If failure of both trains of 480 VAC safety buses occurs because of excessive water levels, then cooldown of the RCS would reduce RCS pressure, thereby reducing the probability of a RXCP seal LOCA, or, if a seal LOCA occurs, reduce RCS flow from the failed seal or seals. By reducing the flow from any potential LOCA, RCS makeup requirements are minimized. RCS makeup flow (due to the Seal LOCA) will come from the ECCS injecting the RWST inventory and from the discharge of the accumulators. The operators must throttle SI flow to conserve the RWST inventory for 24 hours of SI operation while maintaining adequate RCS level.

The Circulating Water system is designed to move over 400,000 gpm of water to the condenser water boxes and has the capability of placing extremely large amounts of water into the Turbine Building in a short amount of time. The probability of a random break in the circulating water piping is very small when compared to the probability of an expansion joint rupture. Therefore, a 6000-gpm break is analyzed due to its higher likelihood. This flow rate represents a small rupture of a condenser inlet or outlet expansion joint.

GOTHIC analysis indicates that the operator would have approximately 29 minutes to isolate a 6000-gpm Circulating Water break (by tripping the Circulating Water pumps) to prevent the water level from eventually reaching 4 inches near 4 kVAC Bus 5 in Safeguards Alley which

would possibly cause the automatic tripping of the breakers associated with the motor loads fed from this bus. The transformers associated with 480 V Buses 51 and 52 would not be affected, however, by this 4-inch water level. Additionally, the bus itself will not be impacted since its failure does not occur until the 18-inch water level. Isolating the break within approximately 45 minutes will prevent the water from ultimately reaching a level of 9 inches in the Turbine Driven AFW Pump room. Additionally, the operator would have approximately 51 minutes to isolate the rupture to prevent the water level from reaching 4 inches near 4 kVAC Bus 6 resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Also, isolating the break within approximately 52 minutes will prevent eventual failure of 480 VAC Buses 61 and 62 at 11 inches of water. Again, the transformers associated with 480 V Buses 61 and 62 would not be affected by the 4-inch water level on Bus 6, but in this scenario buses 61 and 62 fail at 11 inches of water, which occurs if isolation fails at 52 minutes which is approximately the same isolation time to prevent failure of bus 6 motor loads at 4 inches of water. The operator would have approximately 60 minutes to prevent submergence failure of the MDAFPs at 13 inches. The operator would have approximately 66 minutes to prevent the water level in the Turbine Building from reaching 18 inches. [CALC01]

A small Circulating Water break would first be indicated by a Turbine Building sump high-high-high level alarm in the control room from level switch LA-16666 [REPORT02]. The drains and sumps procedure instructs the operator to dispatch someone to locally investigate the sump when this alarm sounds in the control room. Another indication would be low condenser vacuum, which likely would result in a reactor trip.

In this scenario, the expansion joint rupture will be isolated by manually tripping the Circulating Water pumps. If this trip fails, water will continue to flow into Safeguards Alley via leakage under the doors and flow through the drain lines, causing failure of the electrical equipment housed there.

Water level in flood areas TU-95B-1, TU-95B-2, TU-95C, and TU-94 will closely match the water level in the Turbine Building because of the drain lines that connect these areas to the Turbine Building sump. These drain lines did not contain check valves and would have allowed water to flow freely from the sump to the areas. The water level in flood area TU-95A will be lower since water will be entering the room via leakage under doors 5, 263, and 268. Water will flow to the trench in TU-95A that communicates with TU-90. Thus the water level in areas TU-95A and TU-90 will rise simultaneously. Since the drain line in TU-90 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 2 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 4 kVAC 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-90, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus. Additionally, if the water level in TU-95B-1 reaches approximately 3 feet, the firewall

(constructed of gypsum board) that contains doors 263 and 268 is expected to fail structurally allowing a significant volume of water to enter TU-95A and TU-90 [CALC04].

Similarly, the water level in TU-92 will be fed by leakage under door 3. Since the drain line in TU-92 will be filled between the Turbine Building sump and the check valve, the only drainage will be leakage under door 1 leading to the Screenhouse pipe tunnel. When water level exceeds the height of the seiche hump (approximately 2.78 inches relative to the floor around Bus 6 [REPORT03]) in this pipe tunnel, water will flow freely to the Screenhouse. Results from GOTHIC analysis [CALC01] indicate that the water level will exceed 4 inches in TU-92, thereby resulting in the possible automatic tripping of the breakers associated with the motor loads fed from this bus.

The initiating event due to a small break in a Circulating Water System expansion joint is named IE-CY06B.

5.2.9.3 Top Event Description

The top events of the event tree are described in detail below to provide an understanding of the system functions involved. The timeline for operator actions associated with this event is provided in Attachment 2.

The results of the event tree analysis are combinations of top events that together define a particular accident sequence that leads to a particular damage state. Each of these top events is associated with a particular fault tree. These fault trees are logically combined during the later fault tree linking process to yield the combinations of equipment failures and human errors that lead to a particular damage state.

Small Circulating Water Break (CY06B)

This top event represents the initiator, a small rupture in a Circulating Water Expansion Joint resulting in lake water being spilled into the Turbine Building Basement at a rate of 6000 gpm. Following this event, the bottom row of circuit breakers on buses 51, 52, 61, and 62 are assumed to open when water level reaches 2.75 inches. No credit is taken for potential isolation before the volume of water released to the Turbine Building would cause these breakers to open.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 5 Motor Loads Due to Excessive Water Level in Safeguards Alley (I5)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps from the control room within approximately 29 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 4-inch level in the vicinity of 4 kVAC Bus 5. While the water level near the bus might be negligible 29 minutes after the pipe break, GOTHIC

analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train A motor loads: Service Water Pumps A1 and A2, Motor Driven AFW Pump A, Safety Injection Pump A, and RHR Pump A. The transformers associated with 480 VAC Buses 51 and 52 would not be affected at this water level, therefore power to 4 kVAC Bus 5 and 480 VAC Buses 51 and 52 would remain available.

Isolation of Break in Time to Prevent Eventual Failure of Turbine Driven AFW Pump to Start Due to Submergence of Auxiliary Lube Oil Pump (ITD)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps from the control room within approximately 45 minutes of the rupture to prevent the water level in Safeguards Alley from eventually reaching the 9-inch failure height of the auxiliary lube oil pump, which is required for normal start of the TDAFP. While the water level near the TDAFP might be negligible 45 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that any further delay of the break isolation will result in a peak water level (several minutes later) that is sufficiently high to cause failure of the auxiliary lube oil pump and prevent normal remote starting of the TDAFP.

Isolation of Break in Time to Prevent Eventual Isolation of 4 kVAC Bus 6 Motor Loads and Failure of 480 VAC Buses 61 and 62 Due to Excessive Water Level in Safeguards Alley (I6)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps from the control room within approximately 52 minutes of the rupture to prevent eventual failure of 480 VAC Buses 61 and 62 at an 11-inch water level in their room. While the water level near the buses might be negligible 52 minutes after the pipe break, GOTHIC analysis [CALC01] indicates that this level and bus failure will occur fairly early. GOTHIC analysis also shows that tripping both Circulating Water pumps within approximately 51 minutes will prevent the water level in Safeguards Alley from eventually reaching a 4-inch peak water level (several hours later) in the vicinity of 4 kVAC Bus 6 that is sufficiently high to possibly trip the breakers associated with the motor loads from this bus. This would result in the failure of all Train B motor loads: Service Water Pumps B1 and B2, Motor Driven AFW Pump B, Safety Injection Pump B, and RHR Pump B. This loss, however, will not occur for many hours into the event. With I6 failure, credit is taken for the B-Train SI pump providing injection until water rises to 4 inches in the Bus 6 room. The isolation action for both Buses 61 and 62, and Bus 6 is represented by Top Event I6.

Isolation of Break in Time to Prevent Submergence Failure of the Motor Driven AFW Pumps (IMD)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps

from the control room within approximately 60 minutes of the rupture to prevent the water level from reaching the 13-inch failure height of the Motor Driven AFW pumps. In addition, at this level, loss of Bus 5 will occur because of the potential that the A-train motor-driven AFW pump could be running and become shorted. Therefore, Buses 51 and 52 become failed. This would leave only the Turbine Driven AFW pump to provide cooling of the steam generators, along with several hours of injection from the B-train SI pump as noted for Top Event I6.

Isolation of Break in Time to Prevent 18 Inches of Water in the Turbine Building (I18)

The operator must isolate the expansion joint rupture by tripping both Circulating Water pumps from the control room within approximately 66 minutes of the rupture to prevent the water level in the Turbine Building from reaching 18 inches. If water level reaches this height, core damage is assumed since the electrical connections of the reserve auxiliary transformer (RAT) to Buses 1 and 2 will be submerged leading to a loss of offsite power and the eventual failure of all safety-related buses. Additionally, this water level in the Turbine Building will result in the failure of the diesel generators since the supply fans are powered from 480 VAC Buses 51 and 52 and 480 VAC Buses 61 and 62. Therefore, no credit is taken for operation of the B-Train AFW pump for the period prior to water level rising to 4 inches on Bus 6. Finally, if this isolation fails, then over 18 inches of water would have been released to the Turbine Building basement. Therefore, it is assumed that the TDAFW pump would become submerged and be rendered unavailable even if running.

Motor Driven AFW Pump Failure to Start (Automatic Start) (AFS)

Top Event AFS models the random hardware failures associated with the starting of Motor Driven AFW Pump B (MDAFP B). MDAFP B will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (powered by 480 VAC Bus 61/62) must be available for the AFW pump to start. Although the auxiliary lube oil pump is powered through the lowest row of circuit breakers on Bus 61/62, it is expected that the pump will start before its power supply is affected since the AFW Pump will receive a start signal within seconds of a reactor trip and GOTHIC analysis [CALC01] shows that water level in Safeguards Alley will not impact pump start that early in the event.

Motor Driven AFW Pump Failure to Run (AFR)

Top Event AFR models the random hardware failures associated with the running of MDAFP B. Given a successful start, MDAFP B must continue to run to ensure adequate core cooling. Power to MDAFP B is supplied by 4 kVAC Bus 6. The associated auxiliary lube oil pump is not required for continued operation of MDAFP B, only for starting the pump. Analyses [CALC02, CALC05] have shown that room cooling is not required for long-term operation of the AFW pump.

Operator Failure to Start Turbine Driven AFW Pump (AFZ)

This top event is used to model failure of the operator to provide AFW flow for decay heat removal using the turbine-driven AFW pump. The top event is used to model operator action-related failures only. Other nodes in the event trees evaluate hardware-related failures of the turbine-driven AFW train.

For the sequences where top event AFZ is used, several potential success paths exist, depending on the failures that occurred previously in the event tree. First, the operators may have recognized that the flooding event could threaten the motor-driven AFW pumps and would maintain the turbine-driven AFW pump running throughout the event. Second, if the turbine-driven AFW pump were secured, it could be restarted. Depending on when the break flow is terminated, restart could merely require that the operators take the control switch from pull-to-lock. Then, even if the operators did not start the pump, it would automatically start on a low-low steam generator level signal. If break isolation occurred later, the pump would need to be restarted before the auxiliary lube oil pump was submerged, or within 61 minutes of the initial break [CALC01]. Finally, if the turbine-driven pump is not restarted before 61 minutes after flood initiation and then maintained running, then the pump could be started if the low oil pressure interlock is bypassed. Bypass of the low oil pressure interlock may be directed by personnel manning the technical support center and would need to be completed before water level in either of the steam generators dropped to less than 5-percent wide range, the point that bleed and feed cooling would be initiated.

Turbine Driven AFW Pump Failure (Hardware) (AFT)

Top Event AFT models the random hardware failures associated with the start and run of the TDAFP. The TDAFP will start on the low-low steam generator water level signal and provide auxiliary feedwater to the steam generators. The associated auxiliary lube oil pump (which is DC powered) must be available for the TDAFP pump to start normally. If the water level near the TDAFP is below the 9-inch failure height of the auxiliary lube oil pump, then the TDAFP will start normally. If the auxiliary lube oil pump is submerged, then additional operator actions, evaluated in top event AFZ, are required to start the TDAFP.

Operator Failure to Take Manual Control of AFW System (AFX)

This top event is used to model failure of the operator to control AFW flow to maintain level in the steam generators.

By definition, all equipment in the Turbine Building basement is assumed failed by the initiating event. Therefore, service air compressors are lost. Also by definition of the sequences where top event AFX is used the B-train electrical safety buses (4kVAC and 480 VAC) are available as well

as the A-train 480 VAC safety buses. Because the B-train 480 VAC safety buses are available, the B-train instrument air compressor, C1B, is potentially available. Availability of the A-train 480 VAC safety buses means that instrument air compressor C1C is potentially available. Even though the B-train 480 VAC safety buses are available, the bottom row of breakers on the 480 VAC buses will have opened. When these breakers open, the ability to operate the MDAFP auxiliary lube oil pump is lost.

Given the conditions described above, success of the AFX equation can be achieved by several means. First, the B-train motor-driven AFW pump could be maintained running and flow controlled using AFW 2B. If air and power are available, then flow can be controlled from the control room. If air or power is not available, then AFW-2B can be operated locally.

Second, if the operators secure the B-train AFW pump, then the turbine-driven AFW pump can be used. For sequences where top event AFZ follows success of top event AFR, the turbine-driven AFW pump is evaluated within the AFX node. Otherwise the TDAFP hardware is evaluated explicitly by other top events. Lastly, if the motor-driven AFW pump 1B has been secured, then the low oil pressure interlock can be bypassed to allow starting the motor-driven AFW pumps without the auxiliary lube oil pumps.

RXCP Seal Cooling (RCP)

Top Event RCP represents the failure of the hardware needed for RXCP seal cooling. If RXCP seal cooling is maintained, then failure of the RXCP seals would not be expected. Seal cooling can be maintained by charging system injection to the seals or by maintaining CCW cooling to the thermal barrier heat exchanger. Failure of this top event means that the possibility of a RXCP seal LOCA must be evaluated.

RCS Cooldown (OCD)

Top Event OCD represents the failure of the operator to initiate and continue RCS Cooldown. Success of this top event affects the probability and associated size of a RXCP seal LOCA. Should a LOCA occur, the cooldown affects the rate that coolant will be lost through the LOCA. Analyses [CALC06] have shown that if cooldown is successful, then core damage can be prevented regardless of the size of any RXCP seal LOCA provided that AFW is successful and that ECCS injection is available. Success of this top event requires opening of a Steam Generator PORV and ensuring that adequate shutdown margin is available.

If Buses 6, 61, and 62 remain available for 24 hours, then the cooldown will be conducted per ES-0.2 [PROC01], which requires that adequate shutdown margin from boration be available. In this case, the purpose of the RCS cooldown is first to prevent a RXCP seal LOCA and second to minimize leakage from the break if a LOCA were to occur.

If Buses 6, 61, and 62 fail early, then the cooldown will be conducted per ES-1.2 [PROC03] (which does not require normal boration) and a RXCP seal LOCA of some size can be assumed to occur. For these sequences, the purpose of the cooldown is to minimize flow from the LOCA. Minimization of flow is needed so that adequate RCS inventory is available to maintain decay heat removal following loss of safety injection.

Small RCP Seal LOCA (SLC)

Top Event SLC is used to assign the probability of a large RCP Seal LOCAs based on the NRC Safety Evaluation of the WOG2000 RCP Seal Leakage Model [WCAP01]. If seal cooling is lost, then the size of any potential RXCP seal LOCA impacts the success requirements for other systems needed to mitigate the accident.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, and cooldown was successful, analyses [CALC06] have shown that core damage can be prevented regardless of the size of any RXCP seal LOCA if ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) are successful. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage.

For sequences where one train of safety related AC power is available, i.e., Buses 6, 61, and 62, but cooldown was failed, analyses [CALC06] have shown that core damage can be prevented provided that the seal LOCA is less than 480-gpm per pump. However, this analysis will assume that any seal failure greater than 21 gpm per pump will result in core damage. For sequences where RCS pressure is not reduced less than 1410 psig within two hours, [WCAP01] indicates that O-ring extrusion failure should be expected to result in a 480-gpm seal LOCA with a probability of 0.5. This analysis will assume that if cooldown fails (top event OCD) then RCS pressure will be above 1410 psig at two hours. If O-ring extrusion failure does not occur, then the probability of a seal LOCA greater than 21 gpm per pump is 0.2. For these sequences, if the RXCP seal LOCA is less than 21 gpm, success of ECCS injection (top event HPI described below) along with operator actions to conserve RWST inventory (top event RWC described below) will prevent core damage.

The last case to consider for top event SLC is for sequences where isolation of the flooding event did not occur before the volume of water released to the Turbine Building would eventually submerge buses 6, 61, and 62. For these sequences, RXCP seal cooling would be available for at least one hour [CALC01] before electrical buses would submerge and fail the seal cooling systems. Provided that the break flow was isolated prior to level in the Turbine Building exceeding 18 inches, bus 6 would be available to support safety injection pump operation for approximately 8 hours [CALC01] as noted in the timeline in Attachment 2. The analyses of CALC06 have shown that if cooldown and ECCS injection are successful and that if AFW cooling is maintained after ECCS injection is lost, then core damage is prevented provided that

the RXCP seal LOCA is less than 480 gpm per pump. However, this analysis will assume that only the smallest expected seal LOCAs, i.e., 21 gpm per pump, can be mitigated.

ECCS Injection (HPI)

Since an RCP Seal LOCA is assumed to occur if RXCP seal cooling is lost, RCS inventory must be maintained to ensure adequate decay heat removal. This is accomplished by using Safety Injection Pump B to inject the contents of the RWST into the RCS for several hours before loss of the SI pump due to tripping its supply breaker on Bus 6 and by the discharge of the accumulators. Safety Injection Pump A is assumed to be unavailable due to the tripping of its supply breaker in Top Event I5.

The analyses of CALC06 have shown that core damage can be prevented even if safety injection will eventually be lost when water level reaches 4 inches on Bus 6. To prevent core damage, several events must occur. First, cooldown must be successful and AFW must remain available to maintain the RCS depressurized for 24 hours. Second, any seal LOCA must be 21 gpm per pump or less. Third, safety injection must be successful for at least five hours. The analyses presented in [CALC01] and the timeline in Attachment 2 show that water level will not reach four inches on Bus 6 for much longer than five hours. Therefore, operation and control of the safety injection pump will be available when needed prior to loss of the Bus 6 loads.

Conservation of RWST Inventory per ECA-1.1 (RWC)

Top Event RWC models the operator action for throttling SI flow to conserve RWST inventory. This is done via procedure ECA-1.1 and allows for more than 24 hours of safety injection flow without refilling the RWST.

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
CI06B	Rupture of an Inlet Condenser Expansion Joint in TU-22-1	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B MCC-32D MCC-42B MCC-42D AOV PW-52	Detect: Reactor Trip due to Loss of Condenser Vacuum Isolate: Trip both Circulating Water Pumps	Initiating Event: IE-CI06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 40-BS-MCC32D-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 26-AV-PW52---OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
CX06B	Rupture of an Outlet Condenser Expansion Joint in TU-22-1	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B MCC-32D MCC-42B MCC-42D AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump) Isolate: Trip both Circulating Water Pumps	Initiating Event: IE-CX06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 40-BS-MCC32D-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 26-AV-PW52---OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
SI06B	Large Service Water Pipe Break in TU-22-1	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B MCC-32D MCC-42B MCC-42D AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump) Isolate: Close SW-4A/SW-4B (only one of them will be open)	Initiating Event: IE-SI06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 40-BS-MCC32D-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 26-AV-PW52—OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
FI06B	Large Fire Protection Water Pipe Break in TU-22-1	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B MCC-32D MCC-42B MCC-42D AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump); FIRE PUMP RUNNING Alarm Isolate: Close manual discharge valve on each Fire Pump OR Remove power to both Fire Pumps (might not be possible if water propagates throughout Safeguards Alley)	Initiating Event: IE-FI06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 40-BS-MCC32D-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 26-AV-PW52---OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
WI06B	Feedwater Pipe Break in TU-22-1 Leading to Large Fire Protection Water Discharge	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B AOV SD-11A1 AOV SD-11B1 Bus 3 Bus 4 Bus 32 Bus 35 Bus 42 Bus 45 MCC-32D MCC-32G MCC-42B MCC-42D MCC-42G AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump); FIRE PUMP RUNNING Alarm; Hotwell Low Level Alarm Isolate: Close manual discharge valve on each Fire Pump OR Remove power to both Fire Pumps (might not be possible if water propagates throughout Safeguards Alley) OR close manual sprinkler/deluge isolation valves on mezzanine level of Turbine Building	Initiating Event: IE-WI06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 06-AV-SD11A1-FO 06-AV-SD11B1-FO 39-BS-BUS3---SG 39-BS-BUS4---SG 40-BS-BUS32-SG 40-BS-BUS35-SG 40-BS-BUS42-SG 40-BS-BUS45-SG 40-BS-MCC32D-SG 40-BS-MCC32G-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 40-BS-MCC42G-SG 26-AV-PW52---OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
WX06B	Feedwater Pipe Break in TU-22-1 Leading to Medium Fire Protection Water Discharge	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B AOV SD-11A1 AOV SD-11B1 Bus 3 Bus 4 Bus 32 Bus 35 Bus 42 Bus 45 MCC-32D MCC-32G MCC-42B MCC-42D MCC-42G AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump); FIRE PUMP RUNNING Alarm; Hotwell Low Level Alarm Isolate: Close manual discharge valve on each Fire Pump OR Remove power to both Fire Pumps (might not be possible if water propagates throughout Safeguards Alley) OR close manual sprinkler/deluge isolation valves on mezzanine level of Turbine Building	Initiating Event: IE-WX06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 06-AV-SD11A1-FO 06-AV-SD11B1-FO 39-BS-BUS3---SG 39-BS-BUS4---SG 40-BS-BUS32-SG 40-BS-BUS35-SG 40-BS-BUS42-SG 40-BS-BUS45-SG 40-BS-MCC32D-SG 40-BS-MCC32G-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 40-BS-MCC42G-SG 26-AV-PW52---OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
TI06B	Steamline Pipe Break in TU-22-1 Leading to Large Fire Protection Water Discharge	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B AOV SD-11A1 AOV SD-11B1 Bus 3 Bus 4 Bus 32 Bus 35 Bus 42 Bus 45 MCC-32D MCC-32G MCC-42B MCC-42D MCC-42G AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump); FIRE PUMP RUNNING Alarm; Break Upstream of Turbine Throttle Valves Will Result in SI Signal, MSIV Closure, and Rx Trip Isolate: Close manual discharge valve on each Fire Pump OR Remove power to both Fire Pumps (might not be possible if water propagates throughout Safeguards Alley) OR close manual sprinkler/deluge isolation valves on mezzanine level of Turbine Building	Initiating Event: IE-TI06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 06-AV-SD11A1-FO 06-AV-SD11B1-FO 39-BS-BUS3---SG 39-BS-BUS4---SG 40-BS-BUS32-SG 40-BS-BUS35-SG 40-BS-BUS42-SG 40-BS-BUS45-SG 40-BS-MCC32D-SG 40-BS-MCC32G-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 40-BS-MCC42G-SG 26-AV-PW52---OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
TX06B	Steamline Pipe Break in TU-22-1 Leading to Medium Fire Protection Water Discharge	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B AOV SD-11A1 AOV SD-11B1 Bus 3 Bus 4 Bus 32 Bus 35 Bus 42 Bus 45 MCC-32D MCC-32G MCC-42B MCC-42D MCC-42G AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump); FIRE PUMP RUNNING Alarm; Break Upstream of Turbine Throttle Valves Will Result in SI Signal, MSIV Closure, and Rx Trip Isolate: Close manual discharge valve on each Fire Pump OR Remove power to both Fire Pumps (might not be possible if water propagates throughout Safeguards Alley) OR close manual sprinkler/deluge isolation valves on mezzanine level of Turbine Building	Initiating Event: IE-TX06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 06-AV-SD11A1-FO 06-AV-SD11B1-FO 39-BS-BUS3---SG 39-BS-BUS4---SG 40-BS-BUS32-SG 40-BS-BUS35-SG 40-BS-BUS42-SG 40-BS-BUS45-SG 40-BS-MCC32D-SG 40-BS-MCC32G-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 40-BS-MCC42G-SG 26-AV-PW52---OC

Table 5-2
Summary of KPS Turbine Building Flood Scenarios

IE Name	Description	Flood Damage	Detection/ Isolation Means	Failed Gate or Component BEs
CY06B	Small Rupture of an Inlet or Outlet Condenser Expansion Joint in TU-22-1	Propagate: TU-94 TU-95B-1 Damage: Air Compressor 1F Air Compressor 1G Condensate Pump 1A Condensate Pump 1B Feedwater Pump 1A Feedwater Pump 1B Rx Makeup Pump 1A Rx Makeup Pump 1B Plt Equip Wtr Pump 1A Plt Equip Wtr Pump 1B MCC-32D MCC-42B MCC-42D AOV PW-52	Detect: Miscellaneous Sumps Alarm (Turbine Building sump) Isolate: Trip both Circulating Water Pumps	Initiating Event: IE-CY06B Failed BEs: 01-CM-SIAC1F-PR 01-CM-SIAC1G-PR 03-PM--CDP1A-PR 03-PM--CDP1B-PR 05APM--FWP1A-PR 05APM--FWP1B-PR 27APM--RMP1A-PR 27APM--RMP1B-PR 27BPM-PEWPA—PR 27BPM-PEWPB—PR 40-BS-MCC32D-SG 40-BS-MCC42B-SG 40-BS-MCC42D-SG 26-AV-PW52---OC

6.0 REFERENCES

[CALC01] Calculation 0064-0515-LYS-01, Evaluation of Flooding Levels for Various PRA Cases, Revision 2, MPR Associates, Inc.

[CALC02] Calculation 0064-0514-002, GOTHIC Analysis of Additional MDAFW Room Heatup Cases, Revision 0, MPR Associates, Inc

[CALC03] MPR Report 2823, Past Operability Evaluation of Electrical Equipment Due to Internal Flooding in Kewaunee Power Station, Revision 2, MPR Associates, Inc.

[CALC04] "Evaluation of Various Doors and Walls for HELB Flooding – Turbine Building Basement," Revision 1, Scientel Wireless, LLC.

[CALC05] Calculation 0064-0514-001, GOTHIC Analysis of MDAFW Room Heatup Transient, Revision 1, MPR Associates, Inc.

[CALC06] "Thermal/Hydraulic Analysis for the Kewaunee Power Station Significance Determination Process," Calculation Number X10078, Revision 0.

[DWG01] Accessory Control Cabinet and Wiring Diagram, "Reserve Aux Transformer," X-K108-8, Revision A.

[NB01] KPS Internal Flooding Analysis "Qualitative Screening Assessment and Flood Frequency Development," SCIENTECH, LLC.

[NB02] KPS Internal Events PRA, Section 3.0, "Accident Sequence Analysis."

[PROC01] Kewaunee Emergency Operating Procedure ES-0.2, "Natural Circulation Cooldown," January 13, 2005.

[PROC02] Kewaunee Emergency Operating Procedure ES-0.3, "Natural Circulation Cooldown with Steam Void in Vessel," January 19, 1999.

[PROC03] Kewaunee Emergency Operating Procedure ES-1.2, "Post LOCA Cooldown and Depressurization," July 6, 2005.

[REPORT01] not used

[REPORT02] KPS System Description 30, "Miscellaneous Drains and Sumps (MDS)," Rev. 2.

[REPORT03] Letter from Robert E. Lee & Associates, Inc. to Tim Hanna (Dominion Energy Kewaunee, Inc.), September 27, 2005, "Results of Elevation Checks"

[WCAP01] WCAP-16141 "RCP Seal Leakage PRA Model Implementation Guidelines for Westinghouse PWRs," Westinghouse Electric Company, LLC, August 2003.

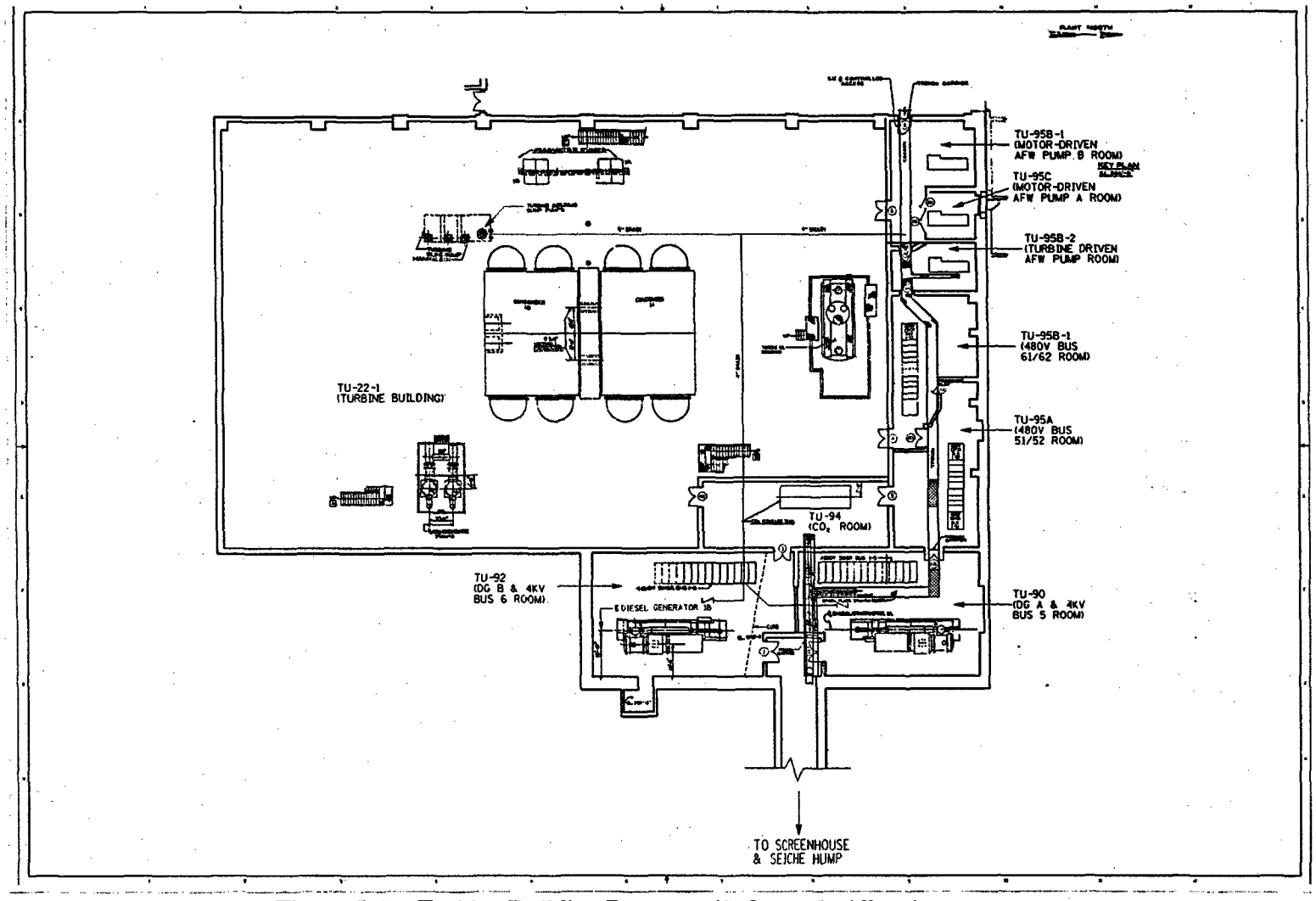

Figure 5-1 – Turbine Building Basement/Safeguards Alley Arrangement

Figure 5-2. CI06B Event Tree

CI06B.pdf

Figure 5-3. CX06B Event Tree

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Figure 5-4. SI06B Event Tree

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Figure 5-5. FI06B Event Tree

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Figure 5-6. WI06B Event Tree

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Figure 5-7. WX06B Event Tree

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Figure 5-8. TI06B Event Tree

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Figure 5-9. TX06B Event Tree

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Figure 5-10. CY06B Event Tree

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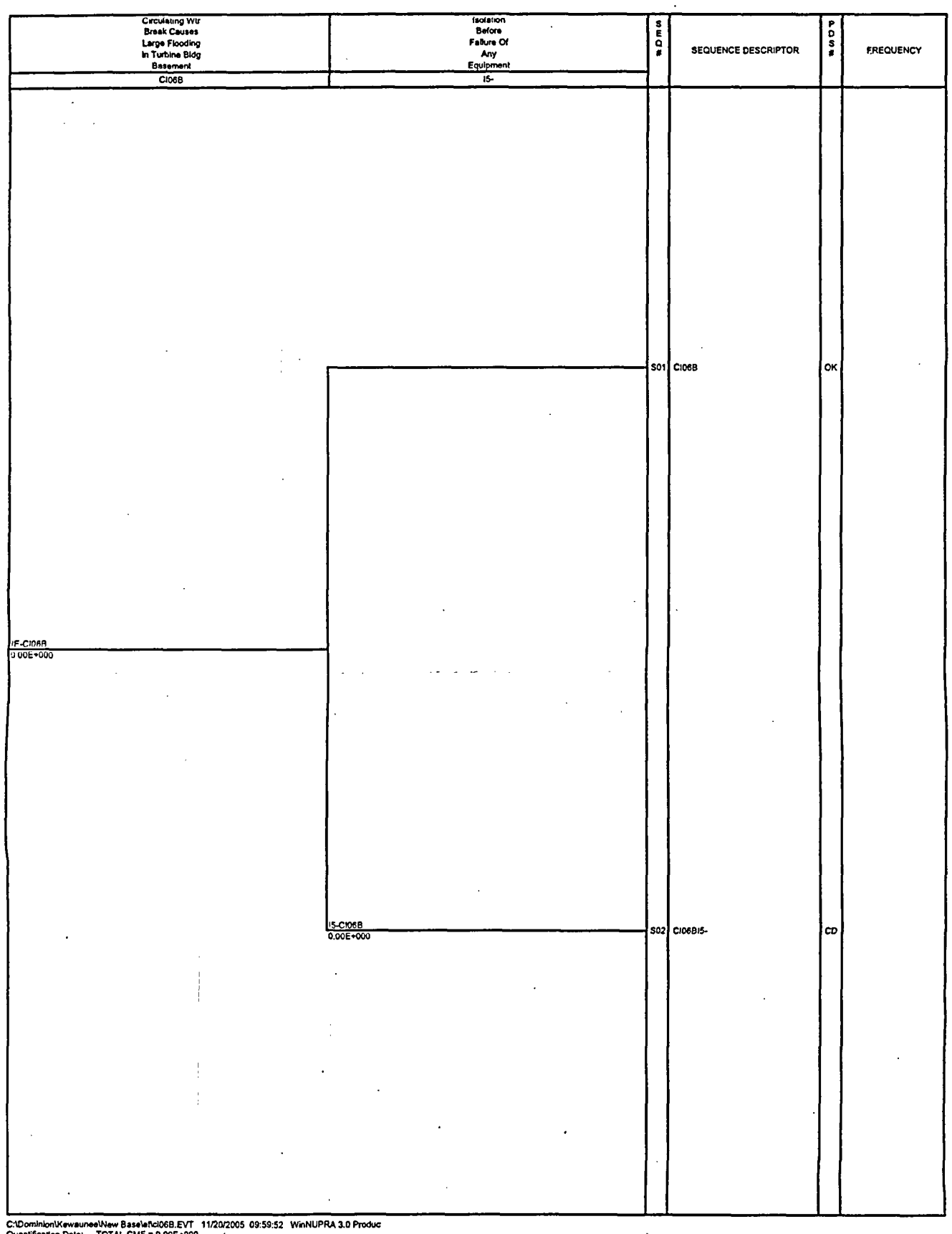

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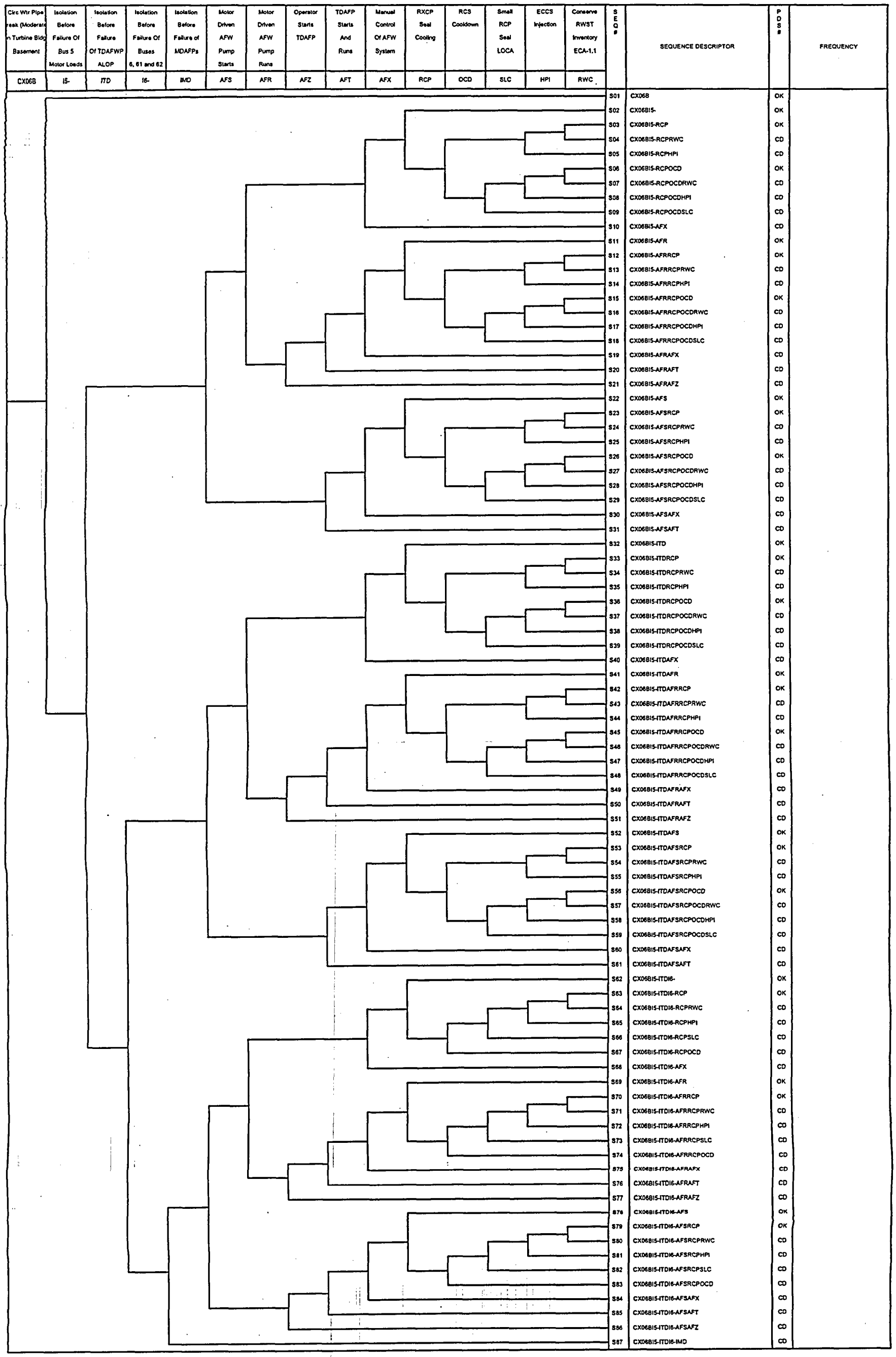

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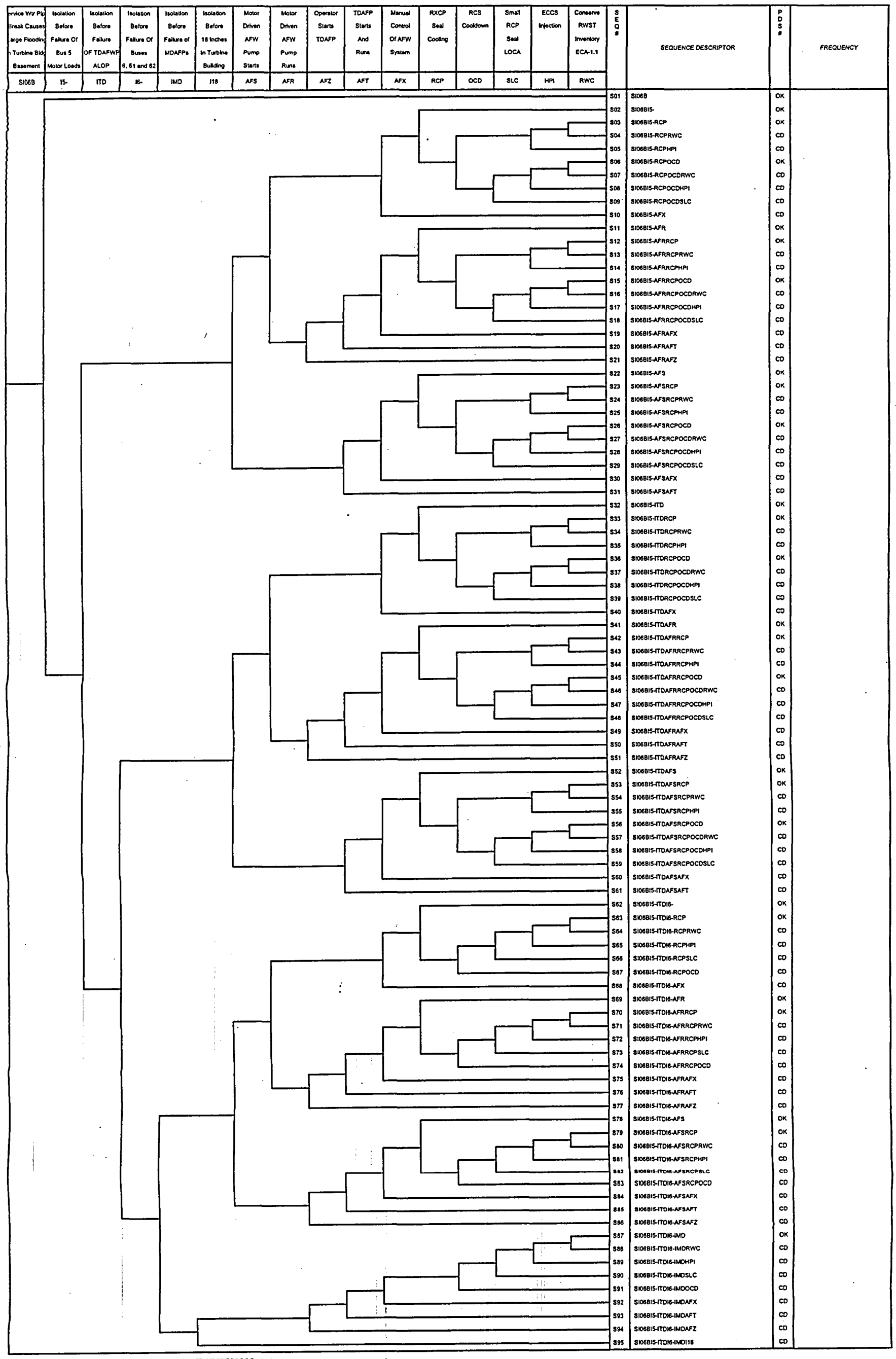

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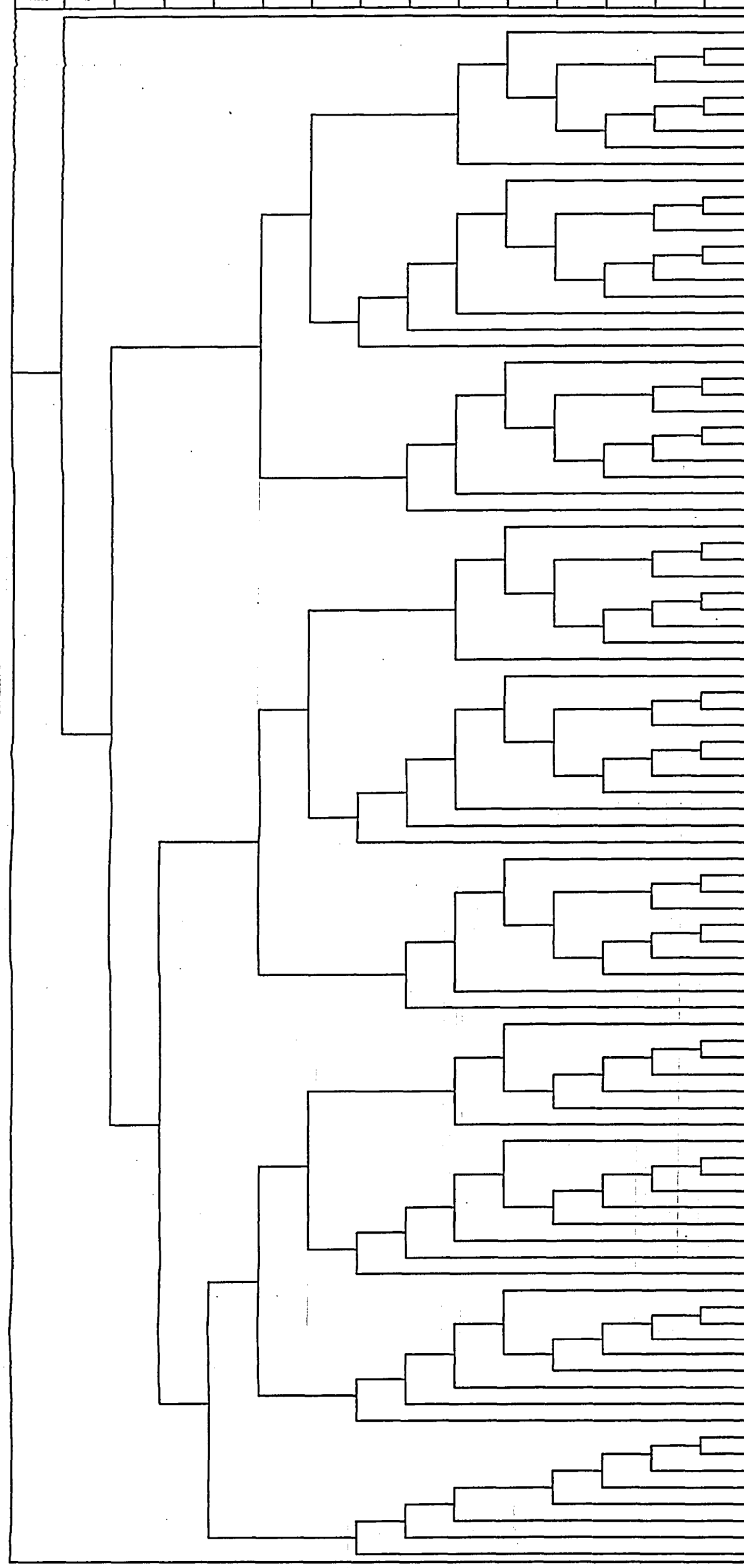

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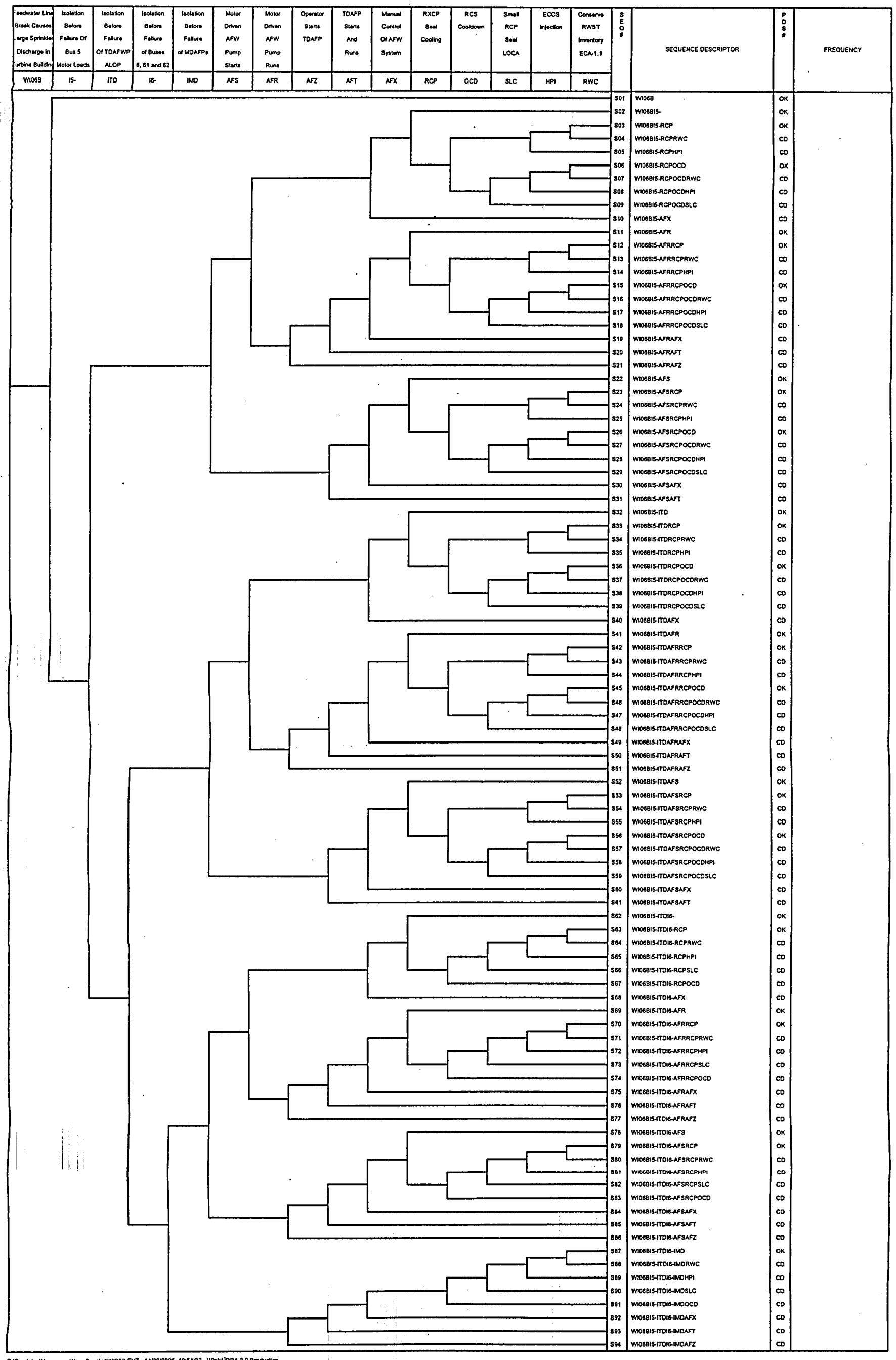

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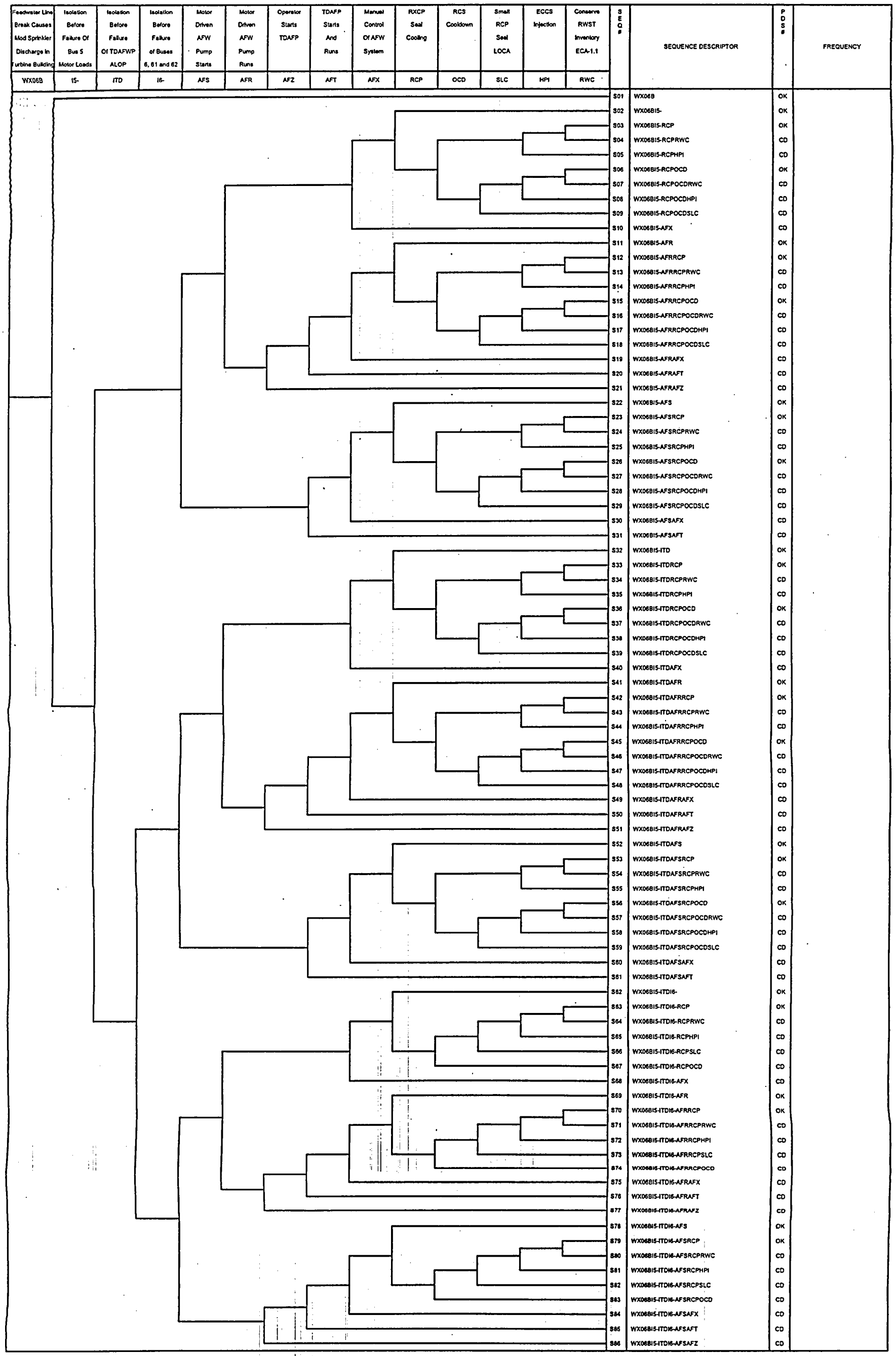

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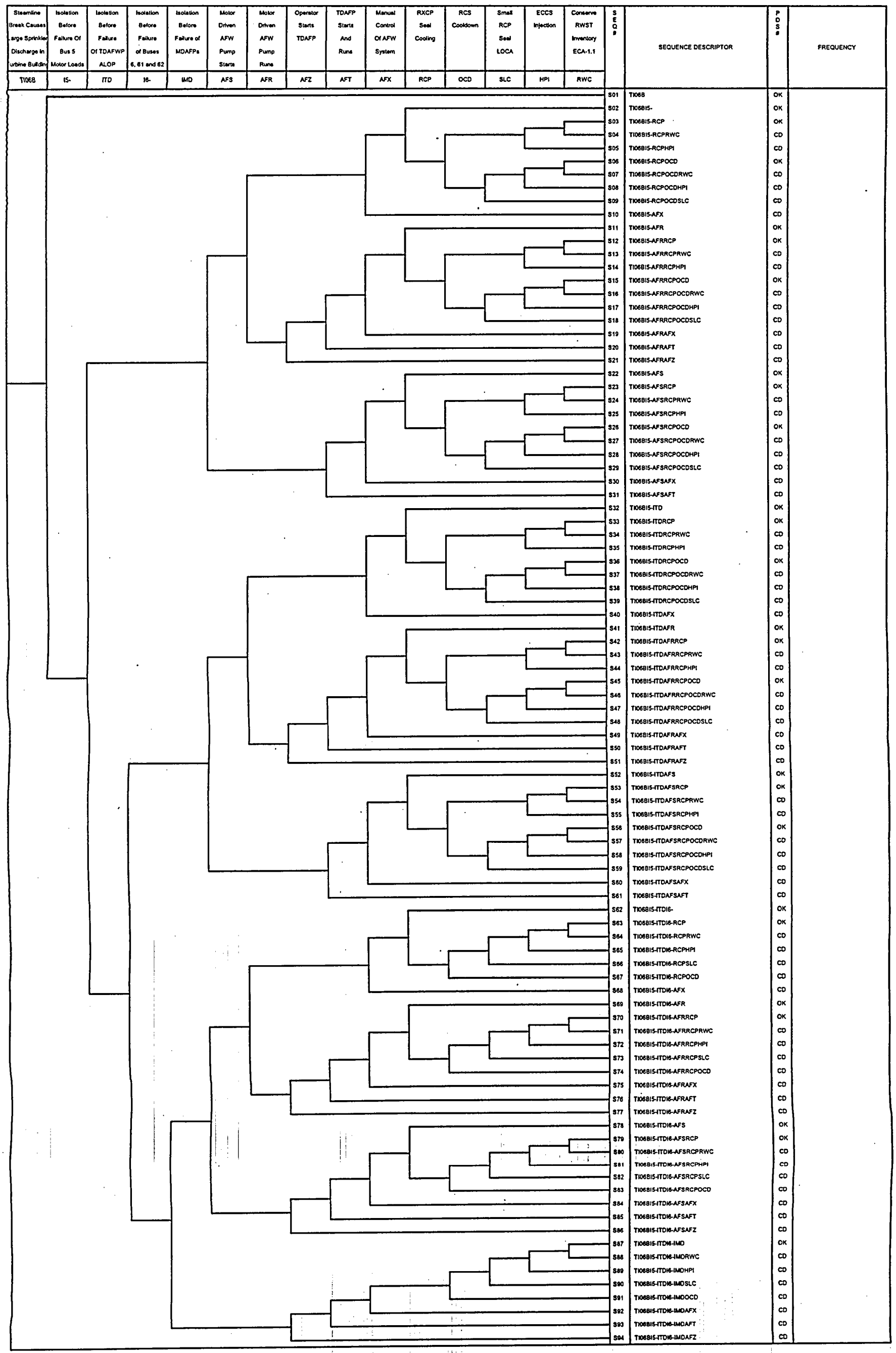

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S40	TI06BI5-ITDAFX	CD	
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S42	TI06BI5-ITDAFRRCP	OK	
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S44	TI06BI5-ITDAFRRCPHPI	CD	
S45	TI06BI5-ITDAFRRCPOCD	OK	
S46	TI06BI5-ITDAFRRCPOCDRWC	CD	
S47	TI06BI5-ITDAFRRCPOCDHPI	CD	
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S51	TI06BI5-ITDAFRAFZ	CD	
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S53	TI06BI5-ITDAFSRCP	OK	
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S59	TI06BI5-ITDAFSRCPOCDSLC	CD	
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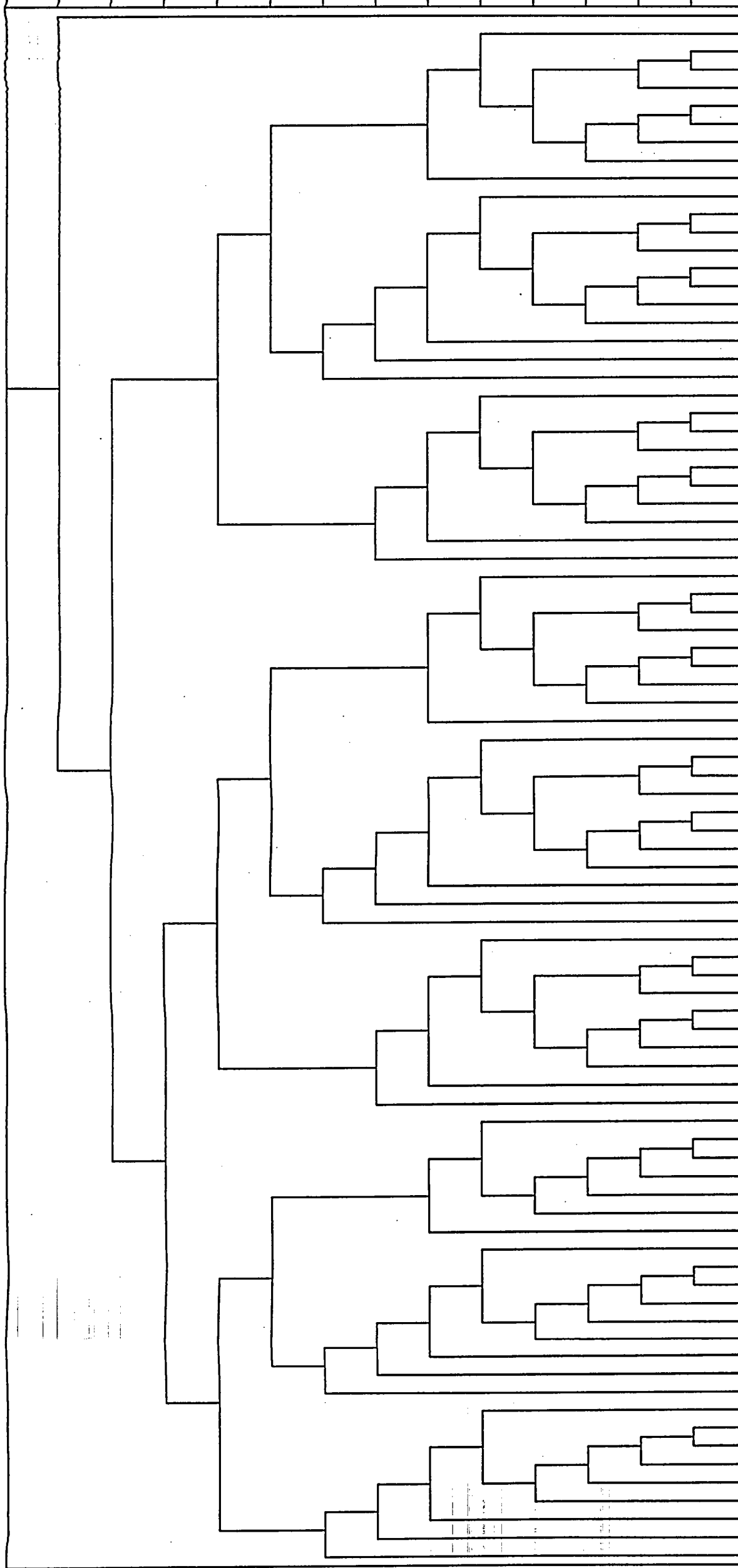

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S09	TX06BI5-RCPOCDSLC	CD	
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S13	TX06BI5-AFRRCPRWC	CD	
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S33	TX06BI5-ITDRCP	OK	
S34	TX06BI5-ITDRCPRWC	CD	
S35	TX06BI5-ITDRCPHPI	CD	
S36	TX06BI5-ITDRCPOCD	OK	
S37	TX06BI5-ITDRCPOCDRWC	CD	
S38	TX06BI5-ITDRCPOCDHPI	CD	
S39	TX06BI5-ITDRCPOCDSLC	CD	
S40	TX06BI5-ITDAFX	CD	
S41	TX06BI5-ITDAFR	OK	
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S45	TX06BI5-ITDAFRRCPOCD	OK	
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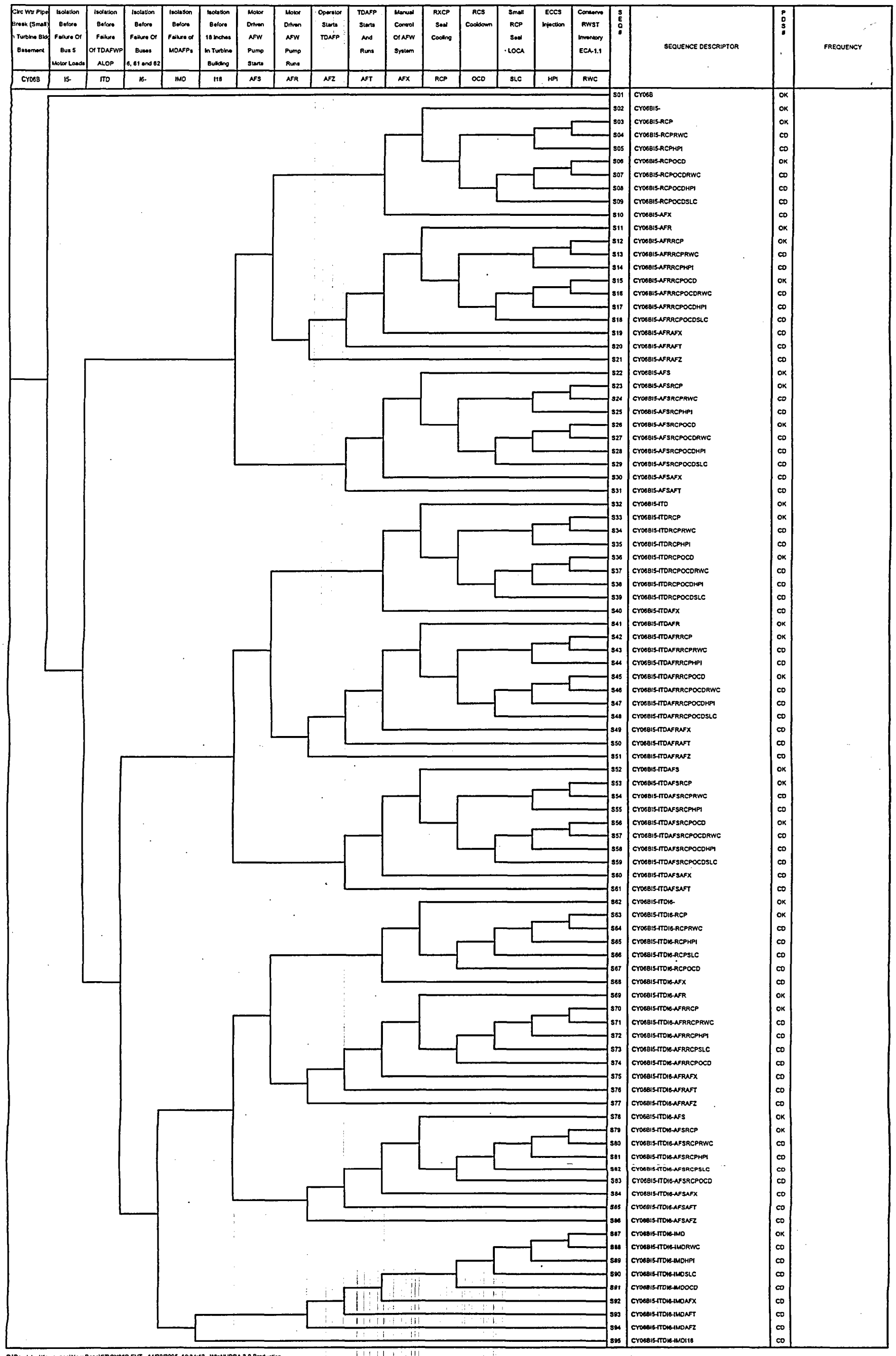

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Appendix D

Accident Sequence Analysis

Attachment 1 – Battery Discharge Analysis

Battery Discharge Analysis

Prepared by: Paul Eshyder — Paul E. Snyder
Signature — Print Name

10/26/05
Date

Reviewed by: Dy Will — Dave Will
Signature — Print Name

10/26/05
Date

This evaluation will determine whether the safeguards batteries can carry normal DC bus loading for a minimum of 24 hours following a flooding event that results in loss of the safeguards battery chargers, provided the inverters are disconnected from their associated battery within 4 hours of losing their associated battery charger.

The total amount of Amp-hours required from each battery during the 24 hour period will be determined by taking the amp-hours required during the first four hours that the inverters are connected, and adding the amp-hours required for the remaining 20 hours. The total amp-hours required will be corrected for battery temperature and load uncertainties, and then be compared to the rated capacity of the batteries to determine if there is adequate capacity for the desired 24 hour duration.

Safeguards Batteries BRA-101 and BRB-101 are C&D Technologies model LCR-19. The 8 hour rated capacity of a LCR-19 battery (Based on vendor instruction 12-334) is 1304 Amp-hours to a final voltage of 1.78 volts per cell at 77 degrees F. The minimum possible battery electrolyte temperature is 65 degrees F. The temperature correction factor based on IEEE-485-1983 for that temperature is 1.08.

Calculation C-038-002 Revision 4, titled "125VDC Battery BRA-101 and BRB-101 Duty Cycle" provides the expected loading on the safeguards batteries. The continuous loads have been rounded up to the nearest whole number. The calculated load for BRA-101 is 108 Amps with the inverters connected, and 18 Amps without. The calculated load for BRB-101 is 105 Amps with the inverters connected, and 15 Amps without.

The continuous loads are used in this evaluation, since the momentary loads that exist during the first minute of the calculated battery discharge are not expected to exist on the battery during the flooding event. Also, any momentary load that would exist on the battery during the initial stages of the event would be absorbed by their associated battery charger. The battery chargers will to be connected to their associated DC bus during the initial plant transient.

As a result of the flooding event, there will be additional load on the batteries due to leakage current through the control power circuitry for buses 1-5 and 1-6. Each control power circuit could have as much as 10.5 Amps, assuming that there is a resistance of 25 ohms between each of the secondary disconnect pins that are submerged. This assumption is based on testing performed by Bussmann. There are a total of 11 control power circuits for each of the two buses. Therefore, there will be an additional 115.5 Amps on each battery that may take up to 6 minutes to clear (based on the Westinghouse type EHD2070 circuit breaker time/current curve No. SC-4143-87A). The load would clear as a result of the 70 Amp circuit breaker that supplies the DC control power, opening on an overload condition.

The required capacity of each battery is determined below:

a. BRA-101:

- Required capacity during first four hours:

  108 Amps * 4 hours = 432 Amp-hours (calculated current)
  115.5 Amps * 6 minutes = 11.6 Amp-hours (additional leakage current)
  432 Amp-hours + 11.6 Amp-hours = 443.6 Amp-hours

- Amount of capacity required during the remaining 20 hours:

  18 Amps X 20 hours = 360 Amp-hours

- Total Amp-hours required during the 24 hour period:

  443.6 Amp-hours + 360 Amp-hours = **803.6 Amp-hours**

b. BRB-101:

- Required capacity during first four hours:

  105 Amps * 4 hours = 420 Amp-hours (calculated current)
  115.5 Amps * 6 minutes = 11.6 Amp-hours (additional leakage current)
  420 Amp-hours + 11.6 Amp-hours = 431.6 Amp-hours

- Amount of capacity required during the remaining 20 hours:

  15 Amps X 20 hours = 300 Amp-hours

- Total Amp-hours required during the 24 hour period:

  431.6 Amp-hours + 300 Amp-hours = **731.6 Amp-hours**

The total Amp-hours required for each battery are corrected for the lowest possible battery temperature of 65 degrees F. Applying the temperature correction factor of 1.08 to the required capacity of each battery shows that **867.9 Amp-hours** is required for BRA-101, and **790.1 Amp-hours** is required for BRB-101.

The required battery capacity is compared to the 8 hour discharge rating and the 3 hour discharge rating. There are no published Amp-Hour ratings for any duration greater than 8 hours. However, the published discharge ratings show the relationship between the battery discharge rate and capacity is not linear. The 8 hour rating for a C&D LCR-19 battery is 1304 Amp-hours and the 3 hour rating is 1054 Amp-hours. The ratings show that as you decrease the discharge rate, the overall capacity of the battery increases. Therefore, it is considered conservative to use the 8 hour discharge rate to determine the battery capacity for

a 24 hour discharge. BRA-101 requires the highest capacity, 866.2 Amp-hours, which is considerably less than the 8 hour rated capacity of the battery. The required capacity of each battery is also greater than the 3 hour rating.

Therefore, BRA-101 and BRB-101 are expected to provide adequate power to their respective DC buses for a minimum of 24 hours following the loss of the battery chargers, provided the inverters are secured within 4 hours of a loss of the battery chargers.

Time Line Summaries

Prepared by: R.J. DREMEL VIA EMAIL R.J. DREMEL

Signature Print Name

12/07/05

Date

Reviewed by: S. GUOKAS VIA EMAIL S. GUOKAS

Signature Print Name

12/07/05

Date

Appendix D

Accident Sequence Analysis

Attachment 2 – Timeline Summaries

Time Sequence of Events for Flooding Scenarios

Feedwater Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
0	Feedwater line break occurs resulting in a large fire protection system actuation.	
5	Contents of both hotwells and the feedwater and condensate system piping emptied to the turbine building basement.	A total volume of 80,000 gallons is included in the GOTHIC models for the feedwater release. If the operators trip condensate or feedwater pumps prior to the 5-minute point, then less volume would be released and the time available to isolate fire system flow (described below) would be increased. No credit is given for tripping the condensate or feedwater pumps.
18	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of motor loads on Bus 5.	1. Because the time available to complete this action is short and because of the harsh environmental conditions in the turbine building, no credit is given for completing this action in the time available. 2. If this action fails, then the motor loads supplied from Bus 5 will eventually be lost. These loads are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of Bus 5 motor loads (see discussion at 69 minutes below) as water flows from the turbine building under doors and through drains to the screenhouse. Power to Bus 5 as well as to Buses 51 and 52 will remain available. 3. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves.

Feedwater Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
19	Water level on Buses 61 and 62 reaches 2.75 inches.	Circuit breakers 16111, 16210, 16206, and 16212 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.
33	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of the turbine-driven AFW pump auxiliary lube oil pump.	1. If this action fails, then the turbine-driven AFW auxiliary lube oil pump will eventually be lost. The auxiliary lube oil pump is not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the auxiliary lube oil pump (see discussion at 49 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. If this action is successful, then the turbine-driven AFW pump auxiliary lube oil pump remains available. Therefore, functionality of the turbine-driven AFW pump is not affected. 3. This action is the same as that discussed above for the 18-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. For this action, however, the possibility exists for successful operator action because of the time available. A failure probability of 0.44 is calculated for this event. This calculation considers the harsh environmental conditions and short time period available to complete the action.

Feedwater Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
40	Time by which isolation of flow from the fire system is required to prevent loss of 480 VAC buses 61 and 62. In addition, this is the time used to prevent loss of the motor loads on Bus 6 (actual time is 41 minutes).	1. If this action fails, then Buses 61, 62, and 6 will eventually be lost. Buses 6, 61 and 62 are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the buses (see discussions at 59 and 513 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. Success of this action guarantees that water level will remain below the critical flood height for the following equipment: motor-driven AFW pump motors and pumps (13 inches), turbine-driven AFW pump turbine and pump (18 inches). Note that to prevent eventual loss of the motor loads on Bus 6, the GOTHIC models show that isolation of flow from the fire system must occur by 41 minutes. Since this time is so close to the 40-minute isolation time for Buses 61 and 62, only one isolation event is modeled. 3. This action is the same as that discussed above for the 18-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. For this action, however, the possibility exists for successful operator action because of the time available. A failure probability of 0.13 is calculated for this event. This calculation considers the harsh environmental conditions and short time period available to complete the action.

Feedwater Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
43	Water level on Buses 51 and 52 reaches 2.75 inches.	Circuit breakers 15106, 15111, 15212, 15206, and 15210 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers. At this time, flow from fire pump 1A stops since the pump is powered through circuit breaker 15106.
49	Water level reaches 9-inches in the turbine-driven AFW pump room, thereby failing the auxiliary lube oil pump.	Note that if isolation of fire system flow occurred prior to 33 minutes (discussed above), then this failure would not occur. If the turbine-driven AFW pump is not running at this point, it cannot be started from the control room. If the turbine-driven AFW pump is running, however, it can continue to run.
54	Time by which isolation of flow from the fire system is required to prevent reaching 13 inches in the AFW pump rooms.	Submergence of AFW pump 1A is assumed to cause a loss of Bus 5 and, accordingly, Buses 51 and 52 because the pump may be energized when becoming submerged. If so, impairment of control power to bus by submergence could preclude opening the AFW pump supply breaker. A failure probability of 0.03 was calculated for this event.
59	Water level reaches 11-inches on Buses 61 and 62.	At this point, all loads supplied from these buses are lost. At this time, flow from fire pump 1B stops since the pump is powered through Bus 62. Since both fire pumps are stopped (fire pump 1A stopped at 43 minutes as discussed above), water release to the turbine building stops.
68	Water level reaches 13-inches in the AFW pump rooms.	Failure of Bus 5 is assumed at this point.
69	Water level on Bus 5 reaches 4-inches.	At this point, all motor loads supplied from Bus 5 are lost. However, power to the bus as well as power to Buses 51 and 52 would still be available.

Feedwater Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
513 (8.6 hours)	Water level on Bus 6 reaches 4-inches (assuming that no curb is in place).	At this point, all motor loads supplied from Bus 6 are lost. Note that Buses 61 and 62 would have been lost at 59 minutes. Water level never reaches 6-inches in the B-train diesel room. Therefore, if the curb was in place, bus 6 would remain available for this scenario.

Feedwater Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
0	Feedwater line break occurs resulting in a moderate fire protection system actuation.	
5	Contents of both hotwells and the feedwater and condensate system piping emptied to the turbine building basement.	A total volume of 80,000 gallons is included in the GOTHIC models for the feedwater release. If the operators trip condensate or feedwater pumps prior to the 5-minute point, then less volume would be released and the time available to isolate fire system flow (described below) would be increased. No credit is given for tripping the condensate or feedwater pumps.
31	Water level on Buses 61 and 62 reaches 2.75 inches.	Circuit breakers 16111, 16210, 16206, and 16212 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.

Feedwater Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
55	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of motor loads on Bus 5.	1. If this action is successful, then the event progresses as a loss of feedwater event. 2. If this action fails, then the motor loads supplied from Bus 5 will eventually be lost. These loads are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of Bus 5 motor loads (see discussion at 93 minutes below) as water flows from the turbine building under doors and through drains to the screenhouse. Power to Bus 5 as well as power to Buses 51 and 52 will remain available. 3. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. A failure probability of 0.03 is calculated for this event. This calculation considers the harsh environmental conditions and time period available to complete the action.
60	Water level on Buses 51 and 52 reaches 2.75 inches.	Circuit breakers 15106, 15111, 15212, 15206, and 15210 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers. At this time, flow from fire pump 1A stops since the pump is powered through circuit breaker 15106.
93	Water level on Bus 5 reaches 4-inches.	At this point, all motor loads supplied from Bus 5 are lost. However, power to the bus as well as power to Buses 51 and 52 would still be available.

Feedwater Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
97	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of the turbine-driven AFW pump auxiliary lube oil pump.	1. If this action fails, then the turbine-driven AFW auxiliary lube oil pump will eventually be lost. The auxiliary lube oil pump is not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the auxiliary lube oil pump (see discussion at 109 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. If this action is successful, then the turbine-driven AFW pump auxiliary lube oil pump remains available. Therefore, functionality of the turbine-driven AFW pump is not affected. 3. This action is the same as that discussed above for the 55-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. A failure probability of 0.03 is calculated for this event. This calculation considers the harsh environmental conditions and short time period available to complete the action.
109	Water level reaches 9-inches in the turbine-driven AFW pump room, thereby failing the auxiliary lube oil pump.	Note that if isolation of fire system flow occurred prior to 97 minutes (discussed above), then this failure would not occur. If the turbine-driven AFW pump is not running at this point, it cannot be started from the control room.

Feedwater Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
120	Time by which isolation of flow from the fire system is required to prevent loss of 480 VAC buses 61 and 62. In addition, this is the time used to prevent loss of the motor loads on Bus 6 (actual time is 120 minutes).	1. If this action fails, then Buses 61, 62, and 6 will eventually be lost. Buses 61 and 62 are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the buses (see discussions at 133 and 700 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. Success of this action guarantees that water level will remain below the critical flood height for the following equipment: motor-driven AFW pump motors and pumps (13 inches), turbine-driven AFW pump turbine and pump (18 inches), Bus 6 assuming a 4-inch failure height for the bus. Note that to prevent eventual loss of motor loads on Bus 6, the GOTHIC models also show that isolation of flow from the fire system must occur by 120 minutes. Therefore, only one isolation event is modeled. 3. This action is the same as that discussed above for the 55-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. A failure probability of 0.017 is calculated for this event. This calculation considers the harsh environmental conditions and time period available to complete the action.

Feedwater Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
133	Water level reaches 11-inches on Buses 61 and 62.	At this point, all loads supplied from these buses are lost. At this time, flow from fire pump 1B stops since the pump is powered through Bus 62. Since both fire pumps are stopped (fire pump 1A stopped at 60 minutes as discussed above), water release to the turbine building stops.
700 (11.7 hours)	Water level on Bus 6 reaches 4-inches (assuming that no curb is in place).	At this point, all motor loads supplied from Bus 6 are lost. Note that Buses 61 and 62 would have been lost at 133 minutes. Water level never reaches 6-inches in the B-train diesel room. Therefore, if the 6-inch curb was in place, bus 6 would remain available for this scenario.

Steam Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
0	Steam line break occurs resulting in a large fire protection system actuation.	
28	Water level on Buses 61 and 62 reaches 2.75 inches.	Circuit breakers 16111, 16210, 16206, and 16212 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.
29	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of motor loads on Bus 5.	1. If this action is successful, then the event progresses as a loss of feedwater event. 2. If this action fails, then the motor loads on Bus 5 will eventually be lost. These loads are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the motor loads on Bus 5 (see discussion at 79 minutes below) as water flows from the turbine building under doors and through drains to the screenhouse. Power to Bus 5 as well as to Buses 51 and 52 will remain available 3. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. A failure probability of 1.0 was used for this event.

Steam Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
45	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of the turbine-driven AFW pump auxiliary lube oil pump.	1. If this action fails, then the turbine-driven AFW auxiliary lube oil pump will eventually be lost. The auxiliary lube oil pump is not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the auxiliary lube oil pump (see discussion at 61 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. If this action is successful, then the turbine-driven AFW pump auxiliary lube oil pump remains available. Therefore, functionality of the turbine-driven AFW pump is not affected. 3. This action is the same as that discussed above for the 29-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. For this action, however, the possibility exists for successful operator action because of the time available. A failure probability of 0.066 is calculated for this event. This calculation considers the harsh environmental conditions and short time period available to complete the action.
53	Water level on Buses 51 and 52 reaches 2.75 inches.	Circuit breakers 15106, 15111, 15212, 15206, and 15210 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers. At this time, flow from fire pump 1A stops since the pump is powered through circuit breaker 15106.

Steam Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
56	Time by which isolation of flow from the fire system is required to prevent loss of 480 VAC buses 61 and 62.	1. If this action fails, then Buses 61, 62, and 6 will eventually be lost. Buses 61 and 62 are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the buses (see discussions at 73 and 527 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. Success of this action guarantees that water level will remain below the critical flood height for the following equipment: motor-driven AFW pump motors and pumps (13 inches), turbine-driven AFW pump turbine and pump (18 inches), Bus 6 assuming a 4-inch failure height for the bus. Note that to prevent eventual loss of Bus 6, the GOTHIC models show that isolation of flow from the fire system must occur by 62 minutes. Since this time is so close to the 56-minute isolation time for Buses 61 and 62, only one isolation event is modeled. 3. This action is the same as that discussed above for the 29-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. For this action, however, the possibility exists for successful operator action because of the time available. A failure probability of 0.03 is calculated for this event. This calculation considers the harsh environmental conditions and time period available to complete the action.
61	Water level reaches 9-inches in the turbine-driven AFW pump room, thereby failing the auxiliary lube oil pump.	Note that if isolation of fire system flow occurred prior to 45 minutes (discussed above), then this failure would not occur. If the turbine-driven AFW pump is not running at this point, it cannot be started from the control room.

Steam Break with Large Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
68	Time by which isolation of flow from the fire system is required to prevent reaching 13 inches in the AFW pump rooms.	Submergence of AFW pump 1A is assumed to cause a loss of Bus 5 and, accordingly, Buses 51 and 52 because the pump may be energized when becoming submerged. If so, impairment of control power to bus by submergence could preclude opening the AFW pump supply breaker. A failure probability of 0.03 was calculated for this event.
73	Water level reaches 11-inches on Buses 61 and 62.	At this point, all loads supplied from these buses are lost. At this time, flow from fire pump 1B stops since the pump is powered through Bus 62. Since both fire pumps are stopped (fire pump 1A stopped at 53 minutes as discussed above), water release to the turbine building stops.
79	Water level on Bus 5 reaches 4-inches.	At this point, all motor loads supplied from Bus 5 are lost. However, power to the bus as well as power to Buses 51 and 52 would still be available.
527 (8.8 hours)	Water level on Bus 6 reaches 4-inches (assuming that no curb is in place).	At this point, all motor loads supplied from Bus 6 are lost. Buses 61 and 62 would have already been lost at 73 minutes Water level never reaches 6-inches in the B-train diesel room. Therefore, if the curb was in place, bus 6 would remain available for this scenario.

Steam Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
0	Steam line break occurs resulting in a moderate fire protection system actuation.	
74	Water level on Buses 61 and 62 reaches 2.75 inches.	Circuit breakers 16111, 16210, 16206, and 16212 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.
98	Water level on Buses 51 and 52 reaches 2.75 inches.	Circuit breakers 15106, 15111, 15212, 15206, and 15210 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers. At this time, flow from fire pump 1A stops since the pump is powered through circuit breaker 15106.

Steam Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
100	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of the motor loads on Bus 5.	1. If this action is successful, then the event progresses as a loss of feedwater event. 2. If this action fails, then the motor loads on Bus 5 will eventually be lost. These loads are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of Bus 5 motor loads (see discussion at 130 minutes below) as water flows from the turbine building under doors and through drains to the screenhouse. Power to Bus 5 as well as to Buses 51 and 52 will remain available. 3. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves.
130	Water level on Bus 5 reaches 4-inches.	At this point, all motor loads supplied from Bus 5 are lost. However, power to the bus as well as power to Buses 51 and 52 would still be available.

Steam Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
150	Water level reaches 9-inches in the turbine-driven AFW pump room, thereby failing the auxiliary lube oil pump.	1. Note that the water level is nearly identical in the turbine building basement and in the turbine-driven AFW pump room. Because of the open communication path with the turbine building basement and because of the relatively low flow rate from the fire protection system, similar water levels are expected. Therefore, action to isolate fire system flow can occur any time prior to submerging the turbine-driven AFW pump auxiliary lube oil pump. If the turbine-driven AFW pump is not running at this point, it cannot be started from the control room. 2. If this action is successful, then the turbine-driven AFW pump auxiliary lube oil pump remains available. Therefore, functionality of the turbine-driven AFW pump is not affected. 3. This action is the same as that discussed above for the 100-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. A failure probability of 0.03 is calculated for this event. This calculation considers the harsh environmental conditions and time period available to complete the action.

Steam Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
170	Time by which isolation of flow from the fire system is required to prevent loss of 480 VAC buses 61 and 62.	1. If this action fails, then Buses 61, 62, and 6 will eventually be lost. Buses 61 and 62 are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the buses (see discussions at 173 and 735 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. Success of this action guarantees that water level will remain below the critical flood height for the following equipment: motor-driven AFW pump motors and pumps (13 inches), turbine-driven AFW pump turbine and pump (18 inches), Bus 6 assuming a 4-inch failure height for the bus. Note that to prevent eventual loss of the motor loads on Bus 6, the GOTHIC models also show that isolation of flow from the fire system must occur by 170 minutes. Therefore, only one isolation event is modeled. 3. This action is the same as that discussed above for the 100-minute time. In parallel with handling the reactor trip, the control room crew will address the fire alarms received by use of E-FP-08. At step 3.2.1.a the NAO will be dispatched to assess conditions in the Turbine Building. When the Turbine Building is accessible, the NAO will investigate for a fire. Once conditions are verified, he'll report there is no fire. The crew exits E-FP-08 to N-FP-08, Step 4.3 to isolate the sprinklers. Isolation of flow from the fire system is by closing sprinkler and deluge system header isolation valves. A failure probability of 0.03 is calculated for this event. This calculation considers the harsh environmental conditions and time period available to complete the action.

Steam Break with Moderate Fire Protection System Actuation		
Time (Minutes)	**Key Event**	**Comments**
173	Water level reaches 11-inches on Buses 61 and 62.	At this point, all loads supplied from these buses are lost. At this time, flow from fire pump 1B stops since the pump is powered through Bus 62. Since both fire pumps are stopped (fire pump 1A stopped at 98 minutes as discussed above), water release to the turbine building stops.
735 (12.2 hours)	Water level on Bus 6 reaches 4-inches (assuming that no curb is in place).	At this point, all motor loads supplied from Bus 6 are lost. Note that Buses 61 and 62 would have been lost at 173 minutes. Water level never reaches 6-inches in the B-train diesel room. Therefore, if the curb was in place, bus 6 would remain available for this scenario.

Service Water System Pipe Break NOTE: the timing for small circulating water breaks is identical to that described here.		
Time (Minutes)	**Key Event**	**Comments**
0	Service water system break occurs.	
28	Water level on Buses 61 and 62 reaches 2.75 inches.	Circuit breakers 16111, 16210, 16206, and 16212 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.
29	Time by which isolation of flow from the service water system by closing air-operated valves SW-4A and SW-4B is required to prevent loss of the motor loads on Bus 5.	1. If this action is successful, then the event progresses as a loss of feedwater event. 2. If this action fails, then the motor loads on Bus 5 will eventually be lost. These loads are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of Bus 5 motor loads (see discussion at 79 minutes below) as water flows from the turbine building under doors and through drains to the screenhouse. Power to Bus 5 as well as to Buses 51 and 52 will remain available. 3. In the case of a Service Water (SW) leak, A-SW-02, "Abnormal Service Water System Operation" is entered. The diagnosis of a leak condition ensues. If a leak exists in the Turbine Building header, the leak will be isolated from the Control Room by positioning the Turbine Building Service Water Isolation control switch to isolate. A failure probability of 0.02 has been calculated for this event.

Service Water System Pipe Break NOTE: the timing for small circulating water breaks is identical to that described here.		
Time (Minutes)	**Key Event**	**Comments**
45	Time by which isolation of flow from the service water system by closing air-operated valves SW-4A and SW-4B is required to prevent loss of the turbine-driven AFW pump auxiliary lube oil pump.	1. If this action fails, then the turbine-driven AFW auxiliary lube oil pump will eventually be lost. The auxiliary lube oil pump is not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the auxiliary lube oil pump (see discussion at 61 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. If this action is successful, then the turbine-driven AFW pump auxiliary lube oil pump remains available. Therefore, functionality of the turbine-driven AFW pump is not affected. 3. In the case of a Service Water (SW) leak, A-SW-02, "Abnormal Service Water System Operation" is entered. The diagnosis of a leak condition ensues. If a leak exists in the Turbine Building header, the leak will be isolated from the Control Room by positioning the Turbine Building Service Water Isolation control switch to isolate. A failure probability of 0.02 is calculated for this event.

Service Water System Pipe Break NOTE: the timing for small circulating water breaks is identical to that described here.		
Time (Minutes)	**Key Event**	**Comments**
51	Time by which isolation of flow from the service water system by closing air-operated valves SW-4A and SW-4B is required to prevent loss of 4 kVAC bus 6 and 480 VAC buses 61 and 62.	1. If this action fails, then Buses 61, 62, and 6 will eventually be lost. Buses 61 and 62 are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the buses (see discussions at 73 and 527 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. Success of this action guarantees that water level will remain below the critical flood height for the following equipment: motor-driven AFW pump motors and pumps (13 inches), turbine-driven AFW pump turbine and pump (18 inches), motor loads on Bus 6 assuming a 4-inch failure height for the bus. Note that to prevent eventual loss of Buses 61 and 62, the GOTHIC models show that isolation of flow from the service water system must occur by 52 minutes. Since this time is so close to the 51-minute isolation time for Bus 6, only one isolation event is modeled. 3. This action is the same as that discussed above for the 29-minute time. In the case of a Service Water (SW) leak, A-SW-02, "Abnormal Service Water System Operation" is entered. The diagnosis of a leak condition ensues. If a leak exists in the Turbine Building header, the leak will be isolated from the Control Room by positioning the Turbine Building Service Water Isolation control switch to isolate. A failure probability of 0.02 is calculated for this event. This calculation considers the harsh environmental conditions and time period available to complete the action.
53	Water level on Buses 51 and 52 reaches 2.75 inches.	Circuit breakers 15106, 15111, 15212, 15206, and 15210 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.

Service Water System Pipe Break NOTE: the timing for small circulating water breaks is identical to that described here.		
Time (Minutes)	**Key Event**	**Comments**
60	Time by which isolation of flow from the service water system by closing air-operated valves SW-4A and SW-4B is required to prevent reaching 13 inches in the AFW pump rooms.	Submergence of AFW pump 1A is assumed to cause a loss of Bus 5 and, accordingly, Buses 51 and 52 because the pump may be energized when becoming submerged. If so, impairment of control power to bus by submergence could preclude opening the AFW pump supply breaker. A failure probability of 0.02 was calculated for this event.
61	Water level reaches 9-inches in the turbine-driven AFW pump room, thereby failing the auxiliary lube oil pump.	Note that if isolation of service water system flow occurred prior to 45 minutes (discussed above), then this failure would not occur. If the turbine-driven AFW pump is not running at this point, it cannot be started from the control room.
66	Time by which isolation of flow from the service water system by closing air-operated valves SW-4A and SW-4B is required to prevent reaching 18 inches in the Turbine Building basement.	If this isolation fails, then core damage is assumed.
73	Water level reaches 11-inches on Buses 61 and 62.	At this point, all loads supplied from these buses are lost.
79	Water level on Bus 5 reaches 4-inches.	At this point, all motor loads supplied from Bus 5 are lost. However, power to the bus as well as power to Buses 51 and 52 would still be available.
125	Water level reaches 13-inches in the AFW pump rooms.	Failure of Bus 5 is assumed at this point.
527 (8.8 hours)	Water level on Bus 6 reaches 4-inches (assuming that no curb is in place).	At this point, all motor loads supplied from Bus 6 are lost. Note that Buses 61 and 62 would have been lost at 73 minutes. If service water break flow is isolated by 60 minutes, water level never reaches 6-inches in the B-train diesel room.

Random Break of Fire Protection System Piping		
Time (Minutes)	**Key Event**	**Comments**
0	A random break in the fire protection system piping occurs.	
28	Water level on Buses 61 and 62 reaches 2.75 inches.	Circuit breakers 16111, 16210, 16206, and 16212 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.
29	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of the motor loads on Bus 5.	1. Because the time available to complete this action is short, no credit is given for completing this action is the time available. 2. If this action fails, then the motor loads on Bus 5 will eventually be lost. These loads are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the motor loads on Bus 5 (see discussion at 79 minutes below) as water flows from the turbine building under doors and through drains to the screenhouse. Power to Bus 5 as well as to Buses 51 and 52 will remain available 3. In the case of a Fire Protection (FP) header leak, direct procedure guidance for isolation does not exist. However, the jockey pump will not maintain FP system pressure. The drop in pressure results in the Fire Pumps starting and Annunciator 54L Fire Pumps Abnormal alarms. E-FP-08, "Emergency Operating Procedure – Fire," is entered and early dispatch of the NAO to investigate identifies the leak and that no fire present. An NAO will be instructed to isolate the header or go to the screenhouse to stop the Fire Pumps, likely through door 4. Though lacking direct procedure guidance for a fire header rupture, NAO's routinely locate and operate FP system components through use of several procedures. A failure probability of 1.0 was used for this event.

Random Break of Fire Protection System Piping		
Time (Minutes)	**Key Event**	**Comments**
45	Time by which isolation of flow from the fire system by closing sprinkler and deluge header isolation valves is required to prevent loss of the turbine-driven AFW pump auxiliary lube oil pump.	1. If this action fails, then the turbine-driven AFW auxiliary lube oil pump will eventually be lost. The auxiliary lube oil pump is not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the auxiliary lube oil pump (see discussion at 61 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. If this action is successful, then the turbine-driven AFW pump auxiliary lube oil pump remains available. Therefore, functionality of the turbine-driven AFW pump is not affected. 3. This action is the same as that discussed above for the 29-minute time. In the case of a Fire Protection (FP) header leak, direct procedure guidance for isolation does not exist. However, the jockey pump will not maintain FP system pressure. The drop in pressure results in the Fire Pumps starting and Annunciator 54L Fire Pumps Abnormal alarms. E-FP-08, "Emergency Operating Procedure – Fire," is entered and early dispatch of the NAO to investigate identifies the leak and that no fire present. An NAO will be instructed to isolate the header or go to the screenhouse to stop the Fire Pumps, likely through door 4. Though lacking direct procedure guidance for a fire header rupture, NAO's routinely locate and operate FP system components through use of several procedures. For this action, however, the possibility exists for successful operator action because of the time available. A failure probability of 0.066 is calculated for this event. This calculation considers the skill-of-the-craft nature of the actions and the time period available to complete the action.

Random Break of Fire Protection System Piping		
Time (Minutes)	**Key Event**	**Comments**
53	Water level on Buses 51 and 52 reaches 2.75 inches.	Circuit breakers 15106, 15111, 15212, 15206, and 15210 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers. At this time, flow from fire pump 1A stops since the pump is powered through circuit breaker 15106.

Random Break of Fire Protection System Piping		
Time (Minutes)	**Key Event**	**Comments**
56	Time by which isolation of flow from the fire system is required to prevent loss of 480 VAC buses 61 and 62 and 4kVAC bus 6.	1. If this action fails, then Buses 61, 62, and 6 will eventually be lost. Buses 61 and 62 are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the buses (see discussions at 73 and 527 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. Success of this action guarantees that water level will remain below the critical flood height for the following equipment: motor-driven AFW pump motors and pumps (13 inches), turbine-driven AFW pump turbine and pump (18 inches), Bus 6 motor loads assuming a 4-inch failure height for the bus. Note that to prevent eventual loss of Bus 6, the GOTHIC models show that isolation of flow from the fire system must occur by 62 minutes. Since this time is so close to the 56-minute isolation time for Buses 61 and 62, only one isolation event is modeled. 3. This action is the same as that discussed above for the 29-minute time. In the case of a Fire Protection (FP) header leak, direct procedure guidance for isolation does not exist. However, the jockey pump will not maintain FP system pressure. The drop in pressure results in the Fire Pumps starting and Annunciator 54L Fire Pumps Abnormal alarms. E-FP-08, "Emergency Operating Procedure – Fire," is entered and early dispatch of the NAO to investigate identifies the leak and that no fire present. An NAO will be instructed to isolate the header or go to the screenhouse to stop the Fire Pumps, likely through door 4. Though lacking direct procedure guidance for a fire header rupture, NAO's routinely locate and operate FP system components through use of several procedures. For this action, however, the possibility exists for successful operator action because of the time available. A failure probability of 0.024 is calculated for this event. This calculation considers the skill-of-the-craft nature of the actions and the time period available to complete the action.

Random Break of Fire Protection System Piping		
Time (Minutes)	**Key Event**	**Comments**
61	Water level reaches 9-inches in the turbine-driven AFW pump room, thereby failing the auxiliary lube oil pump.	Note that if isolation of fire system flow occurred prior to 45 minutes (discussed above), then this failure would not occur. If the turbine-driven AFW pump is not running at this point, it cannot be started from the control room.
68	Time by which isolation of flow from the fire system is required to prevent reaching 13 inches in the AFW pump rooms.	Submergence of AFW pump 1A is assumed to cause a loss of Bus 5 and, accordingly, Buses 51 and 52 because the pump may be energized when becoming submerged. If so, impairment of control power to bus by submergence could preclude opening the AFW pump supply breaker. A failure probability of 0.016 was calculated for this event.
73	Water level reaches 11-inches on Buses 61 and 62.	At this point, all loads supplied from these buses are lost. At this time, flow from fire pump 1B stops since the pump is powered through Bus 62. Since both fire pumps are stopped (fire pump 1A stopped at 53 minutes as discussed above), water release to the turbine building stops.
79	Water level on Bus 5 reaches 4-inches.	At this point, all motor loads supplied from Bus 5 are lost. However, power to the bus as well as power to Buses 51 and 52 would still be available.
527 (8.8 hours)	Water level on Bus 6 reaches 4-inches (assuming that no curb is in place).	At this point, all motor loads supplied from Bus 6 are lost. Buses 61 and 62 would have already been lost at 73 minutes Water level never reaches 6-inches in the B-train diesel room. Therefore, if the curb was in place, bus 6 would remain available for this scenario.

Moderate Circulating Water Pipe Rupture		
Time (Minutes)	**Key Event**	**Comments**
0	Circulating water line break occurs.	
13	Time by which isolation of flow from the circulating water system by tripping the pumps is required to prevent loss of motor loads on Bus 5.	1. If this action fails, then the motor loads on Bus 5 will eventually be lost. These loads are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the motor loads on Bus 5 (see discussion at 63 minutes below) as water flows from the turbine building under doors and through drains to the screenhouse. 2. No direct procedure guidance existed in the relevant time frame. However, the crew would respond to Miscellaneous Sump Level Hi alarms for the Turbine Building Sump. The Emergency Turbine Oil Sump Level High also alarms due to water leakage around the cover, as well as the berm surrounding the Turbine Oil Reservoir overflowing. The Reactor initially stays at power. The NAO would be dispatched to the Turbine Building basement and report the leak rather quickly. The CW pumps would be ordered to be stopped, which terminates the flooding. A failure probability of 0.26 is calculated for this event. This calculation considers the skill-of-the-craft nature of the actions and the time period available to complete the action.
17	Water level on Buses 61 and 62 reaches 2.75 inches.	Circuit breakers 16111, 16210, 16206, and 16212 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.

Moderate Circulating Water Pipe Rupture		
Time (Minutes)	**Key Event**	**Comments**
19	Time by which isolation of flow from the circulating water system by tripping the pumps is required to prevent loss of the turbine-driven AFW pump auxiliary lube oil pump.	1. If this action fails, then the turbine-driven AFW pump auxiliary lube oil will eventually be lost. The auxiliary lube oil pump is not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the auxiliary lube oil pump (see discussion at 36 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. If this action is successful, then the turbine-driven AFW pump auxiliary lube oil pump remains available. Therefore, functionality of the turbine-driven AFW pump is not affected. 3. This action is the same as that discussed above for the 13-minute time. No direct procedure guidance existed in the relevant time frame. However, the crew would respond to Miscellaneous Sump Level Hi alarms for the Turbine Building Sump. The Emergency Turbine Oil Sump Level High also alarms due to water leakage around the cover, as well as the berm surrounding the Turbine Oil Reservoir overflowing. The Reactor initially stays at power. The NAO would be dispatched to the Turbine Building basement and report the leak rather quickly. The CW pumps would be ordered to be stopped, which terminates the flooding. A failure probability of 0.12 is calculated for this event. This calculation considers the skill-of-the-craft nature of the actions and the time period available to complete the action.

Moderate Circulating Water Pipe Rupture		
Time (Minutes)	**Key Event**	**Comments**
22	Time by which isolation of flow from the circulating water system by tripping the pumps is required to prevent loss of 480 VAC buses 61 and 62 and 4kVAC bus 6.	1. If this action fails, then Buses 61, 62, and 6 will eventually be lost. Buses 61 and 62 are not yet lost; however, the volume of water released to the turbine building will result in eventual failure of the buses (see discussions at 43 and 423 minutes below) as water flows under doors and through drains from the turbine building to the screenhouse. 2. Success of this action guarantees that water level will remain below the critical flood height for the following equipment: motor-driven AFW pump motors and pumps (13 inches), turbine-driven AFW pump turbine and pump (18 inches), Bus 6 assuming a 4-inch failure height for the bus. Note that to prevent eventual loss of Bus 6, the GOTHIC models show that isolation of flow from the fire system must occur by 22 minutes, which is the same time. Therefore, only one isolation event is modeled. 3. This action is the same as that discussed above for the 13-minute time. No direct procedure guidance existed in the relevant time frame. However, the crew would respond to Miscellaneous Sump Level Hi alarms for the Turbine Building Sump. The Emergency Turbine Oil Sump Level High also alarms due to water leakage around the cover, as well as the berm surrounding the Turbine Oil Reservoir overflowing. The Reactor initially stays at power. The NAO would be dispatched to the Turbine Building basement and report the leak rather quickly. The CW pumps would be ordered to be stopped, which terminates the flooding. A failure probability of 0.12 is calculated for this event. This calculation considers the skill-of-the-craft nature of the actions and the time period available to complete the action.

Moderate Circulating Water Pipe Rupture		
Time (Minutes)	**Key Event**	**Comments**
25	Time by which isolation of flow from the circulating water system by tripping the pumps is required to prevent reaching 13 inches in the AFW pump rooms and 18 inches in the Turbine Building basement.	If this isolation fails, then core damage is assumed.
36	Water level reaches 9-inches in the turbine-driven AFW pump room, thereby failing the auxiliary lube oil pump.	Note that if isolation of circulating water system flow occurred prior to 19 minutes (discussed above), then this failure would not occur. If the turbine-driven AFW pump is not running at this point, it cannot be started from the control room.
38	Water level on Buses 51 and 52 reaches 2.75 inches.	Circuit breakers 15106, 15111, 15212, 15206, and 15210 open. The PRA models fail all loads associated with these breakers after this time. The PRA models assume that it is not possible to isolate the break in time to prevent opening these circuit breakers.
43	Water level reaches 11-inches on Buses 61 and 62.	At this point, all loads supplied from these buses are lost.
63	Water level on Bus 5 reaches 4-inches.	At this point, all motor loads supplied from Bus 5 are lost. However, power to the bus as well as power to Buses 51 and 52 would still be available.
423 (7 hours)	Water level on Bus 6 reaches 4-inches (assuming that no curb is in place).	At this point, all motor loads supplied from Bus 6 are lost. Buses 61 and 62 would have already been lost at 43 minutes.

Appendix D

Accident Sequence Analysis

Attachment 3 - Assessment of Potential for Spray on RAT Breakers on Mezzanine Level

Assessment of Potential for Spray on RAT Breakers on Mezzanine Level

Prepared by: R.J. DREMEL VIA EMAIL R. J. DREMEL

Signature Print Name

12/01/05

Date

Reviewed by: S. GUOKAS VIA EMAIL S. GUOKAS

Signature Print Name

12/01/05

Date

Assessment of Potential for Spray on RAT Breakers on Mezzanine Level

The purpose of this document is to address the likelihood of spray-induced failure of buses 3 and 4 resulting in loss of the Reserve Auxiliary Transformer (RAT). These buses are located on the mezzanine level of the Turbine Building between column lines 8 and 9 and lines A and C. Loss of the RAT could occur if the flooding shorts the power supply connections to the RAT.

As described in the Initiating Events Analysis for Turbine Building Floods, to be considered as a flooding initiating event, the break must occur in a fire protection water or service water line of four inches or greater. No fire protection water or service water lines that are included in the initiating events evaluated for the internal flooding model are located in the vicinity of buses 3 and 4. Smaller diameter fire protection water piping, e.g., fire hose riser piping, is located near the buses, however, a random break in that piping would not be considered an internal flooding initiating event and, therefore, is not considered in this analysis. No circulating water, condensate, or feedwater piping is located in the vicinity of Buses 3 and 4. Therefore, failure of the buses from service water, fire protection water, feedwater, condensate, or circulating water system breaks is not credible.

Several large main steam pipes are located in the overhead near buses 3 and 4. A failure of one of these pipes could spray buses 3 and 4, however, such an event is considered unlikely for several reasons. First, only a small portion of the main steam piping is located in the area near the buses. Using the pipe data generated for the initiating event frequency calculation, less than 110 linear feet of steam piping is located north of column line 7 and west of column line C. This total overstates the amount of piping of concern because some of the piping in that total originates near column line 5 and continues to column line 7. Other piping originates near column line D and continues to column line C. No steam piping was identified between column lines A and B on the mezzanine level. Therefore of a total length of 2590 linear feet of piping, only a 110 feet, or 4.2% is located such that a pipe break could impact bus 3 or 4.

Second, of the pipe located in the vicinity of buses 3 and 4, any break must spray directly on the buses to be of concern. Any break which sprays away from the buses would not challenge the buses such that offsite power from the RAT would be challenged. From visual inspections of the area, only spray in a 45-degree horizontal arc toward the buses would be of concern. Therefore only 12% of the breaks in the piping located near the buses would potentially threaten the buses.

From the above conservative estimates, only 0.0053 of the total steam line break frequency could potentially impact the availability of offsite power to other buses. However, as discussed in the initiating events analysis in Appendix A, a steam line break could raise temperatures in the Turbine Building to the point that fire protection sprinklers or deluge systems actuate. If a large number of sprinklers actuate, the potential exists to threaten equipment in Safeguards Alley, in addition to failing buses 3 and 4.

In event of a steam line break or fire sprinkler actuation impinging on Bus 3 and/or Bus 4, the loss of the bus has little impact on the recovery of a battery charger. Steam impingement would cause a loss of Reserve Auxiliary Transformer (RAT) however the Tertiary Auxiliary Transformer (TAT) would remain available as the TAT supplies only Buses 5 and 6. Bus 6 is normally powered from RAT however the Diesel would automatically on load on the bus. Additionally the operator could also manually load Bus 6 on to the TAT.

As discussed above, feedwater, condensate, fire protection water, service water, and circulating water pipes are located away from buses 3 and 4. Of the steam line breaks, only a small fraction (0.0053) of the potential steam line breaks could potentially impinge on bus3 or 4. Therefore only steam line breaks could potentially fail bus 3 or 4 by direct spray or fire sprinkler actuation. Even if a break does impact buses 3 and 4, the impact of the failure on the overall accident progression is minimal. Therefore, it is concluded that buses 3 and 4 would be unavailable to supply loads credited in accident mitigation, and result in loss of the RAT.

Appendix D

Accident Sequence Analysis

Attachment 4 – Loss of Reserve Auxiliary Transformer (RAT) Auxiliaries

Loss of Reserve Auxiliary Transformer (RAT) Auxiliaries

Prepared by: George E Baldwin — George E Baldwin
Signature — Print Name

10/18/05
Date

Reviewed by: Paul E Snyder — Paul E. Snyder
Signature — Print Name

10/21/05
Date

Loss of Reserve Auxiliary Transformer (RAT) Auxiliaries

The RAT Auxiliaries provide oil circulation and fans for transformer cooling. These auxiliaries are power from MCC-42A[1], which is located in the southeast corner area of the Turbine Building Basement[2]. MCC-42A and MCC-42G share a common breaker on 480V Bus 42[3]. MCC-42G is located on the west side of Turbine Mezzanine between the Feedwater heaters[4].

The loss of the RAT auxiliaries reduces the RAT capacity from 40 MVA to 24 MVA[5]. The stopping of the Main Feedwater (5000 hp)[6] or Reactor Coolant (6000 hp)[7] Pumps would reduce the load with in this limit. The flooding event will cause a loss of Main Feedwater Pumps early in the event thus reducing load on the RAT to less than 24 MVA. In general, as the flood causes breakers to trip the load on RAT is reduced.

[1] DWG. E-410
[2] DWG. A-203
[3] DWG. E-240
[4] DWG. A-205
[5] Kewaunee System Description 39, page 6
[6] Kewaunee System Description 05A, page 8
[7] Kewaunee System Description 36, page 19

Appendix D

Accident Sequence Analysis

Attachment 5 - Steam Generator (S/G) Power Operated Relief Valve (PORV) Operation During Turbine Building Flood Event

Steam Generator (S/G) Power Operated Relief Valve (PORV) Operation During Turbine Building Flood Event

Prepared by: George E. Baldwin
Signature

George E. Baldwin
Print Name

10/18/05
Date

Reviewed by: Jeffrey T. Stafford
Signature

JEFFREY T. STAFFORD
Print Name

10-18-05
Date

Steam Generator (S/G) Power Operated Relief Valve (PORV) Operation During Turbine Building Flood Event

In a Turbine Building Basement flood event, the operators by procedure would eventually operate the S/G PORV by local manual means to cooldown the Reactor Coolant System (RCS). This would happen approximately four hours into the event due to a loss of Instrument Air. DC control power would remain available for a minimum of 8-9 hours into the event, however the backup nitrogen would run out in approximately 4 hours after loss of the air compressors[1].

The loss of Instrument Air occurs sequential with the flood. Both "F" and "G" Air Compressors are located in the Turbine Building Basement[2] and would be lost early in the flood. Instrument Air compressors "A" and "C" is powered off Bus 52 via MCC-5262[3] and MCC-52A[4] and would be lost with the loss of Bus 52. Instrument Air Compressor "B" is powered off MCC-62A[5] and would be lost with the loss of Bus 62. With the loss of the air compressors, Instrument Air pressure would decrease. Once the Instrument Air pressure goes less than 60 psig, E-AS-01, *Loss of Instrument Air*, would be entered. Both S/G PORVs (SD-3A and SD-3B) are equipped with a 4-hour Nitrogen backup. However the procedure also directs the operator to locally operate SD-3A and SD-3B if the valves fail to operate, which would be the case when the nitrogen flask is emptied.

[1] Kewaunee System Description 06, page 8 and E-AS-01
[2] DWG. A-203
[3] DWG. E-416 and N-ELV-40
[4] DWG. E-417
[5] DWG. E-417

Appendix D

Accident Sequence Analysis

Attachment 6 - TSC Diesel Fuel Oil Supply

TSC Diesel Fuel Oil Supply

Prepared by: _____ Raymond Dremel
Signature Print Name

10/28/05
Date

Reviewed by: _____ Diane M Jones
Signature Print Name

10/28/05
Date

N/A
Date

TSC Diesel Fuel Oil Supply

The Technical Support Center (TSC) diesel-generator is equipped with a 275 gallon day tank and a 10,000 gallon fuel oil storage tank. The day tank is normally and automatically maintained between 110 and 240 gallons (Reference 1). A fuel oil day tank level low low alarm actuates at 107 gallons (Reference 2). A fuel oil storage tank level low alarm actuates at 2400 gallons (Reference 3).

The engine is designed to use 48.74 gallons of fuel per hour at full load (Reference 4).

Assuming that both the day tank and fuel oil storage tank are at the low level alarm setpoint, 2507 gallons of fuel could be available. Assuming that the engine operated at full load, 2507 gallons of fuel would allow for over 50 hours of operation. It is unlikely that both tanks would be at or below the alarm setpoint because the operators generally take steps to clear control room alarms quickly.

Although not all fuel in the tanks would be available for use, the margin available is sufficient to conclude that sufficient fuel oil would be available to support 24-hours of operation even if both tanks were at the alarm setpoint.

References:

KNPP System Description, "Diesel Generator Mechanical," Revision 1
DGM-10, Annunciator DR-121-35, Revision C
DGM-10, Annunciator DR-121-34, Revision A
Purchase Order K05557, 6-13-80

Appendix D

Accident Sequence Analysis

Attachment 7 – Flooding Impact on 4kV Control Power

Flooding Impact on 4kV Control Power

Prepared by: PAUL SNYDER VIA EMAIL

Signature | Print Name

11/18/05

Date

Reviewed by: MPR ASSOCIATES INC VIA EMAIL

Signature | Print Name

11/18/05

Date

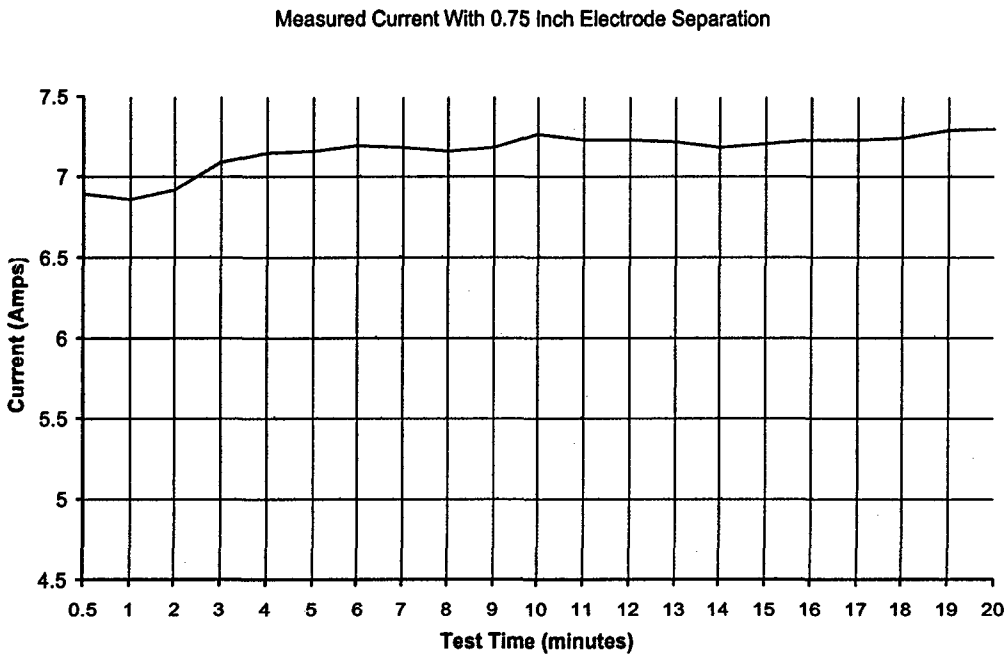
The "Past Operability Evaluation of Electrical Equipment Due to Internal Flooding in Kewaunee Nuclear Power Plant" report identified that once water level in the rooms where the 4kV bus 1-5 and 1-6 are located reaches 4 inches, several secondary disconnects are submerged and the impact on the circuit breakers was indeterminate and that loss of the bus loads was assumed. This analysis will be used as a supplement to that report to determine the impact on bus control power.

Kewaunee contracted Bussman to perform a test with electrodes placed in a water solution of the same conductivity used to test the 480 VAC circuit breaker static trip units. The size of the electrodes was similar to that of a 4 kV circuit breaker secondary disconnect and the spacing between the electrodes was varied to account for the spacing differences between the secondary disconnect pins of interest. The electrodes were energized with 125 VDC and the measured current was recorded over time. The volume of water used for the test was chosen to closely match the volume of water that would exist in one 4 kV circuit breaker cubicle containing 4 inches of water.

The "Past Operability Evaluation of Electrical Equipment Due to Internal Flooding in Kewaunee Nuclear Power Plant" evaluation describes the control power for each 4 kV cubicle being split into a closing circuit, a trip circuit, and a spring charging circuit. Each of those circuits is separately fused. The impact on the control power circuit will be evaluated at the flood levels the circuitry is impacted. Since the distributed resistance between switchgear cubicles is high compared to the coupling at the secondary disconnects, multiple circuit pathways between switchgear cubicles can be ignored.

3 ¼ Inch Flood Height

At a flood height of 3 ¼ inches, the first row of secondary disconnects become submerged. The bottom row of secondary disconnects are only associated with spring charging circuit and do not impact the closing or trip circuit for any circuit breaker on either 4 kV bus. The spring charging circuit for each control power circuit is protected by a 20 Amp fuse. The spring charging motor is connected to the circuit thru the use of pins 16 and 18 on the secondary disconnect. Pin 17 is also on the bottom row of the secondary disconnect, but is a spare. The spacing between each secondary disconnect pin is ¾ inch center to center, making the distance between pins 16 and 18 1½ inches. Bussman replicated this configuration and measured current for 20 minutes. A chart of the current measured with respect to time is shown below.



When water level reaches the bottom row of pins, there will be a 25 ohm resistance across pins 16 and 18, and 4.9 to 5.1 Amps of current will flow thru the spring charging fuses. This will be insufficient current to cause any spring charging circuit fuse to open. Bus 1-5 and Bus 1-6 each have eleven cubicles. With 4.9 to 5.1 Amps of current in each cubicle, there will be between 54 and 56 Amps of current above the normal control power loading for each bus. The normal control power load for a cubicle consists only of indicating lights, which draw 0.04 Amps of current each. There is a remote and local indicating light for each cubicle, which means that the normal control power load for each of the eleven cubicles is approximately 0.1 Amps. Therefore, the normal control power load for each bus is just over 1 Amp. The DC control power for each bus is supplied by a 70 Amp Westinghouse EHD circuit breaker. Since the maximum control power load will only be 57 Amps, the control power to either bus will not be affected.

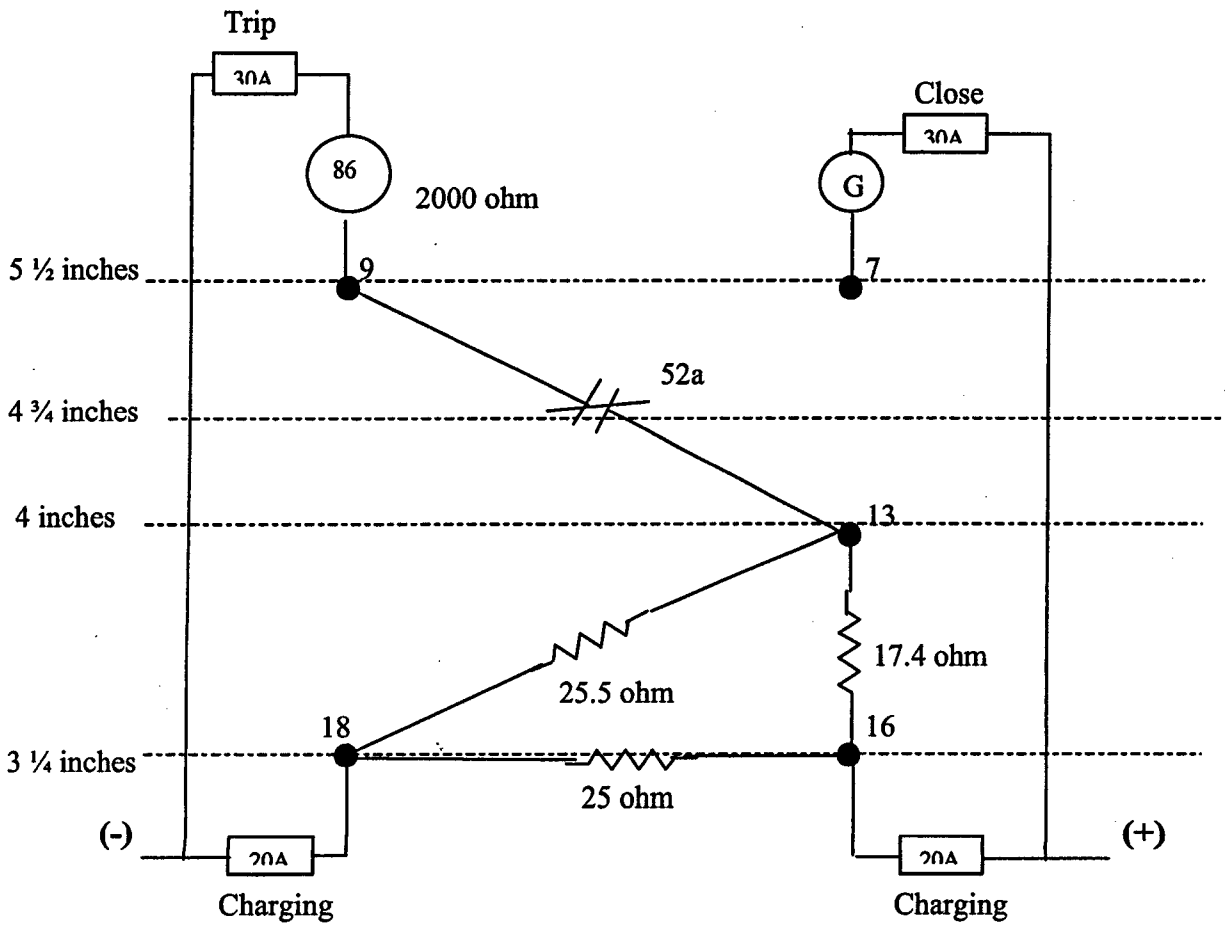
4 Inch Flood Height

At a flood height of 4 inches, the first two rows of secondary disconnects become submerged. The first row are associated with the spring charging circuit for each circuit breaker and the impact on this row of secondary disconnects is the same as at the 3 ¼ inch flood height.

The second row of secondary disconnects are spare in the control power circuits for the bus supplies from any of the transformers, the bus tie breakers, the Emergency Diesel Generators, and for the 4 kV breakers that supply the 480 VAC bus. Therefore, these circuit breakers are not affected at this flood height.

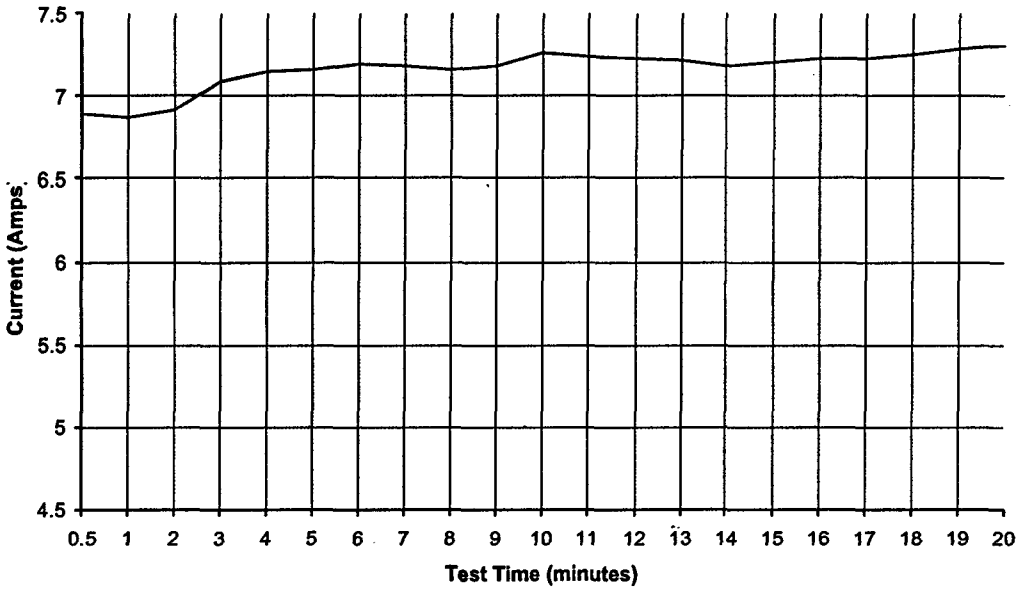
The control power circuits for the motor load circuit breakers (SI, RHR, SW, and AFW) use secondary disconnect pin 13 to provide a circuit breaker lockout signal in the event of

an overcurrent condition is present on the load it feeds. A lockout signal will cause the circuit breaker to trip and will prevent remote closure of the circuit breaker until the lockout is reset. A simplified diagram of the circuit as it relates to the secondary disconnects is shown below. Secondary disconnects 10, 11, 14, 15, and 17 are all spare and not shown on the diagram.

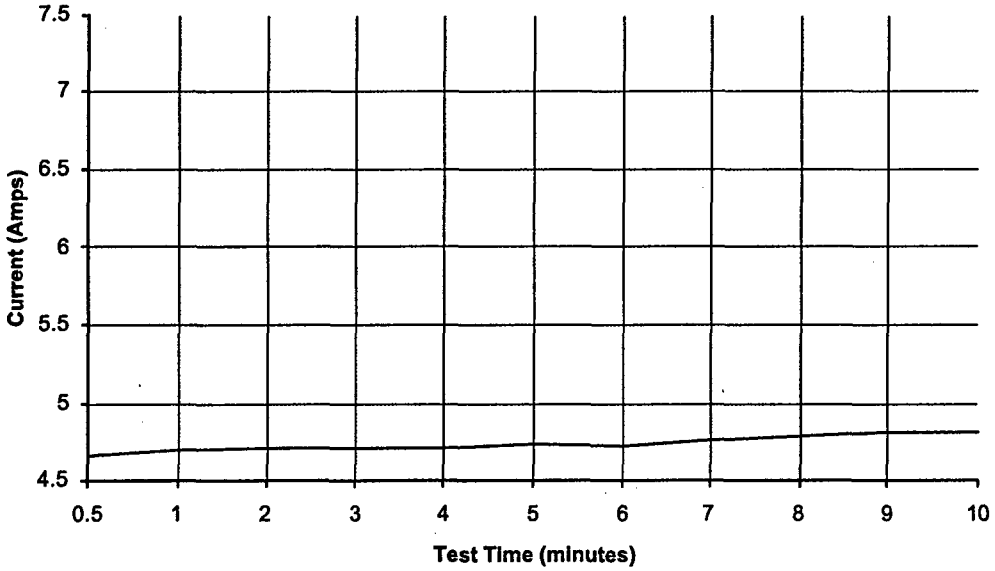


The resistances shown were derived from the currents measured during the Bussman testing with the electrodes separated by distances of 0.75 inches, 1.5 inches, and 1.75 inches. The graphs below show the measured current with respect to time for the 0.75 inch and the 1.75 inch tests that were performed. The 1.5 inch test is shown above in the evaluation with flood levels at 3 ¼ inches.

Measured Current With 0.75 Inch Electrode Separation



Measured Current With 1.75 Inch Electrode Separation

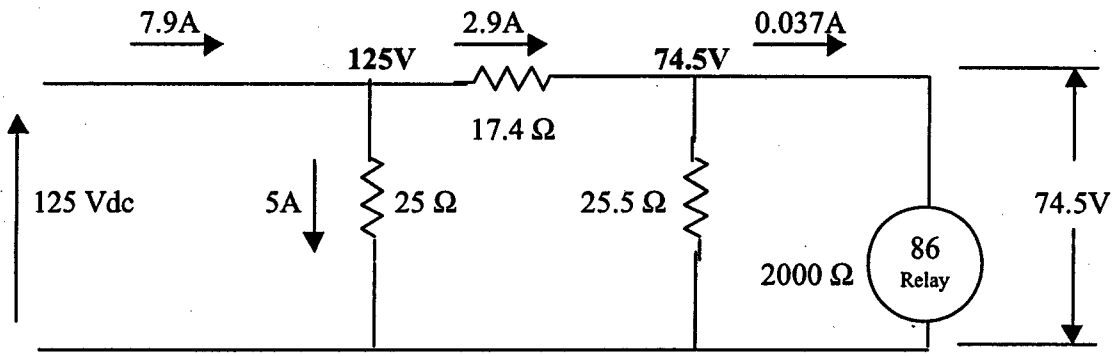


The measured current with the electrodes separated by ¾ inch was 7.2 Amps at 125 Vdc, providing 17.4 ohms of resistance between those electrodes. Secondary disconnect pins 13 and 16 are separated by ¾ inch. Therefore, the resistance between secondary disconnect pins 13 and 16 will be 17.4 ohms.

The measured current with the electrodes separated by 1 ¾ inch was 4.8 Amps at 125 Vdc, providing 26 ohms of resistance between those electrodes. As stated above in the description of control power impact at flood levels of 3 ¼ inch, the measured current between electrodes separated by 1.5 inch was approximately 5 Amps, providing 25 ohms of resistance between those electrodes.

Secondary disconnect pins 13 and 18 are separated by 1.68 inches. The distance between these pins is between the distances that were tested by Bussman. With only a 0.2 Amp difference in current (or 1 ohm difference in resistance) between the two tests, the use of either resistance will not make a significant difference in the results. A value of 25.5 ohms of resistance will be used, a resistance between the two values.

The configuration can be shown in a schematic format to show the various resistances and how they are connected.



The lockout relay is a Westinghouse MG-6. During the 2001 refueling outage, KPS I&C tested various MG-6 relays installed in the Engineered Safety Features System and found them to pickup at ranges typically between 70 and 90 Vdc. The voltage across the lockout relay coil within the typical range needed to pickup the relay and the lockout relay would most likely actuate for the motor loads supplied by bus 1-5 and 1-6 when water level reached 4 inches in the respective rooms.

The total control power current for each load will now be 7.9 Amps, 5 Amps thru the charging circuit and 2.9 Amps thru the remaining of the circuit. This current is not sufficient to cause the 30 Amp trip control power fuses to open for any of the individual loads.

The control power current for each bus will be 69.5 Amps. That consists of 30 Amps as a result of the source breakers (5 Amps for each of the three source breakers, 5 Amps for the EDG output breaker, 5 Amps for the bus tie breaker, and 5 Amps for the 480 VAC supply breaker) and 39.5 Amps from the remaining motor load breakers (7.9 Amps for the five motor load breakers). Based on the same Time Current Curve for the 70 Amp control power circuit breaker, the breaker should trip some time after 20 minutes in this condition. The Bussman testing did show that current continued to slowly increase during their testing. As the current increases, the load on the control power circuit for

each bus will increase, which will put the control power supply breaker further into an overload condition. In addition, any motor load that does receive a lockout signal will cause an additional load on the control power circuit by the trip coil energizing.

4 3/4 Inch Flood Height

At a flood height of 4 3/4 inches, the third rows of secondary disconnects become submerged. The use of the third row of disconnects is the same for all of the circuit breaker control power circuits from each bus. Each control power circuit uses only pin 12 of the third row. The other two are spares and not connected. Secondary disconnect pin 12 is associated with the negative potential of the closing circuitry and does not provide any path thru any circuit breaker closing relaying to cause any spurious breaker operation. The impact of water at this level would be to create further leakage paths between secondary disconnect 16 to 12 and 13 to 12 that would further increase the control power current and reduce the available voltage at the lockout relay for the motor load circuit breakers. This additional current would further overload the control power circuit for each bus and reduce the time it takes for the control power supply breaker to trip.

The conclusion is that the motor loads on the 4 kV buses will most likely receive a lockout signal and be tripped following flood levels at the secondary disconnects at 4 inches. In as little as twenty minutes following the secondary disconnects becoming submerged to the level of 4 inches, control power to each bus will be lost as a result of the control power supply circuit breaker tripping on an overload condition. The load on the control power circuit for each bus will increase as the water level continues to rise, reducing the time it takes for the control power supply breaker to trip.

The 4 kV bus will remain energized and supply power to their respective 480 VAC buses, and any running motor that does not receive a lockout will continue to run until power is lost to the entire bus, which will not occur until water level reaching the primary stabs at a height of 18 3/16 inches. At that height, the bus supply transformers will receive a lockout signal and their associated high side supply circuit breaker will open.

Appendix E

Non-Seismic Quantification

Non-Seismic Quantification

Owner's Acceptance: Thomas G Hook

Signature

THOMAS G HOOK

Print Name

12/01/05

Date

Kewaunee Nuclear Power Plant

Quantification for Turbine Building Floods

Effective Date: November 2005

S. E. GUOKAS VIA EMAIL — 12/01/05
Prepared By: S. E. Guokas — Date

R. J. DREMEL VIA EMAIL — 12/01/05
Reviewed By: R. J. Dremel — Date

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1.0 PURPOSE

The purpose of this quantification appendix is to document the quantification of the core damage frequency (CDF) for floods due to pipe breaks in the Turbine Building at Kewaunee Power Station (KPS). This model applies to the plant configuration before February 2005.

2.0 UNIT DIFFERENCES

Kewaunee is a single unit site so there are no unit differences.

3.0 RISK MONITOR CONSIDERATIONS

The risk monitor used at KPS is the Safety Monitor. Modification of the Safety Monitor model is outside the scope of this analysis.

4.0 METHODOLOGY

The core damage frequency (CDF) for pipe breaks in the Turbine Building is quantified using the WinNUPRA 3.0 software package [SOFT01]. A batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. This batch file is displayed in Table 1. The quantification was initiated by selecting "Batch Processing" in the "Tools" menu in the WinNUPRA 3.0 Calculation Module.

Batch job FLOOD.BCL was run using the Initiating Event BED File, FLDINIT.BED and KNPP.BED as inputs to create the FLOOD.BED file that was used for the quantification. FLDINIT.BED contained the values for the initiating events. KNPP.BED contained the basic events from the Kewaunee Nuclear Plant Internal Events PRA.

House event BED files were developed that overwrite the existing random failure rates of various components to reflect the failed state of such equipment due to a flooding event. Several such house event BED files were developed for each initiator. The first house event BED file **(*BA.BED)** assigns a logical TRUE (1.0) as the failure rates of equipment in the Turbine Building that will fail due to the flooding initiator. *BA.BED files were used for the Auxiliary Feedwater Start branches only and were required to show that the pumps had started before the bottom row of breakers failed. The second house event BED file **(*BB.BED)** builds on the first case by adding in the failure of the bottom row of breakers. This BED file also assigns a logical TRUE (1.0) to the motor loads powered from 4kVAC Bus 5. This represents the case where the water level inside A-train diesel room has risen to four inches. The third house event BED file **(*B4.BED)** builds on the second case by assigning a logical TRUE (1.0) as the failure rate of 480 VAC buses 61 and 62, representing the case where the water level inside Safeguards Alley has risen to the failure level of those buses or 11 inches. The next house event BED file **(*BM.BED)** builds on the third case and adds failure of buses 5, 51, and 52. One

additional house event BED file (***RCP61.BED**) is used to quantify the availability of RXCP seal injection systems for cases where water level has risen to the point that the B-train 480 VAC buses will be lost but the A-train 480 VAC buses are still available. Most of the equations developed by WinNUPRA as part of the quantification use one of these house event BED files.

Auto editing of the cutsets was performed to apply the correct human error probabilities to flood isolation and to eliminate invalid cutsets containing the failure of DC power early due to failure of battery room cooling. Isolation-related events are represented by top events I5-, ITD, I6-, IMD, and I18, which appear in succession on the event trees and represent failure of the operator to isolate the break in different time periods. Obviously, these events are dependent because they are the same actions performed in different times. To correctly quantify the failure probability of these actions, the event trees were quantified using a dummy event for each of the isolation-related events. The dummy event was assigned a value of 0.5 to ensure that truncation errors would not eliminate any significant cutsets. After the initial cutset generation, the cutset equation files were edited and the various combinations of the dummy events were replaced with a single basic event that used the correct probability for the associated isolation.

The overall list of cutsets for floods due to pipe breaks in the Turbine Building associated with this model is documented in Table 2. Tables 3 through 11 document the cutsets for each individual Turbine Building flooding initiator in the model. Basic event descriptions and values for this model are provided in Table 12.

Sensitivities were performed for the quantification. These were:

- HEPs for operator actions with less than a 30-minute time window were increased by 500% and 1000%
- HEPs for operator actions with less than a one- hour time window were increased by 500% and 1000%
- HEPs for unproceduralized (i.e., skill-based or not well proceduralized, such as transferring inverters to an alternate source at four hours) operator actions were increased by 500% and 1000%
- High energy (main steam and feedwater) line break frequencies were increased by 500% and 1000%
- Circulating water expansion joint break frequencies were increased by 500% and 1000%
- Random pipe break frequencies were increased by 500% and 1000%
- The HEP representing the first isolation failure following a HELB was set to 0.1, 0.3, and 0.6 with all other HEPs as in the base case.
- The HEP for each isolation event following a HELB was recalculated using a minimum time requirement of 38 minutes. Then theHEP representing the first isolation failure following a HELB was set to 0.1, 0.3, and 0.6.

5.0 RESULTS AND CONCLUSIONS

The results of the above evaluation show that the non-seismic CDF for floods due to pipe beaks in the Turbine Building at KPS is 6.57E-05 per year. The results of the evaluation for seismic CDF for floods due to pipe breaks in the Turbine Building at KPS is presented in Appendix F. The CDF for floods due to seismically induced pipe breaks in the Turbine Building at KPS is 6.6E-06 per year. The total CDF for floods due to pipe breaks in the Turbine Building at KPS is the sum of the seismic and non-seismic CDF.

$CDF_{TOTAL} = CDF_{SEISMIC} + CDF_{NON\text{-}SEISMIC}$

$CDF_{TOTAL} = 6.6E\text{-}06 + 6.57E\text{-}05 = 7.23E\text{-}05$ per year

The biggest contributors to the non-seismic CDF are the HEPs associated with tripping the Circulating Water pumps following a condenser expansion joint rupture and the HEP associated with the operators controlling steam generator level after losing all DC power due to battery depletion. This action would be required at more than 8 hours into the event.

Of the total non-seismic CDF, over 50% is due to a large Circulating Water break due to a rupture of the condenser inlet expansion joint. This event assumes a 58,000 gpm rupture which does not allow the operator sufficient time to trip the Circulating Water pumps before failure of most of the equipment in Safeguards Alley.

The second highest contribution to non-seismic CDF is a Steam Line break resulting in a 6,000 gpm discharge of the Fire Protection System. This event contributes 15% to the overall risk. The operator actions associated with isolating the flood are challenged by the Turbine Building environmental conditions, e.g., temperature and humidity.

The third highest contribution to non-seismic CDF is a Feedwater Line break resulting in a 6,000 gpm discharge of the Fire Protection System. This event contributes 14% to the overall risk. The operator actions associated with isolating the flood are challenged by the Turbine Building environmental conditions, e.g., temperature and humidity, and the fact that the Feedwater System discharges so much inventory onto the Turbine Building floor that the time available to the operators to isolate the break is greatly reduced.

When the HEPs for operator actions with less than a 30-minute time window were increased by 500%, the non-seismic CDF increased from the base case value of 6.57E-5 per year to a sensitivity value of 7.97E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 8.63E-5 per year. Details of this sensitivity are provided in Attachment A.

When the HEPs for operator actions with less than a 30-minute time window were increased by 1000%, the non-seismic CDF increased from the base case value of 6.57E-5 per year to a sensitivity value of 7.98E-5 per year. The total CDF increased from a base value of 7.23E-5 per

year to 8.64E-5 per year. Details of this sensitivity are provided in Attachment A.

For the sensitivity case where the HEPs for operator actions with less than a one- hour time window were increased by 500%, the non-seismic CDF increased from the base case value of 6.57E-5 per year to a sensitivity value of 1.17E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.24E-4 per year. Details of this sensitivity are provided in Attachment B.

For the sensitivity case where the HEPs for operator actions with less than a one- hour time window were increased by 1000%, the non-seismic CDF increased from the base case value of 6.57E-5 per year to a sensitivity value of 1.46E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.53E-4 per year. Details of this sensitivity are provided in Attachment B.

Increasing the HEPs for unproceduralized operator actions by 500% changed the non-seismic CDF from the base case value of 6.57E-5 per year to a sensitivity value of 9.58E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.02E-4 per year. Details of this sensitivity are provided in Attachment C.

Increasing the HEPs for unproceduralized operator actions by 1000% changed the non-seismic CDF from the base case value of 6.57E-5 per year to a sensitivity value of 1.10E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.17E-4 per year. Details of this sensitivity are provided in Attachment C.

When the value for High Energy Line Breaks (HELBs) was increased by 500% the non-seismic CDF increased from the base value of 6.57E-5 per year to a sensitivity value of 1.42E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.49E-4 per year. Details of this sensitivity are provided in Attachment D.

When the value for High Energy Line Breaks (HELBs) was increased by 1000% the non-seismic CDF increased from the base value of 6.57E-5 per year to a sensitivity value of 2.36E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 2.43E-4 per year. Details of this sensitivity are provided in Attachment D.

Increasing the circulating water expansion joint break frequencies by 500% resulted in an increase in the non-seismic CDF from the base case value of 6.57E-5 per year to 1.86E-04 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.93E-4 per year. Details of this sensitivity are provided in Attachment E.

Increasing the circulating water expansion joint break frequencies by 1000% resulted in an increase in the non-seismic CDF from the base case value of 6.57E-5 per year to 3.34E-04 per year. The total CDF increased from a base value of 7.23E-5 per year to 3.41E-4 per year. Details of this sensitivity are provided in Attachment E.

Increasing the value for random pipe break frequencies by 500% increased the non-seismic CDF from the base value of 6.57E-5 per year to 1.34E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.41E-4 per year. Details of this sensitivity are provided in Attachment F.

Increasing the value for random pipe break frequencies by 1000% increased the non-seismic CDF from the base value of 6.57E-5 per year to 2.19E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 2.26E-4 per year. Details of this sensitivity are provided in Attachment F.

Using the base-case 32-minute time window to isolate fire sprinklers following a HELB, when the value for the first isolation modeled following a HELB was set to 0.1, the non-seismic CDF decreased from the base value of 6.57E-5 per year to a sensitivity value of 6.27E-5 per year. The total CDF decreased from a base value of 7.23E-5 per year to 6.93E-5 per year. Details of this sensitivity are provided in Attachment G.

Using the base-case 32-minute time window to isolate fire sprinklers following a HELB, when the value for the first isolation modeled following a HELB was set to 0.3, the non-seismic CDF decreased from the base value of 6.57E-5 per year to a sensitivity value of 6.35E-5 per year. The total CDF decreased from a base value of 7.23E-5 per year to 7.01E-5 per year. Details of this sensitivity are provided in Attachment G.

Using the base-case 32-minute time window to isolate fire sprinklers following a HELB, when the value for the first isolation modeled following a HELB was set to 0.6, the non-seismic CDF decreased from the base value of 6.57E-5 per year to a sensitivity value of 6.47E-5 per year. The total CDF decreased from a base value of 7.23E-5 per year to 7.13E-5 per year. Details of this sensitivity are provided in Attachment G.

Using a 38-minute time window to isolate fire sprinklers following a HELB and a value for the first isolation modeled following a HELB of 0.1, the non-seismic CDF increased from the base value of 6.57E-5 per year to a sensitivity value of 7.24E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 7.90E-5 per year. Details of this sensitivity are provided in Attachment H.

Using a 38-minute time window to isolate fire sprinklers following a HELB and a value for the first isolation modeled following a HELB of 0.3, the non-seismic CDF increased from the base value of 6.57E-5 per year to a sensitivity value of 7.32E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 7.98E-5 per year. Details of this sensitivity are provided in Attachment H.

Using a 38-minute time window to isolate fire sprinklers following a HELB and a value for the first isolation modeled following a HELB of 0.6, the non-seismic CDF increased from the base value of 6.57E-5 per year to a sensitivity value of 7.43E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 8.09E-5 per year. Details of this sensitivity are provided in Attachment H.

Increasing the frequency of medium and small circulating water expansion joints leaks by 500% increased the non-seismic CDF from a base value of 6.57E-5 per year to a sensitivity value of 8.79E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 9.45E-5 per year. Details of this sensitivity are provided in Attachment I.

Increasing the frequency of medium and small circulating water expansion joints leaks by 500% while resetting the value for CW pump trip HEPs in moderate circulating water break to 0.05 increased the non-seismic CDF from a base value of 6.57E-5 per year to a sensitivity value of 7.67E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 8.33E-5 per year. Details of this sensitivity are provided in Attachment I.

Increasing the frequency of medium and small circulating water expansion joints leaks by 500% while resetting the value for CW pump trip HEPs in moderate circulating water break to 0.12 increased the non-seismic CDF from a base value of 6.57E-5 per year to a sensitivity value of 8.77E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 9.43E-5 per year. Details of this sensitivity are provided in Attachment I.

Increasing the frequency of medium and small circulating water expansion joints leaks by 1000% increased the non-seismic CDF from a base value of 6.57E-5 per year to a sensitivity value of 1.16E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.23E-4 per year. Details of this sensitivity are provided in Attachment I.

Increasing the frequency of medium and small circulating water expansion joints leaks by 1000% while resetting the value for CW pump trip HEPs in moderate circulating water break to 0.05 increased the non-seismic CDF from a base value of 6.57E-5 per year to a sensitivity value of 9.37E-5 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.00E-4 per year. Details of this sensitivity are provided in Attachment I.

Increasing the frequency of medium and small circulating water expansion joints leaks by 1000% while resetting the value for CW pump trip HEPs in moderate circulating water break to 0.12 increased the non-seismic CDF from a base value of 6.57E-5 per year to a sensitivity value of 1.15E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to 1.22E-4 per year. Details of this sensitivity are provided in Attachment I.

When the IPE value for circulating water expansion joints was used for the large, medium and small break expansion joint failures, the non-seismic CDF increased from a base value of 6.57E-5 per year to a sensitivity value of 2.71E-4 per year. The total CDF increased from a base value of

7.23E-5 per year to a value of 2.78E-4 per year. Details of this sensitivity are provided in Attachment J.

When the IPE value for circulating water expansion joints was used for the large break only and the medium and small break expansion joint failures are set to 0, the non-seismic CDF increased from a base value of 6.57E-5 per year to a sensitivity value of 2.36E-4 per year. The total CDF increased from a base value of 7.23E-5 per year to a value of 2.43E-4 per year. Details of this sensitivity are provided in Attachment J.

6.0 REFERENCES

[SOFT01] WinNUPRA User's Manual, Version 3.0.

Table 1 – Batch File IE-FLOOD1.IN

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MAXPRT = 100
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YP	,IE-WI06B	,FLOODING.LKC	,GFLD110	,NA	,1.00E-12
YP	,I5-WI06B	,FLOODING.LKC	,GFLD410	,NA	,1.00E-12
YP	,ITDWI06B	,FLOODING.LKC	,GFLD411	,NA	,1.00E-12
YP	,I6-WI06B	,FLOODING.LKC	,GFLD412	,NA	,1.00E-12
YP	,IMDWI06B	,FLOODING.LKC	,GFLD510	,NA	,1.00E-12
YP	,AFSWI06B	,AFM.LKC	,GAFM111	,HWI06BA.BED	,1.00E-09
YP	,AFSWI064	,AFM.LKC	,GAFM111	,HWI06B4.BED	,1.00E-09
YP	,AFRWI06B	,AFM.LKC	,GAFM502	,HWI06BB.BED	,1.00E-09
YP	,AFRWI064	,AFM.LKC	,GAFM502	,HWI06B4.BED	,1.00E-09
YP	,AFZ-AWIB	,FLOODING.LKC	,GFLD4612	,HWI06BB.BED	,1.00E-12
YP	,AFZ-BWIB	,FLOODING.LKC	,GFLD4614	,HWI06BB.BED	,1.00E-12
YP	,AFZ-BWI4	,FLOODING.LKC	,GFLD4614	,HWI06B4.BED	,1.00E-12
YP	,AFTWI06M	,AFM.LKC	,GAFM1002	,HWI06BM.BED	,1.00E-09
YP	,AFTWI06B	,AFM.LKC	,GAFM1002	,HWI06BB.BED	,1.00E-09
YP	,AFTWI064	,AFM.LKC	,GAFM1002	,HWI06B4.BED	,1.00E-09
YP	,AFX-1WIB	,FLOODING.LKC	,GFLD142	,HWI06BB.BED	,1.00E-12

YP	,AFX-1AWI	,FLOODING.LKC	,GFLD4672	,HWI06BB.BED	,1.00E-12
YP	,AFX-2WIB	,FLOODING.LKC	,GFLD4642	,HWI06BB.BED	,1.00E-12
YP	,AFX-2WI4	,FLOODING.LKC	,GFLD4644	,HWI06B4.BED	,1.00E-12
YP	,RCPWI06B	,FLOODING.LKC	,GFLD140	,HWI06BB.BED	,1.00E-12
YP	,RCPWI06A	,FLOODING.LKC	,GFLD140	,HWIRCP61.BED	,1.00E-12
YP	,OCWI06BM	,FLOODING.LKC	,GFLD160	,HWI06BM.BED	,1.00E-09
YP	,OCWI06B4	,FLOODING.LKC	,GFLD4664	,HWI06B4.BED	,1.00E-09
YP	,OCWI06BB	,FLOODING.LKC	,GFLD4664	,HWI06BB.BED	,1.00E-09
YP	,SLCWI06M	,FLOODING.LKC	,GFLD3142	,NA	,1.00E-09
YP	,SLCWI06B	,FLOODING.LKC	,GFLD3140	,NA	,1.00E-09
YP	,HPIWI06M	,FLOODING.LKC	,GFLD310	,HWI06BM.BED	,1.00E-09
YP	,HPIWI06B	,FLOODING.LKC	,GFLD310	,HWIHPIBB.BED	,1.00E-09
YP	,HPIWI065	,FLOODING.LKC	,GFLD310	,HWIHPI61.BED	,1.00E-09
YP	,RWCWI06B	,FLOODING.LKC	,GFLD3210	,HWI06BB.BED	,1.00E-09
YP	,IE-WX06B	,FLOODING.LKC	,GFLD115	,NA	,1.00E-12
YP	,I5-WX06B	,FLOODING.LKC	,GFLD413	,NA	,1.00E-12
YP	,ITDWX06B	,FLOODING.LKC	,GFLD414	,NA	,1.00E-12
YP	,I6-WX06B	,FLOODING.LKC	,GFLD415	,NA	,1.00E-12
YP	,AFSWX06B	,AFM.LKC	,GAFM111	,HWX06BA.BED	,1.00E-09
YP	,AFSWX064	,AFM.LKC	,GAFM111	,HWX06B4.BED	,1.00E-09
YP	,AFRWX06B	,AFM.LKC	,GAFM502	,HWX06BB.BED	,1.00E-09
YP	,AFRWX064	,AFM.LKC	,GAFM502	,HWX06B4.BED	,1.00E-09
YP	,AFZ-AWXB	,FLOODING.LKC	,GFLD4712	,HWX06BB.BED	,1.00E-12
YP	,AFZ-BWXB	,FLOODING.LKC	,GFLD4714	,HWX06BB.BED	,1.00E-12
YP	,AFTWX06B	,AFM.LKC	,GAFM1002	,HWX06BB.BED	,1.00E-09
YP	,AFTWX064	,AFM.LKC	,GAFM1002	,HWX06B4.BED	,1.00E-09
YP	,AFX-1WXB	,FLOODING.LKC	,GFLD142	,HWX06BB.BED	,1.00E-12
YP	,AFX-1AWX	,FLOODING.LKC	,GFLD4772	,HWX06BB.BED	,1.00E-12
YP	,AFX-2WXB	,FLOODING.LKC	,GFLD4742	,HWX06BB.BED	,1.00E-12
YP	,RCPWX06B	,FLOODING.LKC	,GFLD140	,HWX06BB.BED	,1.00E-12
YP	,RCPWX06A	,FLOODING.LKC	,GFLD140	,HWXRCP61.BED	,1.00E-12
YP	,OCWX06B4	,FLOODING.LKC	,GFLD4764	,HWX06B4.BED	,1.00E-09
YP	,OCWX06BB	,FLOODING.LKC	,GFLD4764	,HWX06BB.BED	,1.00E-09
YP	,SLCWX06M	,FLOODING.LKC	,GFLD3142	,NA	,1.00E-09
YP	,SLCWX06B	,FLOODING.LKC	,GFLD3140	,NA	,1.00E-09
YP	,HPIWX06B	,FLOODING.LKC	,GFLD310	,HWXHPIBB.BED	,1.00E-09
YP	,HPIWX065	,FLOODING.LKC	,GFLD310	,HWXHPI61.BED	,1.00E-09
YP	,RWCWX06B	,FLOODING.LKC	,GFLD3210	,HWX06BB.BED	,1.00E-09
YP	,IE-TI06B	,FLOODING.LKC	,GFLD134	,NA	,1.00E-12
YP	,I5-TI06B	,FLOODING.LKC	,GFLD430	,NA	,1.00E-12
YP	,ITDTI06B	,FLOODING.LKC	,GFLD431	,NA	,1.00E-12
YP	,I6-TI06B	,FLOODING.LKC	,GFLD432	,NA	,1.00E-12
YP	,IMDTI06B	,FLOODING.LKC	,GFLD4B3	,NA	,1.00E-12
YP	,AFSTI06B	,AFM.LKC	,GAFM111	,HTI06BA.BED	,1.00E-09
YP	,AFSTI064	,AFM.LKC	,GAFM111	,HTI06B4.BED	,1.00E-09
YP	,AFRTI06B	,AFM.LKC	,GAFM502	,HTI06BB.BED	,1.00E-09
YP	,AFRTI064	,AFM.LKC	,GAFM502	,HTI06B4.BED	,1.00E-09
YP	,AFZ-BTI4	,FLOODING.LKC	,GFLD4414	,HWI06B4.BED	,1.00E-12
YP	,AFZ-ATIB	,FLOODING.LKC	,GFLD4412	,HTI06BB.BED	,1.00E-12
YP	,AFZ-BTIB	,FLOODING.LKC	,GFLD4414	,HTI06BB.BED	,1.00E-12
YP	,AFTTI06M	,AFM.LKC	,GAFM1002	,HTI06BM.BED	,1.00E-09
YP	,AFTTI06B	,AFM.LKC	,GAFM1002	,HTI06BB.BED	,1.00E-09
YP	,AFTTI064	,AFM.LKC	,GAFM1002	,HTI06B4.BED	,1.00E-09
YP	,AFX-1TIB	,FLOODING.LKC	,GFLD142	,HTI06BB.BED	,1.00E-12
YP	,AFX-1ATI	,FLOODING.LKC	,GFLD4472	,HTI06BB.BED	,1.00E-12
YP	,AFX-2TIB	,FLOODING.LKC	,GFLD4442	,HTI06BB.BED	,1.00E-12
YP	,AFX-2TI4	,FLOODING.LKC	,GFLD4444	,HWI06B4.BED	,1.00E-12
YP	,RCPTI06B	,FLOODING.LKC	,GFLD140	,HTI06BB.BED	,1.00E-12
YP	,RCPTI06A	,FLOODING.LKC	,GFLD140	,HTIRCP61.BED	,1.00E-12
YP	,OCTI06B4	,FLOODING.LKC	,GFLD4464	,HTI06B4.BED	,1.00E-09
YP	,OCTI06BM	,FLOODING.LKC	,GFLD160	,HTI06BM.BED	,1.00E-09
YP	,OCTI06BB	,FLOODING.LKC	,GFLD4464	,HTI06BB.BED	,1.00E-09
YP	,SLCTI06M	,FLOODING.LKC	,GFLD3142	,NA	,1.00E-09

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YP   ,SLCTI06B       ,FLOODING.LKC   ,GFLD3140    ,NA                  ,1.00E-09
YP   ,HPITI06M       ,FLOODING.LKC   ,GFLD310     ,HTI06BM.BED         ,1.00E-09
YP   ,HPITI06B       ,FLOODING.LKC   ,GFLD310     ,HTIHPIBB.BED        ,1.00E-09
YP   ,HPITI065       ,FLOODING.LKC   ,GFLD310     ,HTIHPI61.BED        ,1.00E-09
YP   ,RWCTI06B       ,FLOODING.LKC   ,GFLD3210    ,HTI06BB.BED         ,1.00E-09
YP   ,IE-TX06B       ,FLOODING.LKC   ,GFLD135     ,NA                  ,1.00E-12
YP   ,I5-TX06B       ,FLOODING.LKC   ,GFLD433     ,NA                  ,1.00E-12
YP   ,ITDTX06B       ,FLOODING.LKC   ,GFLD434     ,NA                  ,1.00E-12
YP   ,I6-TX06B       ,FLOODING.LKC   ,GFLD435     ,NA                  ,1.00E-12
YP   ,AFSTX06B       ,AFM.LKC        ,GAFM111     ,HTX06BA.BED         ,1.00E-09
YP   ,AFSTX064       ,AFM.LKC        ,GAFM111     ,HTX06B4.BED         ,1.00E-09
YP   ,AFRTX06B       ,AFM.LKC        ,GAFM502     ,HTX06BB.BED         ,1.00E-09
YP   ,AFRTX064       ,AFM.LKC        ,GAFM502     ,HTX06B4.BED         ,1.00E-09
YP   ,AFZ-ATXB       ,FLOODING.LKC   ,GFLD4512    ,HTX06BB.BED         ,1.00E-12
YP   ,AFZ-BTXB       ,FLOODING.LKC   ,GFLD4514    ,HTX06BB.BED         ,1.00E-12
YP   ,AFTTX06B       ,AFM.LKC        ,GAFM1002    ,HTX06BB.BED         ,1.00E-09
YP   ,AFTTX064       ,AFM.LKC        ,GAFM1002    ,HTX06B4.BED         ,1.00E-09
YP   ,AFX-1TXB       ,FLOODING.LKC   ,GFLD142     ,HTX06BB.BED         ,1.00E-12
YP   ,AFX-1ATX       ,FLOODING.LKC   ,GFLD4572    ,HTX06BB.BED         ,1.00E-12
YP   ,AFX-2TXB       ,FLOODING.LKC   ,GFLD4542    ,HTX06BB.BED         ,1.00E-12
YP   ,RCPTX06B       ,FLOODING.LKC   ,GFLD140     ,HTX06BB.BED         ,1.00E-12
YP   ,RCPTX06A       ,FLOODING.LKC   ,GFLD140     ,HTXRCP61.BED        ,1.00E-12
YP   ,OCTX06B4       ,FLOODING.LKC   ,GFLD4564    ,HTX06B4.BED         ,1.00E-09
YP   ,OCTX06BB       ,FLOODING.LKC   ,GFLD4564    ,HTX06BB.BED         ,1.00E-09
YP   ,SLCTX06M       ,FLOODING.LKC   ,GFLD3142    ,NA                  ,1.00E-09
YP   ,SLCTX06B       ,FLOODING.LKC   ,GFLD3140    ,NA                  ,1.00E-09
YP   ,HPITX06B       ,FLOODING.LKC   ,GFLD310     ,HTXHPIBB.BED        ,1.00E-09
YP   ,HPITX065       ,FLOODING.LKC   ,GFLD310     ,HTXHPI61.BED        ,1.00E-09
YP   ,RWCTX06B       ,FLOODING.LKC   ,GFLD3210    ,HTX06BB.BED         ,1.00E-09
YP   ,IE-FI06B       ,FLOODING.LKC   ,GFLD113     ,NA                  ,1.00E-12
YP   ,I5-FI06B       ,FLOODING.LKC   ,GFLD470     ,NA                  ,1.00E-12
YP   ,ITDFI06B       ,FLOODING.LKC   ,GFLD471     ,NA                  ,1.00E-12
YP   ,I6-FI06B       ,FLOODING.LKC   ,GFLD472     ,NA                  ,1.00E-12
YP   ,IMDFI06B       ,FLOODING.LKC   ,GFLD4B4     ,NA                  ,1.00E-12
YP   ,AFSFI06B       ,AFM.LKC        ,GAFM111     ,HFI06BA.BED         ,1.00E-09
YP   ,AFSFI064       ,AFM.LKC        ,GAFM111     ,HFI06B4.BED         ,1.00E-09
YP   ,AFRFI06B       ,AFM.LKC        ,GAFM502     ,HFI06BB.BED         ,1.00E-09
YP   ,AFRFI064       ,AFM.LKC        ,GAFM502     ,HFI06B4.BED         ,1.00E-09
YP   ,AFZ-BFI4       ,FLOODING.LKC   ,GFLD4214    ,HWI06B4.BED         ,1.00E-12
YP   ,AFZ-AFIB       ,FLOODING.LKC   ,GFLD4212    ,HFI06BB.BED         ,1.00E-12
YP   ,AFZ-BFIB       ,FLOODING.LKC   ,GFLD4214    ,HFI06BB.BED         ,1.00E-12
YP   ,AFTFI06M       ,AFM.LKC        ,GAFM1002    ,HFI06BM.BED         ,1.00E-09
YP   ,AFTFI06B       ,AFM.LKC        ,GAFM1002    ,HFI06BB.BED         ,1.00E-09
YP   ,AFTFI064       ,AFM.LKC        ,GAFM1002    ,HFI06B4.BED         ,1.00E-09
YP   ,AFX-1FIB       ,FLOODING.LKC   ,GFLD142     ,HFI06BB.BED         ,1.00E-12
YP   ,AFX-1AFI       ,FLOODING.LKC   ,GFLD4232    ,HFI06BB.BED         ,1.00E-12
YP   ,AFX-2FIB       ,FLOODING.LKC   ,GFLD4292    ,HFI06BB.BED         ,1.00E-12
YP   ,AFX-2FI4       ,FLOODING.LKC   ,GFLD4294    ,HWI06B4.BED         ,1.00E-12
YP   ,RCPFI06B       ,FLOODING.LKC   ,GFLD140     ,HFI06BB.BED         ,1.00E-12
YP   ,RCPFI06A       ,FLOODING.LKC   ,GFLD140     ,HFIRCP61.BED        ,1.00E-12
YP   ,OCFI06BM       ,FLOODING.LKC   ,GFLD160     ,HFI06BM.BED         ,1.00E-09
YP   ,OCFI06B4       ,FLOODING.LKC   ,GFLD4264    ,HFI06B4.BED         ,1.00E-09
YP   ,OCFI06BB       ,FLOODING.LKC   ,GFLD4264    ,HFI06BB.BED         ,1.00E-09
YP   ,SLCFI06M       ,FLOODING.LKC   ,GFLD3142    ,NA                  ,1.00E-09
YP   ,SLCFI06B       ,FLOODING.LKC   ,GFLD3140    ,NA                  ,1.00E-09
YP   ,HPIFI06M       ,FLOODING.LKC   ,GFLD310     ,HFI06BM.BED         ,1.00E-09
YP   ,HPIFI06B       ,FLOODING.LKC   ,GFLD310     ,HFIHPIBB.BED        ,1.00E-09
YP   ,HPIFI065       ,FLOODING.LKC   ,GFLD310     ,HFIHPI61.BED        ,1.00E-09
YP   ,RWCFI06B       ,FLOODING.LKC   ,GFLD3210    ,HFI06BB.BED         ,1.00E-09
YR, NA,       CI06B.OCL
YR, NA,       CX06B.OCL
YR, NA,       CY06B.OCL
YR, NA,       FI06B.OCL
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YR, NA,        WI06B.OCL
YR, NA,        WX06B.OCL
YR, NA,        SI06B.OCL
YR, NA,        TI06B.OCL
YR, NA,        TX06B.OCL
SEQ = CI06B.SEQ
Y , *,         SEQ
Y , CI06B,      SEQ
SEQ = CX06B.SEQ
Y , *,         SEQ
Y , CX06B,      SEQ
Y   ,CX06B             ,CX06ISOL.TBL   ,CX06B.APP      ,CX1.PRT                ,
N   ,CX06B             ,BATCLGCC.TBL   ,BATCLGCX.APP      ,BATCLGCX.PRT
 ,
SEQ = CY06B.SEQ
Y , *,         SEQ
Y , CY06B,      SEQ
Y   ,CY06B             ,CY06ISOL.TBL   ,CY06B.APP      ,CY1.PRT                ,
N   ,CY06B             ,BATCLGCC.TBL   ,BATCLGCX.APP      ,BATCLGCX.PRT
 ,
SEQ = FI06B.SEQ
Y , *,         SEQ
Y , FI06B,      SEQ
Y   ,FI06B             ,FI06ISOL.TBL   ,FI06B.APP      ,FI1.PRT                ,
N   ,FI06B             ,BATCLGCC.TBL   ,BATCLGFI.APP      ,BATCLGFI.PRT
 ,
SEQ = WI06B.SEQ
Y , *,         SEQ
Y , WI06B,    SEQ
Y   ,WI06B             ,WI06ISOL.TBL   ,WI06B.APP      ,WI1.PRT                ,
N   ,WI06B             ,BATCLGCC.TBL   ,BATCLGWI.APP      ,BATCLGWI.PRT
 ,
SEQ = WX06B.SEQ
Y , *,         SEQ
Y , WX06B,    SEQ
Y   ,WX06B             ,WX06ISOL.TBL   ,WX06B.APP      ,WX1.PRT                ,
N   ,WX06B             ,BATCLGCC.TBL   ,BATCLGWX.APP      ,BATCLGWX.PRT
 ,
SEQ = SI06B.SEQ
Y , *,         SEQ
Y , SI06B,    SEQ
Y   ,SI06B             ,SI06ISOL.TBL   ,SI06B.APP      ,SI1.PRT                ,
N   ,SI06B             ,BATCLGCC.TBL   ,BATCLGSI.APP      ,BATCLGSI.PRT
 ,
SEQ = TI06B.SEQ
Y , *,         SEQ
Y , TI06B,      SEQ
Y   ,TI06B             ,TI06ISOL.TBL   ,TI06B.APP      ,TI1.PRT                ,
N   ,TI06B             ,BATCLGCC.TBL   ,BATCLGTI.APP      ,BATCLGTI.PRT
 ,
SEQ = TX06B.SEQ
Y , *,         SEQ
Y , TX06B,      SEQ
Y   ,TX06B             ,TX06ISOL.TBL   ,TX06B.APP      ,TX1.PRT                ,
N   ,TX06B             ,BATCLGCC.TBL   ,BATCLGTX.APP      ,BATCLGTX.PRT
 ,
SEQ = CDFTBFLD.SEQ
Y , *,         SEQ
Y , CDFTBFLD,  SEQ
Y   ,CDFTBFLD             ,CDFTBFLD1.TBL   ,CDFTBFLD1.APP      ,CDF1.PRT
 ,
Y   ,CDFTBFLD             ,CDFTBFLD2.TBL   ,CDFTBFLD2.APP      ,CDF2.PRT
 ,
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N   ,CDFTBFLD              ,BATCLGCC.TBL    ,BATCLGCC.APP      ,BATCLGCC.PRT
    ,
Y , CDFTBFLD, MIN,  NA, CDF-TBFLDMIN
Y , CI06B,   MIN,  NA, CI06B-CDMIN
Y , CX06B,   MIN,  NA, CX06B-CDMIN
Y , CY06B,   MIN,  NA, CY06B-CDMIN
Y , FI06B,   MIN,  NA, FI06B-CDMIN
Y , WI06B,   MIN,  NA, WI06B-CDMIN
Y , WX06B,   MIN,  NA, WX06B-CDMIN
Y , SI06B,   MIN,  NA, SI06B-CDMIN
Y , TI06B,   MIN,  NA, TI06B-CDMIN
Y , TX06B,   MIN,  NA, TX06B-CDMIN
Y , CDF-TBFLDMIN,   NA
Y , CI06B-CDMIN,  NA
Y , CX06B-CDMIN,  NA
Y , CY06B-CDMIN,  NA
Y , FI06B-CDMIN,  NA
Y , WI06B-CDMIN,  NA
Y , WX06B-CDMIN,  NA
Y , SI06B-CDMIN,  NA
Y , TI06B-CDMIN,  NA
Y , TX06B-CDMIN,  NA
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Table 2
KNPP Turbine Building Flood CDF Cutsets

```
==============================================================================
WinNUPRA 3.0 Production                                   Licensed to: KEWAUNEE
CDFTBFLD.EQP                                            File created: 11-20-2005
==============================================================================
   Equation File                              = CDFTBFLD.EQN
   Basic Event Data file referenced           = FLOOD.BED
   Number of cut sets in equation             = 10611
   Top event unavailability  (rare event)     = 6.571E-005
------------------------------------------------------------------------------
     1  3.7300E-005   IE-CI06B          04-CW-TRIP-F-HE
     2  4.2613E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                      08-FPSISO68F-HE
     3  3.5040E-006   IE-CX06B          04-CWSTP25-F-HE
     4  3.2664E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                      XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     5  2.1096E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                      08-ISO-FS54F-HE
     6  9.3175E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                      XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     7  9.3175E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                      IE-TI06B          08-FPSISO68F-HE
     8  8.8080E-007   IE-CY06B          04-CWSTP66-F-HE
     9  7.5379E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                      IE-WI06B          08-ISO-FS54F-HE
    10  6.5216E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                      XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
    11  6.4400E-007   IE-SI06B          02-SW4A-B66F-HE
    12  6.3599E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                      08-FPISO68F-HE
    13  5.8641E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                      01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    14  5.8641E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                      01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    15  4.5879E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                      04-CWSTP60-F-HE
    16  4.4553E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    17  4.3529E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                      SL21-CD           IE-TI06B          08-FPSISO68F-HE
    18  3.6156E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                      02-SW4A-B60F-HE
    19  3.1291E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                      01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    20  3.1291E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                      01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    21  2.8753E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                      05BPT--AFW1C-PS   08-ISO-FS40F-HE
    22  2.5710E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                      IE-WI06B          08-ISO-FS40F-HE
    23  2.3773E-007   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS18F-HE
    24  2.2052E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                      IE-TI06B          08-FPSISO68F-HE
    25  2.1549E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                      SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    26  2.0859E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                      XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
    27  1.9126E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
```

Table 2 (continued)
KNPP Turbine Building Flood CDF Cutsets

		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
28	1.6410E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
29	1.6410E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
30	1.6393E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
31	1.3906E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
32	1.3768E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
33	1.3768E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
34	1.3403E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
35	1.3403E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
36	1.2468E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
37	1.1985E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
38	1.0917E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
39	1.0460E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
40	1.0060E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
41	7.9057E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
42	7.9057E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
43	6.6353E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
44	6.4967E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
45	5.7592E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
46	5.7407E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
47	5.7359E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
48	5.7359E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
49	5.1333E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
50	5.0517E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
51	4.6894E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
52	4.6894E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
53	4.6866E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
54	4.6737E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE

Table 2 (continued)
KNPP Turbine Building Flood CDF Cutsets

55	4.6737E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
56	4.6592E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
57	3.8703E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
58	3.8703E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
59	3.7659E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
60	3.6934E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
61	3.3924E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
62	3.2913E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
63	3.0607E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
64	3.0607E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
65	3.0006E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
66	2.9405E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
67	2.6831E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
68	2.5153E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
69	2.4939E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
70	2.4939E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
71	2.4120E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
72	2.4120E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
73	2.4120E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
74	2.4120E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
75	2.3743E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
76	2.3215E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
77	2.1085E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
78	2.0085E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
79	2.0004E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
80	1.8711E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
81	1.8179E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE

Table 2 (continued)
KNPP Turbine Building Flood CDF Cutsets

82	1.7597E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
83	1.7597E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
84	1.7555E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
85	1.7555E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
86	1.6836E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
87	1.6117E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
88	1.6052E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
89	1.6052E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
90	1.5813E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
91	1.5813E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
92	1.5321E-008	02-AV-SW4B---FC	IE-SI06B	
93	1.5321E-008	02-AV-SW4A---FC	IE-SI06B	
94	1.5054E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
95	1.5033E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
96	1.4431E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
97	1.3467E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
98	1.3467E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
99	1.3442E-008	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	
100	1.3370E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE

Table 3
Large Circulating Water Pipe Break in Turbine Building CDF Cutsets (CI06B)

```
==============================================================================
WinNUPRA 3.0 Production      File: CI06B-CDMIN        Licensed to: KEWAUNEE
==============================================================================
   Equation File                              = CI06B-CDMIN.EQN
   Basic Event Data file referenced           = FLOOD.BED
   Number of cut sets in equation             = 1
   Top event unavailability  (rare event)     = 3.730E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B         04-CW-TRIP-F-HE
```

Table 4
Moderate Circulating Water Pipe Break in Turbine Building CDF Cutsets (CX06B)

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==============================================================================
WinNUPRA 3.0 Production      File: CX06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CX06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 865
   Top event unavailability  (rare event)       = 4.410E-006
------------------------------------------------------------------------------
     1   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
     2   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     3   5.74E-008   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
     4   5.13E-008   XCOM-AFZ-BCXB     86-INSTRFCRF-HE   XEQN-AFSCX064
                     IE-CX06B          04-CWSTP22-F-HE
     5   2.01E-008   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05B-CST-SWS--HE   04-CWSTP22-F-HE
     6   1.76E-008   IE-CX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   04-CWSTP13-F-HE
     7   1.76E-008   IE-CX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   04-CWSTP13-F-HE
     8   1.34E-008   IE-CX06B          36--LHS-DIAG-HE   04-CWSTP13-F-HE
     9   8.12E-009   IE-CX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   04-CWSTP19-F-HE
    10   8.12E-009   IE-CX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   04-CWSTP19-F-HE
    11   7.52E-009   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PR   04-CWSTP22-F-HE
    12   6.77E-009   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BMVI-MS102-FO   04-CWSTP22-F-HE
    13   6.17E-009   IE-CX06B          36--LHS-DIAG-HE   04-CWSTP19-F-HE
    14   5.02E-009   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     36--LHS-DIAG-HE   04-CWSTP22-F-HE
    15   2.62E-009   05B-FRACTDP-OFF   05B-MDPTD36F-HE   IE-CX06B
                     05BPM--AFW1B-PR   04-CWSTP13-F-HE
    16   2.47E-009   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05B-CST-DIAG-HE   04-CWSTP22-F-HE
    17   2.33E-009   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BFAFWA-CAL-AE   04-CWSTP22-F-HE
    18   2.33E-009   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BFAFWB-CAL-AE   04-CWSTP22-F-HE
    19   1.72E-009   IE-CX06B          01-CMSIAC1A--PS   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   04-CWSTP13-F-HE
    20   1.72E-009   IE-CX06B          01-CMSIAC1A--PR   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   04-CWSTP13-F-HE
    21   1.43E-009   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BSVAFW111C-FO   04-CWSTP22-F-HE
    22   1.40E-009   IE-CX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE   04-CWSTP13-F-HE
    23   1.40E-009   IE-CX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE   04-CWSTP13-F-HE
    24   7.94E-010   IE-CX06B          01-CMSIAC1A--PR   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   04-CWSTP19-F-HE
    25   7.94E-010   IE-CX06B          01-CMSIAC1A--PS   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   04-CWSTP19-F-HE
```

Table 4 (continued)
Moderate Circulating Water Pipe Break in Turbine Building CDF Cutsets (CX06B)

26	7.24E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
27	7.24E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP13-F-HE
28	7.24E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
29	7.24E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP13-F-HE
30	6.47E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP19-F-HE
31	6.47E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP19-F-HE
32	6.33E-010	IE-CX06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		04-CWSTP13-F-HE		
33	5.46E-010	IE-CX06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
34	5.32E-010	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CX06B	05BPM--AFW1B-PR	04-CWSTP19-F-HE
35	3.34E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
36	3.34E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
37	3.34E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	04-CWSTP19-F-HE
38	3.34E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	04-CWSTP19-F-HE
39	3.28E-010	IE-CX06B	05BPMSKPSCCF23	04-CWSTP13-F-HE
40	3.08E-010	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		06-CV-KFOCCF12	04-CWSTP22-F-HE	
41	2.97E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	04-CWSTP13-F-HE	
42	2.97E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	04-CWSTP13-F-HE	
43	2.92E-010	IE-CX06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		04-CWSTP19-F-HE		
44	2.84E-010	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		38-BY-BRA101-OP	04-CWSTP22-F-HE	
45	2.52E-010	IE-CX06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
46	1.51E-010	IE-CX06B	05BPMSKPSCCF23	04-CWSTP19-F-HE
47	1.43E-010	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BCVD-AFW1C-FO	04-CWSTP22-F-HE	
48	1.37E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP13-F-HE
49	1.37E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP13-F-HE
50	1.37E-010	IE-CX06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRFCRF-HE	04-CWSTP19-F-HE	
51	1.37E-010	IE-CX06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRFCRF-HE	04-CWSTP19-F-HE	

Table 4 (continued)
Moderate Circulating Water Pipe Break in Turbine Building CDF Cutsets (CX06B)

52	1.23E-010	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPMSKPSCCF23	04-CWSTP22-F-HE	
53	1.23E-010	IE-CX06B	05BPM--AFW1B-PS	05BPT--AFW1C-PS
		04-CWSTP13-F-HE		
54	1.10E-010	86-INSTRFCRF-HE	IE-CX06B	05BPM--AFW1B-PS
		04-CWSTP13-F-HE		
55	1.06E-010	IE-CX06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	04-CWSTP13-F-HE	
56	1.06E-010	IE-CX06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	04-CWSTP13-F-HE	
57	1.06E-010	IE-CX06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
58	1.06E-010	IE-CX06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
59	1.06E-010	IE-CX06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
60	1.06E-010	IE-CX06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
61	7.64E-011	IE-CX06B	05BSVAFW111B-FO	05BPT--AFW1C-PS
		04-CWSTP13-F-HE		
62	7.62E-011	XCOM-AFZ-ACXB	IE-CX06B	05BPMRKPRCCF23
		04-CWSTP13-F-HE		
63	7.19E-011	XCOM-AFZ-ACXB	IE-CX06B	05BPM--AFW1B-PR
		05BPT--AFW1C-PS	04-CWSTP13-F-HE	
64	7.08E-011	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP13-F-HE
65	7.08E-011	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP13-F-HE
66	6.83E-011	86-INSTRFCRF-HE	IE-CX06B	05BSVAFW111B-FO
		04-CWSTP13-F-HE		
67	6.43E-011	XCOM-AFZ-ACXB	86-INSTRFCRF-HE	IE-CX06B
		05BPM--AFW1B-PR	04-CWSTP13-F-HE	
68	6.33E-011	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP19-F-HE
69	6.33E-011	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP19-F-HE
70	5.77E-011	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP13-F-HE
71	5.77E-011	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP13-F-HE
72	5.68E-011	IE-CX06B	05BPM--AFW1B-PS	05BPT--AFW1C-PS
		04-CWSTP19-F-HE		
73	5.59E-011	05B-FRACTDP-OFF	05B-MDPTD36F-HE	IE-CX06B
		05BPMRKPRCCF23	04-CWSTP13-F-HE	
74	5.34E-011	IE-CX06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
75	5.22E-011	IE-CX06B	01-CMAKPSCCF123	86-INSTRRCRF-HE
		04-CWSTP13-F-HE		
76	5.08E-011	86-INSTRFCRF-HE	IE-CX06B	05BPM--AFW1B-PS
		04-CWSTP19-F-HE		

Table 4 (continued)
Moderate Circulating Water Pipe Break in Turbine Building CDF Cutsets (CX06B)

77	4.96E-011	XCOM-AFZ-BCXB	IE-CX06B	05BPMRKPRCCF23
		04-CWSTP19-F-HE		
78	4.96E-011	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPMRKPRCCF23	04-CWSTP22-F-HE	
79	4.91E-011	IE-CX06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRFCRF-HE	04-CWSTP19-F-HE	
80	4.91E-011	IE-CX06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRFCRF-HE	04-CWSTP19-F-HE	
81	4.91E-011	IE-CX06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
82	4.91E-011	IE-CX06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
83	4.91E-011	IE-CX06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
84	4.91E-011	IE-CX06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
85	4.90E-011	IE-CX06B	01-CMSIAC1B--PR	27BCV-SWT251-FC
		86-INSTRRCRF-HE	04-CWSTP13-F-HE	
86	4.90E-011	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	04-CWSTP13-F-HE
87	4.90E-011	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	04-CWSTP13-F-HE
88	4.68E-011	XCOM-AFZ-BCXB	IE-CX06B	05BPM--AFW1B-PR
		05BPT--AFW1C-PS	04-CWSTP19-F-HE	
89	4.59E-011	IE-CX06B	05BSV-KFOCCF23	04-CWSTP13-F-HE
90	4.58E-011	IE-CX06B	47-CN-AFP1XB-RC	05BPT--AFW1C-PS
		04-CWSTP13-F-HE		
91	4.58E-011	IE-CX06B	47-CN-AFP2XB-RC	05BPT--AFW1C-PS
		04-CWSTP13-F-HE		
92	4.35E-011	IE-CX06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP13-F-HE
93	4.30E-011	IE-CX06B	05BPM--AFW1B-PS	05B-CST-SWS--HE
		04-CWSTP13-F-HE		
94	4.19E-011	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	IE-CX06B
		05BPM--AFW1B-PR	04-CWSTP19-F-HE	
95	4.10E-011	86-INSTRFCRF-HE	IE-CX06B	47-CN-AFP1XB-RC
		04-CWSTP13-F-HE		
96	4.10E-011	86-INSTRFCRF-HE	IE-CX06B	47-CN-AFP2XB-RC
		04-CWSTP13-F-HE		
97	3.82E-011	IE-CX06B	01-AV-SW420A-FO	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
98	3.53E-011	IE-CX06B	05BSVAFW111B-FO	05BPT--AFW1C-PS
		04-CWSTP19-F-HE		
99	3.46E-011	XCOM-AFZ-ACXB	IE-CX06B	03-XV--MU2A--FC
		16-BATCLG--F-HE	04-CWSTP13-F-HE	
100	3.31E-011	05B-FRACTDP-OFF	05B-MDPTD36F-HE	IE-CX06B
		05BAV--AFW2B-OC	04-CWSTP13-F-HE	

Table 5
Large Service Water Pipe Break in Turbine Building CDF Cutsets (SI06B)

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==============================================================================
WinNUPRA 3.0 Production      File: SI06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = SI06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 1025
   Top event unavailability  (rare event)       = 1.315E-006
------------------------------------------------------------------------------
     1   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
     2   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
     3   7.91E-008   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSSI064     IE-SI06B          02-SW4A-B51F-HE
     4   7.91E-008   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-SI06B          02-SW4A-B60F-HE
     5   3.69E-008   XCOM-OCSI06BM     XCOM-AFX-2SI4     XCOM-AFZ-BSI4
                     SL21-CD           IE-SI06B          02-SW4A-B60F-HE
     6   1.87E-008   XCOM-AFX-2SI4     XCOM-AFZ-BSI4     06--OC6----F-HE
                     IE-SI06B          02-SW4A-B60F-HE
     7   1.53E-008   02-AV-SW4B---FC   IE-SI06B
     8   1.53E-008   02-AV-SW4A---FC   IE-SI06B
     9   1.14E-008   XCOM-AFZ-BSIB     XEQN-AFSSI064     IE-SI06B
                     05BPT--AFW1C-PS   02-SW4A-B51F-HE
    10   1.14E-008   XCOM-AFZ-BSI4     IE-SI06B          05BPT--AFW1C-PS
                     02-SW4A-B60F-HE
    11   1.02E-008   XCOM-AFZ-BSIB     86-INSTRFCRF-HE   XEQN-AFSSI064
                     IE-SI06B          02-SW4A-B51F-HE
    12   3.98E-009   XCOM-AFZ-BSIB     XEQN-AFSSI064     IE-SI06B
                     05B-CST-SWS--HE   02-SW4A-B51F-HE
    13   3.98E-009   XCOM-AFZ-BSI4     IE-SI06B          05B-CST-SWS--HE
                     02-SW4A-B60F-HE
    14   1.49E-009   IE-SI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   02-SW4A-B45F-HE
    15   1.49E-009   IE-SI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   02-SW4A-B29F-HE
    16   1.49E-009   IE-SI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   02-SW4A-B45F-HE
    17   1.49E-009   IE-SI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   02-SW4A-B29F-HE
    18   1.49E-009   XCOM-AFZ-BSIB     XEQN-AFSSI064     IE-SI06B
                     05BPT--AFW1C-PR   02-SW4A-B51F-HE
    19   1.49E-009   XCOM-AFZ-BSI4     IE-SI06B          05BPT--AFW1C-PR
                     02-SW4A-B60F-HE
    20   1.34E-009   XCOM-AFZ-BSI4     IE-SI06B          05BMVI-MS102-FO
                     02-SW4A-B60F-HE
    21   1.34E-009   XCOM-AFZ-BSIB     XEQN-AFSSI064     IE-SI06B
                     05BMVI-MS102-FO   02-SW4A-B51F-HE
    22   1.13E-009   36--LHS-DIAG-HE   IE-SI06B          02-SW4A-B45F-HE
    23   1.13E-009   36--LHS-DIAG-HE   IE-SI06B          02-SW4A-B29F-HE
    24   9.95E-010   XCOM-AFZ-BSIB     XEQN-AFSSI064     IE-SI06B
                     36--LHS-DIAG-HE   02-SW4A-B51F-HE
    25   9.95E-010   XCOM-AFZ-BSI4     IE-SI06B          36--LHS-DIAG-HE
                     02-SW4A-B60F-HE
    26   7.39E-010   XCOM-SLCSI06M     XCOM-OCSI06BM     XCOM-AFX-2SI4
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Table 5 (continued)
Large Service Water Pipe Break in Turbine Building CDF Cutsets (SI06B)

		XCOM-AFZ-BSI4	27A-ORR----F-HE	IE-SI06B
		02-SW4A-B60F-HE		
27	4.89E-010	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05B-CST-DIAG-HE	02-SW4A-B51F-HE	
28	4.89E-010	XCOM-AFZ-BSI4	IE-SI06B	05B-CST-DIAG-HE
		02-SW4A-B60F-HE		
29	4.61E-010	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BFAFWA-CAL-AE	02-SW4A-B51F-HE	
30	4.61E-010	XCOM-AFZ-BSI4	IE-SI06B	05BFAFWB-CAL-AE
		02-SW4A-B60F-HE		
31	4.61E-010	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BFAFWB-CAL-AE	02-SW4A-B51F-HE	
32	4.61E-010	XCOM-AFZ-BSI4	IE-SI06B	05BFAFWA-CAL-AE
		02-SW4A-B60F-HE		
33	2.95E-010	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	33-PM---SI1B-TM
		02-SW4A-B60F-HE		
34	2.82E-010	XCOM-AFZ-BSI4	IE-SI06B	05BSVAFW111C-FO
		02-SW4A-B60F-HE		
35	2.82E-010	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BSVAFW111C-FO	02-SW4A-B51F-HE	
36	1.55E-010	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	33-PM---SI1B-PS
		02-SW4A-B60F-HE		
37	1.48E-010	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	33-CV---SI6A-FC
		02-SW4A-B60F-HE		
38	1.46E-010	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	02-SW4A-B29F-HE
39	1.46E-010	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	02-SW4A-B45F-HE
40	1.46E-010	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	02-SW4A-B29F-HE
41	1.46E-010	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	02-SW4A-B45F-HE
42	1.21E-010	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	33-PM---SI1B-PR
		02-SW4A-B60F-HE		
43	1.19E-010	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	02-SW4A-B45F-HE
44	1.19E-010	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	02-SW4A-B45F-HE
45	1.19E-010	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	02-SW4A-B29F-HE
46	1.19E-010	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	02-SW4A-B29F-HE
47	1.18E-010	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	33-XV---SI7B-AE
		02-SW4A-B60F-HE		
48	7.57E-011	05B-FRACTDP-OFF	05B-MDPTD1CF-HE	IE-SI06B

Table 5 (continued)
Large Service Water Pipe Break in Turbine Building CDF Cutsets (SI06B)

		05BPM--AFW1B-PR	02-SW4A-B29F-HE	
49	6.55E-011	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	33--MAN-HPI--HE
		02-SW4A-B60F-HE		
50	6.45E-011	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	05BPM--AFW1B-PR	02-SW4A-B45F-HE
51	6.14E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	02-SW4A-B29F-HE
52	6.14E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	02-SW4A-B45F-HE
53	6.14E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	02-SW4A-B45F-HE
54	6.14E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	02-SW4A-B45F-HE
55	6.14E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	02-SW4A-B29F-HE
56	6.14E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	02-SW4A-B45F-HE
57	6.14E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	02-SW4A-B29F-HE
58	6.14E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	02-SW4A-B29F-HE
59	6.10E-011	XCOM-AFZ-BSI4	IE-SI06B	06-CV-KFOCCF12
		02-SW4A-B60F-HE		
60	6.10E-011	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		06-CV-KFOCCF12	02-SW4A-B51F-HE	
61	5.63E-011	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		38-BY-BRA101-OP	02-SW4A-B51F-HE	
62	5.63E-011	XCOM-AFZ-BSI4	IE-SI06B	38-BY-BRA101-OP
		02-SW4A-B60F-HE		
63	5.37E-011	IE-SI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		02-SW4A-B29F-HE		
64	5.37E-011	IE-SI06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		02-SW4A-B45F-HE		
65	4.63E-011	IE-SI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	02-SW4A-B45F-HE
66	4.63E-011	IE-SI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	02-SW4A-B29F-HE
67	2.82E-011	XCOM-AFZ-BSI4	IE-SI06B	05BCVD-AFW1C-FO
		02-SW4A-B60F-HE		
68	2.82E-011	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BCVD-AFW1C-FO	02-SW4A-B51F-HE	
69	2.78E-011	05BPMSKPSCCF23	IE-SI06B	02-SW4A-B45F-HE
70	2.78E-011	05BPMSKPSCCF23	IE-SI06B	02-SW4A-B29F-HE
71	2.52E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRFCRF-HE	02-SW4A-B45F-HE	
72	2.52E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	02-SW4A-B29F-HE	
73	2.52E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRFCRF-HE	02-SW4A-B45F-HE	

Table 5 (continued)
Large Service Water Pipe Break in Turbine Building CDF Cutsets (SI06B)

74	2.52E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	02-SW4A-B29F-HE	
75	2.44E-011	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPMSKPSCCF23	02-SW4A-B51F-HE	
76	2.44E-011	XCOM-AFZ-BSI4	IE-SI06B	05BPMSKPSCCF23
		02-SW4A-B60F-HE		
77	1.63E-011	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	33-PM-KPSCCF12
		02-SW4A-B60F-HE		
78	1.47E-011	XCOM-SLCSI06M	XCOM-OCSI06BM	XCOM-AFX-2SI4
		XCOM-AFZ-BSI4	IE-SI06B	38-BY-BRB101-OP
		02-SW4A-B60F-HE		
79	1.16E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	02-SW4A-B29F-HE
80	1.16E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	02-SW4A-B29F-HE
81	1.16E-011	IE-SI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	02-SW4A-B45F-HE
82	1.16E-011	IE-SI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	02-SW4A-B45F-HE
83	1.04E-011	05BPT--AFW1C-PS	IE-SI06B	05BPM--AFW1B-PS
		02-SW4A-B29F-HE		
84	1.04E-011	05BPT--AFW1C-PS	IE-SI06B	05BPM--AFW1B-PS
		02-SW4A-B45F-HE		
85	9.83E-012	XCOM-AFZ-BSI4	IE-SI06B	05BPMRKPRCCF23
		02-SW4A-B60F-HE		
86	9.83E-012	XCOM-AFZ-BSIB	IE-SI06B	05BPMRKPRCCF23
		02-SW4A-B45F-HE		
87	9.83E-012	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPMRKPRCCF23	02-SW4A-B51F-HE	
88	9.59E-012	XCOM-AFZ-ASIB	IE-SI06B	05BPMRKPRCCF23
		02-SW4A-B29F-HE		
89	9.33E-012	86-INSTRFCRF-HE	IE-SI06B	05BPM--AFW1B-PS
		02-SW4A-B29F-HE		
90	9.33E-012	86-INSTRFCRF-HE	IE-SI06B	05BPM--AFW1B-PS
		02-SW4A-B45F-HE		
91	9.28E-012	XCOM-AFZ-BSIB	IE-SI06B	05BPM--AFW1B-PR
		05BPT--AFW1C-PS	02-SW4A-B45F-HE	
92	9.05E-012	XCOM-AFZ-ASIB	IE-SI06B	05BPM--AFW1B-PR
		05BPT--AFW1C-PS	02-SW4A-B29F-HE	
93	9.03E-012	IE-SI06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRFCRF-HE	02-SW4A-B45F-HE	
94	9.03E-012	IE-SI06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	02-SW4A-B29F-HE	
95	9.03E-012	IE-SI06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	02-SW4A-B29F-HE	
96	9.03E-012	IE-SI06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRFCRF-HE	02-SW4A-B45F-HE	
97	9.02E-012	IE-SI06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	02-SW4A-B45F-HE

Table 5 (continued)
Large Service Water Pipe Break in Turbine Building CDF Cutsets (SI06B)

98	9.02E-012	IE-SI06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	02-SW4A-B29F-HE
99	9.02E-012	IE-SI06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	02-SW4A-B45F-HE
100	9.02E-012	IE-SI06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	02-SW4A-B29F-HE

Table 6
Large Fire Protection Break in Turbine Building CDF Cutsets (FI06B)

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==============================================================================
WinNUPRA 3.0 Production      File: FI06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = FI06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 1389
   Top event unavailability  (rare event)       = 1.852E-006
------------------------------------------------------------------------------
     1   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
     2   2.09E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B         08-FPISO56-F-HE
     3   1.64E-007   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
     4   1.64E-007   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
     5   1.39E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-FI06B          08-FPISO68F-HE
     6   1.25E-007   36--LHS-DIAG-HE   IE-FI06B         08-FPISO29-F-HE
     7   6.50E-008   XCOM-OCFI06BM     XCOM-AFX-2FI4    XCOM-AFZ-BFI4
                     SL21-CD           IE-FI06B         08-FPISO68F-HE
     8   3.29E-008   XCOM-AFX-2FI4     XCOM-AFZ-BFI4    06--OC6----F-HE
                     IE-FI06B          08-FPISO68F-HE
     9   3.00E-008   XCOM-AFZ-BFIB     XEQN-AFSFI064    IE-FI06B
                     05BPT--AFW1C-PS   08-FPISO56-F-HE
    10   2.68E-008   XCOM-AFZ-BFIB     86-INSTRFCRF-HE  XEQN-AFSFI064
                     IE-FI06B          08-FPISO56-F-HE
    11   2.00E-008   XCOM-AFZ-BFI4     IE-FI06B         05BPT--AFW1C-PS
                     08-FPISO68F-HE
    12   1.61E-008   05B-FRACTDP-OFF   05B-MDPTD61F-HE  IE-FI06B
                     05BPM--AFW1B-PR   08-FPISO29-F-HE
    13   1.61E-008   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    14   1.61E-008   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    15   1.31E-008   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE  08-FPISO29-F-HE
    16   1.31E-008   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE  08-FPISO29-F-HE
    17   1.08E-008   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE  08-FPISO45-F-HE
    18   1.08E-008   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE  08-FPISO45-F-HE
    19   1.05E-008   XCOM-AFZ-BFIB     XEQN-AFSFI064    IE-FI06B
                     05B-CST-SWS--HE   08-FPISO56-F-HE
    20   8.23E-009   36--LHS-DIAG-HE   IE-FI06B         08-FPISO45-F-HE
    21   7.00E-009   XCOM-AFZ-BFI4     IE-FI06B         05B-CST-SWS--HE
                     08-FPISO68F-HE
    22   6.75E-009   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PS
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    23   6.75E-009   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PS   86-INSTRRCRF-HE  08-FPISO29-F-HE
    24   6.75E-009   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PS   86-INSTRRCRF-HE  08-FPISO29-F-HE
```

Table 6 (continued)
Large Fire Protection Break in Turbine Building CDF Cutsets (FI06B)

25	6.75E-009	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
26	5.90E-009	IE-FI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPISO29-F-HE		
27	5.09E-009	IE-FI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
28	3.93E-009	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PR	08-FPISO56-F-HE	
29	3.54E-009	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BMVI-MS102-FO	08-FPISO56-F-HE	
30	3.06E-009	05BPMSKPSCCF23	IE-FI06B	08-FPISO29-F-HE
31	2.77E-009	IE-FI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPISO29-F-HE	
32	2.77E-009	IE-FI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPISO29-F-HE	
33	2.62E-009	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		36--LHS-DIAG-HE	08-FPISO56-F-HE	
34	2.62E-009	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PR
		08-FPISO68F-HE		
35	2.36E-009	XCOM-AFZ-BFI4	IE-FI06B	05BMVI-MS102-FO
		08-FPISO68F-HE		
36	1.75E-009	XCOM-AFZ-BFI4	IE-FI06B	36--LHS-DIAG-HE
		08-FPISO68F-HE		
37	1.30E-009	XCOM-SLCFI06M	XCOM-OCFI06BM	XCOM-AFX-2FI4
		XCOM-AFZ-BFI4	27A-ORR----F-HE	IE-FI06B
		08-FPISO68F-HE		
38	1.29E-009	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05B-CST-DIAG-HE	08-FPISO56-F-HE	
39	1.28E-009	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
40	1.28E-009	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
41	1.22E-009	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BFAFWB-CAL-AE	08-FPISO56-F-HE	
42	1.22E-009	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BFAFWA-CAL-AE	08-FPISO56-F-HE	
43	1.15E-009	05BPT--AFW1C-PS	IE-FI06B	05BPM--AFW1B-PS
		08-FPISO29-F-HE		
44	1.06E-009	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
45	1.06E-009	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
46	1.03E-009	86-INSTRFCRF-HE	IE-FI06B	05BPM--AFW1B-PS
		08-FPISO29-F-HE		
47	9.92E-010	IE-FI06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	08-FPISO29-F-HE	
48	9.92E-010	IE-FI06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	08-FPISO29-F-HE	
49	9.91E-010	IE-FI06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE

Table 6 (continued)
Large Fire Protection Break in Turbine Building CDF Cutsets (FI06B)

50	9.91E-010	IE-FI06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
51	9.91E-010	IE-FI06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
52	9.91E-010	IE-FI06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
53	8.88E-010	XCOM-AFZ-AFIB	05BPMRKPRCCF23	IE-FI06B
		08-FPISO29-F-HE		
54	8.63E-010	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPISO45-F-HE
55	8.63E-010	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPISO45-F-HE
56	8.60E-010	XCOM-AFZ-BFI4	IE-FI06B	05B-CST-DIAG-HE
		08-FPISO68F-HE		
57	8.38E-010	XCOM-AFZ-AFIB	05BPT--AFW1C-PS	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
58	8.11E-010	XCOM-AFZ-BFI4	IE-FI06B	05BFAFWA-CAL-AE
		08-FPISO68F-HE		
59	8.11E-010	XCOM-AFZ-BFI4	IE-FI06B	05BFAFWB-CAL-AE
		08-FPISO68F-HE		
60	7.50E-010	XCOM-AFZ-AFIB	86-INSTRFCRF-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
61	7.45E-010	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BSVAFW111C-FO	08-FPISO56-F-HE	
62	7.12E-010	05BPT--AFW1C-PS	IE-FI06B	05BSVAFW111B-FO
		08-FPISO29-F-HE		
63	6.60E-010	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
64	6.60E-010	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
65	6.37E-010	86-INSTRFCRF-HE	IE-FI06B	05BSVAFW111B-FO
		08-FPISO29-F-HE		
66	5.38E-010	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
67	5.38E-010	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
68	5.20E-010	XCOM-SLCFI06M	XCOM-OCFI06BM	XCOM-AFX-2FI4
		XCOM-AFZ-BFI4	IE-FI06B	33-PM---SI1B-TM
		08-FPISO68F-HE		
69	4.98E-010	IE-FI06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
70	4.97E-010	XCOM-AFZ-BFI4	IE-FI06B	05BSVAFW111C-FO
		08-FPISO68F-HE		
71	4.87E-010	IE-FI06B	01-CMAKPSCCF123	86-INSTRRCRF-HE
		08-FPISO29-F-HE		
72	4.68E-010	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	05BPM--AFW1B-PR	08-FPISO45-F-HE
73	4.57E-010	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-FPISO29-F-HE
74	4.57E-010	IE-FI06B	01-CMSIAC1B--PR	27BCV-SWT251-FC

Table 6 (continued)
Large Fire Protection Break in Turbine Building CDF Cutsets (FI06B)

		86-INSTRRCRF-HE	08-FPISO29-F-HE	
75	4.57E-010	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-FPISO29-F-HE
76	4.45E-010	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPISO45-F-HE
77	4.45E-010	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
78	4.45E-010	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPISO45-F-HE
79	4.45E-010	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
80	4.28E-010	05BSV-KFOCCF23	IE-FI06B	08-FPISO29-F-HE
81	4.27E-010	05BPT--AFW1C-PS	IE-FI06B	47-CN-AFP1XB-RC
		08-FPISO29-F-HE		
82	4.27E-010	05BPT--AFW1C-PS	IE-FI06B	47-CN-AFP2XB-RC
		08-FPISO29-F-HE		
83	4.05E-010	IE-FI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
84	4.03E-010	XCOM-AFZ-AFIB	03-XV--MU2A--FC	16-BATCLG--F-HE
		IE-FI06B	08-FPISO29-F-HE	
85	4.01E-010	05B-CST-SWS--HE	IE-FI06B	05BPM--AFW1B-PS
		08-FPISO29-F-HE		
86	3.89E-010	IE-FI06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		08-FPISO45-F-HE		
87	3.82E-010	86-INSTRFCRF-HE	IE-FI06B	47-CN-AFP2XB-RC
		08-FPISO29-F-HE		
88	3.82E-010	86-INSTRFCRF-HE	IE-FI06B	47-CN-AFP1XB-RC
		08-FPISO29-F-HE		
89	3.56E-010	IE-FI06B	01-AV-SW420A-FO	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
90	3.44E-010	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPMRKPRCCF23	08-FPISO29-F-HE	
91	3.36E-010	IE-FI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
92	2.93E-010	XCOM-AFZ-AFIB	05B-CST-SWS--HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
93	2.90E-010	XCOM-AFZ-AFIB	03-AS-HTLVLC-OP	16-BATCLG--F-HE
		IE-FI06B	08-FPISO29-F-HE	
94	2.78E-010	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
95	2.78E-010	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
96	2.72E-010	XCOM-SLCFI06M	XCOM-OCFI06BM	XCOM-AFX-2FI4
		XCOM-AFZ-BFI4	IE-FI06B	33-PM---SI1B-PS
		08-FPISO68F-HE		
97	2.65E-010	05BPT--AFW1C-PS	IE-FI06B	47-RE-AFP1XB-RF
		08-FPISO29-F-HE		
98	2.65E-010	05BPT--AFW1C-PS	IE-FI06B	47-RE-AFP2XB-RF
		08-FPISO29-F-HE		
99	2.60E-010	XCOM-SLCFI06M	XCOM-OCFI06BM	XCOM-AFX-2FI4

Table 6 (continued)
Large Fire Protection Break in Turbine Building CDF Cutsets (FI06B)

		XCOM-AFZ-BFI4 08-FPISO68F-HE	IE-FI06B	33-CV---SI6A-FC
100	2.49E-010	05B-CST-SWS--HE 08-FPISO29-F-HE	IE-FI06B	05BSVAFW111B-FO

Table 7
Steamline Break (Large Fire Protection Discharge) in Turbine Building CDF Cutsets (TI06B)

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==============================================================================
WinNUPRA 3.0 Production      File: TI06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = TI06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 2124
   Top event unavailability  (rare event)       = 9.733E-006
------------------------------------------------------------------------------
     1   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     2   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     3   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     4   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
     5   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
     6   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
     7   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
     8   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
     9   1.34E-007   XCOM-AFZ-BTIB     XEQN-AFSTI064     IE-TI06B
                     05BPT--AFW1C-PS   08-FPSISO56F-HE
    10   1.34E-007   XCOM-AFZ-BTI4     IE-TI06B          05BPT--AFW1C-PS
                     08-FPSISO68F-HE
    11   1.20E-007   XCOM-AFZ-BTIB     86-INSTRFCRF-HE   XEQN-AFSTI064
                     IE-TI06B          08-FPSISO56F-HE
    12   5.76E-008   05B-FRACTDP-OFF   05B-MDPTD61F-HE   IE-TI06B
                     05BPM--AFW1B-PR   08-FPSISO29F-HE
    13   5.74E-008   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    14   5.74E-008   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    15   4.69E-008   XCOM-AFZ-BTI4     IE-TI06B          05B-CST-SWS--HE
                     08-FPSISO68F-HE
    16   4.69E-008   XCOM-AFZ-BTIB     XEQN-AFSTI064     IE-TI06B
                     05B-CST-SWS--HE   08-FPSISO56F-HE
    17   4.67E-008   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE   08-FPSISO29F-HE
    18   4.67E-008   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE   08-FPSISO29F-HE
    19   3.87E-008   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-FPSISO45F-HE
    20   3.87E-008   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-FPSISO45F-HE
    21   2.94E-008   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO45F-HE
    22   2.41E-008   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PS   86-INSTRRCRF-HE   08-FPSISO29F-HE
    23   2.41E-008   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PS
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    24   2.41E-008   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
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Table 7 (continued)
Steamline Break (Large Fire Protection Discharge) in Turbine Building CDF Cutsets (TI06B)

		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
25	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
26	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
27	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
28	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
29	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
30	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
31	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
32	1.17E-008	XCOM-AFZ-BTI4	IE-TI06B	36--LHS-DIAG-HE
		08-FPSISO68F-HE		
33	1.17E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
34	1.09E-008	05BPMSKPSCCF23	IE-TI06B	08-FPSISO29F-HE
35	9.88E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
36	9.88E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
37	8.71E-009	XCOM-SLCTI06M	XCOM-OCTI06BM	XCOM-AFX-2TI4
		XCOM-AFZ-BTI4	27A-ORR----F-HE	IE-TI06B
		08-FPSISO68F-HE		
38	5.76E-009	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-DIAG-HE
		08-FPSISO68F-HE		
39	5.76E-009	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-DIAG-HE	08-FPSISO56F-HE	
40	5.43E-009	XCOM-AFZ-BTI4	IE-TI06B	05BFAFWB-CAL-AE
		08-FPSISO68F-HE		
41	5.43E-009	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BFAFWB-CAL-AE	08-FPSISO56F-HE	
42	5.43E-009	XCOM-AFZ-BTI4	IE-TI06B	05BFAFWA-CAL-AE
		08-FPSISO68F-HE		
43	5.43E-009	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BFAFWA-CAL-AE	08-FPSISO56F-HE	
44	4.57E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
45	4.57E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
46	4.10E-009	05BPT--AFW1C-PS	IE-TI06B	05BPM--AFW1B-PS
		08-FPSISO29F-HE		
47	3.79E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
48	3.79E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE

Table 7 (continued)
Steamline Break (Large Fire Protection Discharge) in Turbine Building CDF Cutsets (TI06B)

49	3.67E-009	86-INSTRFCRF-HE	IE-TI06B	05BPM--AFW1B-PS
		08-FPSISO29F-HE		
50	3.55E-009	IE-TI06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
51	3.55E-009	IE-TI06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
52	3.54E-009	IE-TI06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
53	3.54E-009	IE-TI06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
54	3.54E-009	IE-TI06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
55	3.54E-009	IE-TI06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
56	3.48E-009	XCOM-SLCTI06M	XCOM-OCTI06BM	XCOM-AFX-2TI4
		XCOM-AFZ-BTI4	IE-TI06B	33-PM---SI1B-TM
		08-FPSISO68F-HE		
57	3.33E-009	XCOM-AFZ-BTI4	IE-TI06B	05BSVAFW111C-FO
		08-FPSISO68F-HE		
58	3.33E-009	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BSVAFW111C-FO	08-FPSISO56F-HE	
59	3.17E-009	XCOM-AFZ-ATIB	05BPMRKPRCCF23	IE-TI06B
		08-FPSISO29F-HE		
60	3.08E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPSISO45F-HE
61	3.08E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPSISO45F-HE
62	3.00E-009	XCOM-AFZ-ATIB	05BPT--AFW1C-PS	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
63	2.68E-009	XCOM-AFZ-ATIB	86-INSTRFCRF-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
64	2.55E-009	05BPT--AFW1C-PS	IE-TI06B	05BSVAFW111B-FO
		08-FPSISO29F-HE		
65	2.36E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
66	2.36E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
67	2.28E-009	86-INSTRFCRF-HE	IE-TI06B	05BSVAFW111B-FO
		08-FPSISO29F-HE		
68	1.92E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
69	1.92E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
70	1.82E-009	XCOM-SLCTI06M	XCOM-OCTI06BM	XCOM-AFX-2TI4
		XCOM-AFZ-BTI4	IE-TI06B	33-PM---SI1B-PS
		08-FPSISO68F-HE		
71	1.78E-009	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
72	1.74E-009	XCOM-SLCTI06M	XCOM-OCTI06BM	XCOM-AFX-2TI4

Table 7 (continued)
Steamline Break (Large Fire Protection Discharge) in Turbine Building CDF Cutsets (TI06B)

		XCOM-AFZ-BTI4	IE-TI06B	33-CV---SI6A-FC
		08-FPSISO68F-HE		
73	1.74E-009	IE-TI06B	01-CMAKPSCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
74	1.67E-009	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-TI06B	05BPM--AFW1B-PR	08-FPSISO45F-HE
75	1.63E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-FPSISO29F-HE
76	1.63E-009	IE-TI06B	01-CMSIAC1B--PR	27BCV-SWT251-FC
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
77	1.63E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-FPSISO29F-HE
78	1.59E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPSISO45F-HE
79	1.59E-009	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
80	1.59E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPSISO45F-HE
81	1.59E-009	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
82	1.53E-009	05BSV-KFOCCF23	IE-TI06B	08-FPSISO29F-HE
83	1.53E-009	05BPT--AFW1C-PS	IE-TI06B	47-CN-AFP1XB-RC
		08-FPSISO29F-HE		
84	1.53E-009	05BPT--AFW1C-PS	IE-TI06B	47-CN-AFP2XB-RC
		08-FPSISO29F-HE		
85	1.45E-009	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
86	1.44E-009	XCOM-AFZ-ATIB	03-XV--MU2A--FC	16-BATCLG--F-HE
		IE-TI06B	08-FPSISO29F-HE	
87	1.43E-009	05B-CST-SWS--HE	IE-TI06B	05BPM--AFW1B-PS
		08-FPSISO29F-HE		
88	1.42E-009	XCOM-SLCTI06M	XCOM-OCTI06BM	XCOM-AFX-2TI4
		XCOM-AFZ-BTI4	IE-TI06B	33-PM---SI1B-PR
		08-FPSISO68F-HE		
89	1.39E-009	IE-TI06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		08-FPSISO45F-HE		
90	1.39E-009	XCOM-SLCTI06M	XCOM-OCTI06BM	XCOM-AFX-2TI4
		XCOM-AFZ-BTI4	IE-TI06B	33-XV---SI7B-AE
		08-FPSISO68F-HE		
91	1.37E-009	86-INSTRFCRF-HE	IE-TI06B	47-CN-AFP2XB-RC
		08-FPSISO29F-HE		
92	1.37E-009	86-INSTRFCRF-HE	IE-TI06B	47-CN-AFP1XB-RC
		08-FPSISO29F-HE		
93	1.27E-009	IE-TI06B	01-AV-SW420A-FO	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
94	1.23E-009	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPMRKPRCCF23	08-FPSISO29F-HE	
95	1.20E-009	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE

Table 7 (continued)
Steamline Break (Large Fire Protection Discharge) in Turbine Building CDF Cutsets (TI06B)

96	1.05E-009	XCOM-AFZ-ATIB	05B-CST-SWS--HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
97	1.04E-009	XCOM-AFZ-ATIB	03-AS-HTLVLC-OP	16-BATCLG--F-HE
		IE-TI06B	08-FPSISO29F-HE	
98	9.92E-010	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
99	9.92E-010	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
100	9.47E-010	05BPT--AFW1C-PS	IE-TI06B	47-RE-AFP1XB-RF
		08-FPSISO29F-HE		

Table 8
Steamline Break (Moderate Fire Protection Discharge) in Turbine Building CDF Cutsets (TX06B)

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==============================================================================
WinNUPRA 3.0 Production      File: TX06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = TX06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 708
   Top event unavailability  (rare event)       = 4.958E-008
------------------------------------------------------------------------------
     1   1.13E-008   XEQN-AFSTX064     IE-TX06B          05BPT--AFW1C-PS
                     08-FPSISO3CF-HE
     2   1.01E-008   86-INSTRFCRF-HE   XEQN-AFSTX064     IE-TX06B
                     08-FPSISO3CF-HE
     3   9.11E-009   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD2HF-HE
                     XEQN-AFSTX064     IE-TX06B          08-FPSISO3CF-HE
     4   3.95E-009   XEQN-AFSTX064     IE-TX06B          05B-CST-SWS--HE
                     08-FPSISO3CF-HE
     5   1.48E-009   XEQN-AFSTX064     IE-TX06B          05BPT--AFW1C-PR
                     08-FPSISO3CF-HE
     6   1.33E-009   XEQN-AFSTX064     IE-TX06B          05BMVI-MS102-FO
                     08-FPSISO3CF-HE
     7   1.30E-009   IE-TX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-FPSISO2CF-HE
     8   1.30E-009   IE-TX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO1CF-HE
     9   1.30E-009   IE-TX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO1CF-HE
    10   1.30E-009   IE-TX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-FPSISO2CF-HE
    11   9.88E-010   XEQN-AFSTX064     IE-TX06B          36--LHS-DIAG-HE
                     08-FPSISO3CF-HE
    12   9.88E-010   IE-TX06B          36--LHS-DIAG-HE   08-FPSISO1CF-HE
    13   9.88E-010   IE-TX06B          36--LHS-DIAG-HE   08-FPSISO2CF-HE
    14   4.86E-010   XEQN-AFSTX064     IE-TX06B          05B-CST-DIAG-HE
                     08-FPSISO3CF-HE
    15   4.58E-010   XEQN-AFSTX064     IE-TX06B          05BFAFWB-CAL-AE
                     08-FPSISO3CF-HE
    16   4.58E-010   XEQN-AFSTX064     IE-TX06B          05BFAFWA-CAL-AE
                     08-FPSISO3CF-HE
    17   2.80E-010   XEQN-AFSTX064     IE-TX06B          05BSVAFW111C-FO
                     08-FPSISO3CF-HE
    18   1.27E-010   IE-TX06B          01-CMSIAC1A--PS   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO1CF-HE
    19   1.27E-010   IE-TX06B          01-CMSIAC1A--PS   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-FPSISO2CF-HE
    20   1.27E-010   IE-TX06B          01-CMSIAC1A--PR   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-FPSISO2CF-HE
    21   1.27E-010   IE-TX06B          01-CMSIAC1A--PR   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO1CF-HE
    22   1.04E-010   IE-TX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE   08-FPSISO1CF-HE
    23   1.04E-010   IE-TX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRFCRF-HE   08-FPSISO2CF-HE
    24   1.04E-010   IE-TX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
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Table 8 (continued)
Steamline Break (Moderate Fire Protection Discharge)
in Turbine Building CDF Cutsets (TX06B)

		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO1CF-HE
25	1.04E-010	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPSISO2CF-HE
26	6.06E-011	XEQN-AFSTX064	IE-TX06B	06-CV-KFOCCF12
		08-FPSISO3CF-HE		
27	5.59E-011	XEQN-AFSTX064	IE-TX06B	38-BY-BRA101-OP
		08-FPSISO3CF-HE		
28	5.35E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
29	5.35E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPSISO2CF-HE
30	5.35E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPSISO2CF-HE
31	5.35E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO1CF-HE
32	5.35E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
33	5.35E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
34	5.35E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO1CF-HE
35	5.35E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
36	4.68E-011	IE-TX06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO1CF-HE		
37	4.68E-011	IE-TX06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		08-FPSISO2CF-HE		
38	4.03E-011	IE-TX06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
39	4.03E-011	IE-TX06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
40	2.80E-011	XEQN-AFSTX064	IE-TX06B	05BCVD-AFW1C-FO
		08-FPSISO3CF-HE		
41	2.42E-011	IE-TX06B	05BPMSKPSCCF23	08-FPSISO1CF-HE
42	2.42E-011	XEQN-AFSTX064	IE-TX06B	05BPMSKPSCCF23
		08-FPSISO3CF-HE		
43	2.42E-011	IE-TX06B	05BPMSKPSCCF23	08-FPSISO2CF-HE
44	2.19E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO1CF-HE	
45	2.19E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRFCRF-HE	08-FPSISO2CF-HE	
46	2.19E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO1CF-HE	
47	2.19E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRFCRF-HE	08-FPSISO2CF-HE	
48	1.69E-011	05B-FRACTDP-OFF	05B-MDPTD2HF-HE	IE-TX06B
		05BPM--AFW1B-PR	08-FPSISO1CF-HE	
49	1.54E-011	XEQN-AFSTX064	XEQN-OCTX06B4	IE-TX06B
		16-BATCLG--F-HE	35-MV-CVC301-FO	STBY-CCWPA

Table 8 (continued)
Steamline Break (Moderate Fire Protection Discharge)
in Turbine Building CDF Cutsets (TX06B)

		08-FPSISO3CF-HE		
50	1.01E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO1CF-HE
51	1.01E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPSISO2CF-HE
52	1.01E-011	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPSISO2CF-HE
53	1.01E-011	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO1CF-HE
54	9.76E-012	IE-TX06B	05BPMRKPRCCF23	08-FPSISO1CF-HE
55	9.76E-012	IE-TX06B	05BPMRKPRCCF23	08-FPSISO2CF-HE
56	9.76E-012	XEQN-AFSTX064	IE-TX06B	05BPMRKPRCCF23
		08-FPSISO3CF-HE		
57	9.21E-012	IE-TX06B	05BPM--AFW1B-PR	05BPT--AFW1C-PS
		08-FPSISO1CF-HE		
58	9.21E-012	IE-TX06B	05BPM--AFW1B-PR	05BPT--AFW1C-PS
		08-FPSISO2CF-HE		
59	9.09E-012	IE-TX06B	05BPM--AFW1B-PS	05BPT--AFW1C-PS
		08-FPSISO1CF-HE		
60	9.09E-012	IE-TX06B	05BPM--AFW1B-PS	05BPT--AFW1C-PS
		08-FPSISO2CF-HE		
61	8.24E-012	86-INSTRFCRF-HE	IE-TX06B	05BPM--AFW1B-PR
		08-FPSISO2CF-HE		
62	8.24E-012	86-INSTRFCRF-HE	IE-TX06B	05BPM--AFW1B-PR
		08-FPSISO1CF-HE		
63	8.13E-012	86-INSTRFCRF-HE	IE-TX06B	05BPM--AFW1B-PS
		08-FPSISO1CF-HE		
64	8.13E-012	86-INSTRFCRF-HE	IE-TX06B	05BPM--AFW1B-PS
		08-FPSISO2CF-HE		
65	7.86E-012	IE-TX06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	08-FPSISO1CF-HE	
66	7.86E-012	IE-TX06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRFCRF-HE	08-FPSISO2CF-HE	
67	7.86E-012	IE-TX06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	08-FPSISO1CF-HE	
68	7.86E-012	IE-TX06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRFCRF-HE	08-FPSISO2CF-HE	
69	7.86E-012	IE-TX06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
70	7.86E-012	IE-TX06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
71	7.86E-012	IE-TX06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
72	7.86E-012	IE-TX06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
73	7.86E-012	IE-TX06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
74	7.86E-012	IE-TX06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE

Table 8 (continued)
Steamline Break (Moderate Fire Protection Discharge) in Turbine Building CDF Cutsets (TX06B)

75	7.86E-012	IE-TX06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
76	7.86E-012	IE-TX06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
77	7.43E-012	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD2HF-HE
		IE-TX06B	05BPM--AFW1B-PR	08-FPSISO2CF-HE
78	5.65E-012	IE-TX06B	05BSVAFW111B-FO	05BPT--AFW1C-PS
		08-FPSISO1CF-HE		
79	5.65E-012	IE-TX06B	05BSVAFW111B-FO	05BPT--AFW1C-PS
		08-FPSISO2CF-HE		
80	5.23E-012	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPSISO2CF-HE
81	5.23E-012	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-FPSISO2CF-HE
82	5.23E-012	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO1CF-HE
83	5.23E-012	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO1CF-HE
84	5.05E-012	86-INSTRFCRF-HE	IE-TX06B	05BSVAFW111B-FO
		08-FPSISO2CF-HE		
85	5.05E-012	86-INSTRFCRF-HE	IE-TX06B	05BSVAFW111B-FO
		08-FPSISO1CF-HE		
86	4.43E-012	IE-TX06B	03-XV--MU2A--FC	16-BATCLG--F-HE
		08-FPSISO1CF-HE		
87	4.43E-012	IE-TX06B	03-XV--MU2A--FC	16-BATCLG--F-HE
		08-FPSISO2CF-HE		
88	4.43E-012	XEQN-AFSTX064	IE-TX06B	03-XV--MU2A--FC
		16-BATCLG--F-HE	08-FPSISO3CF-HE	
89	4.39E-012	XEQN-AFSTX064	XEQN-OCTX06B4	IE-TX06B
		39-CB--1-505-CO	08-FPSISO3CF-HE	
90	4.26E-012	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO1CF-HE
91	4.26E-012	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPSISO2CF-HE
92	4.26E-012	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-FPSISO2CF-HE
93	4.26E-012	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO1CF-HE
94	4.21E-012	XEQN-AFSTX064	IE-TX06B	38-CBA102-04-CO
		08-FPSISO3CF-HE		
95	4.21E-012	XEQN-AFSTX064	IE-TX06B	38-CBA101----CO
		08-FPSISO3CF-HE		
96	4.21E-012	XEQN-AFSTX064	IE-TX06B	38-CBA104-14-CO
		08-FPSISO3CF-HE		
97	3.94E-012	IE-TX06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO2CF-HE
98	3.94E-012	IE-TX06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
99	3.86E-012	IE-TX06B	01-CMAKPSCCF123	86-INSTRRCRF-HE

Table 8 (continued)
Steamline Break (Moderate Fire Protection Discharge)
in Turbine Building CDF Cutsets (TX06B)

100	3.86E-012	08-FPSISO1CF-HE IE-TX06B 08-FPSISO2CF-HE	01-CMAKPSCCF123	86-INSTRFCRF-HE

Table 9
Feedwater Break (Large Fire Protection Discharge)
in Turbine Building CDF Cutsets (WI06B)

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==============================================================================
WinNUPRA 3.0 Production      File: WI06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = WI06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 2150
   Top event unavailability  (rare event)       = 9.059E-006
------------------------------------------------------------------------------
     1   3.27E-006   05B-BYALOP-F-HE  05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064    IE-WI06B         08-ISO-FS40F-HE
     2   2.11E-006   XCOM-AFZ-BWI4    06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     3   7.54E-007   05B-BYALOP-F-HE  05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B         08-ISO-FS54F-HE
     4   3.13E-007   IE-WI06B         01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-ISO-FS18F-HE
     5   3.13E-007   IE-WI06B         01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-ISO-FS18F-HE
     6   2.88E-007   XCOM-AFZ-BWIB    XEQN-AFSWI064    IE-WI06B
                     05BPT--AFW1C-PS  08-ISO-FS40F-HE
     7   2.57E-007   XCOM-AFZ-BWIB    86-INSTRFCRF-HE  XEQN-AFSWI064
                     IE-WI06B         08-ISO-FS40F-HE
     8   2.38E-007   36--LHS-DIAG-HE  IE-WI06B         08-ISO-FS18F-HE
     9   2.15E-007   XCOM-OCWI06BM    XCOM-AFX-2WI4    XCOM-AFZ-BWI4
                     SL21-CD          IE-WI06B         08-ISO-FS54F-HE
    10   1.38E-007   IE-WI06B         01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRFCRF-HE  08-ISO-FS33F-HE
    11   1.38E-007   IE-WI06B         01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRFCRF-HE  08-ISO-FS33F-HE
    12   1.09E-007   XCOM-AFX-2WI4    XCOM-AFZ-BWI4    06--OC6----F-HE
                     IE-WI06B         08-ISO-FS54F-HE
    13   1.05E-007   36--LHS-DIAG-HE  IE-WI06B         08-ISO-FS33F-HE
    14   1.01E-007   XCOM-AFZ-BWIB    XEQN-AFSWI064    IE-WI06B
                     05B-CST-SWS--HE  08-ISO-FS40F-HE
    15   6.64E-008   XCOM-AFZ-BWI4    IE-WI06B         05BPT--AFW1C-PS
                     08-ISO-FS54F-HE
    16   4.66E-008   05B-FRACTDP-OFF  05B-MDPTD49F-HE  IE-WI06B
                     05BPM--AFW1B-PR  08-ISO-FS18F-HE
    17   3.77E-008   XCOM-AFZ-BWIB    XEQN-AFSWI064    IE-WI06B
                     05BPT--AFW1C-PR  08-ISO-FS40F-HE
    18   3.39E-008   XCOM-AFZ-BWIB    XEQN-AFSWI064    IE-WI06B
                     05BMVI-MS102-FO  08-ISO-FS40F-HE
    19   3.06E-008   IE-WI06B         01-CMSIAC1A--PR  01-CMSIAC1B--TM
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-ISO-FS18F-HE
    20   3.06E-008   IE-WI06B         01-CMSIAC1A--PS  01-CMSIAC1B--TM
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-ISO-FS18F-HE
    21   2.52E-008   XCOM-AFZ-BWIB    XEQN-AFSWI064    IE-WI06B
                     36--LHS-DIAG-HE  08-ISO-FS40F-HE
    22   2.49E-008   IE-WI06B         01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--TM  86-INSTRRCRF-HE  08-ISO-FS18F-HE
    23   2.49E-008   IE-WI06B         01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--TM  86-INSTRRCRF-HE  08-ISO-FS18F-HE
    24   2.32E-008   XCOM-AFZ-BWI4    IE-WI06B         05B-CST-SWS--HE
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Table 9 (continued)
Feedwater Break (Large Fire Protection Discharge) in Turbine Building CDF Cutsets (WI06B)

		08-ISO-FS54F-HE		
25	1.35E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
26	1.35E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
27	1.29E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
28	1.29E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
29	1.29E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
30	1.29E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
31	1.24E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
32	1.17E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
33	1.17E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
34	1.13E-008	IE-WI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-ISO-FS18F-HE		
35	1.10E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
36	1.10E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
37	9.70E-009	IE-WI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
38	9.02E-009	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD49F-HE
		IE-WI06B	05BPM--AFW1B-PR	08-ISO-FS33F-HE
39	8.69E-009	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PR
		08-ISO-FS54F-HE		
40	7.83E-009	XCOM-AFZ-BWI4	IE-WI06B	05BMVI-MS102-FO
		08-ISO-FS54F-HE		
41	7.14E-009	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BSVAFW111C-FO	08-ISO-FS40F-HE	
42	5.83E-009	05BPMSKPSCCF23	IE-WI06B	08-ISO-FS18F-HE
43	5.80E-009	XCOM-AFZ-BWI4	IE-WI06B	36--LHS-DIAG-HE
		08-ISO-FS54F-HE		
44	5.66E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
45	5.66E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
46	5.66E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS33F-HE
47	5.66E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS33F-HE
48	5.27E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-ISO-FS18F-HE	
49	5.27E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23

Table 9 (continued)
Feedwater Break (Large Fire Protection Discharge) in Turbine Building CDF Cutsets (WI06B)

		86-INSTRRCRF-HE	08-ISO-FS18F-HE	
50	4.95E-009	IE-WI06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		08-ISO-FS33F-HE		
51	4.31E-009	XCOM-SLCWI06M	XCOM-OCWI06BM	XCOM-AFX-2WI4
		XCOM-AFZ-BWI4	27A-ORR----F-HE	IE-WI06B
		08-ISO-FS54F-HE		
52	4.27E-009	IE-WI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
53	2.85E-009	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-DIAG-HE
		08-ISO-FS54F-HE		
54	2.69E-009	XCOM-AFZ-BWI4	IE-WI06B	05BFAFWB-CAL-AE
		08-ISO-FS54F-HE		
55	2.69E-009	XCOM-AFZ-BWI4	IE-WI06B	05BFAFWA-CAL-AE
		08-ISO-FS54F-HE		
56	2.57E-009	05BPMSKPSCCF23	IE-WI06B	08-ISO-FS33F-HE
57	2.44E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
58	2.44E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
59	2.32E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRFCRF-HE	08-ISO-FS33F-HE	
60	2.32E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRFCRF-HE	08-ISO-FS33F-HE	
61	2.19E-009	05BPT--AFW1C-PS	IE-WI06B	05BPM--AFW1B-PS
		08-ISO-FS18F-HE		
62	1.96E-009	86-INSTRFCRF-HE	IE-WI06B	05BPM--AFW1B-PS
		08-ISO-FS18F-HE		
63	1.89E-009	IE-WI06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	08-ISO-FS18F-HE	
64	1.89E-009	IE-WI06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	08-ISO-FS18F-HE	
65	1.89E-009	IE-WI06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
66	1.89E-009	IE-WI06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
67	1.89E-009	IE-WI06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
68	1.89E-009	IE-WI06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
69	1.72E-009	XCOM-SLCWI06M	XCOM-OCWI06BM	XCOM-AFX-2WI4
		XCOM-AFZ-BWI4	IE-WI06B	33-PM---SI1B-TM
		08-ISO-FS54F-HE		
70	1.65E-009	XCOM-AFZ-BWI4	IE-WI06B	05BSVAFW111C-FO
		08-ISO-FS54F-HE		
71	1.54E-009	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		06-CV-KFOCCF12	08-ISO-FS40F-HE	
72	1.42E-009	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		38-BY-BRA101-OP	08-ISO-FS40F-HE	
73	1.36E-009	05BPT--AFW1C-PS	IE-WI06B	05BSVAFW111B-FO

Table 9 (continued)
Feedwater Break (Large Fire Protection Discharge)
in Turbine Building CDF Cutsets (WI06B)

		08-ISO-FS18F-HE		
74	1.36E-009	XCOM-AFZ-AWIB	05BPMRKPRCCF23	IE-WI06B
		08-ISO-FS18F-HE		
75	1.28E-009	XCOM-AFZ-AWIB	05BPT--AFW1C-PS	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
76	1.26E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
77	1.26E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
78	1.21E-009	86-INSTRFCRF-HE	IE-WI06B	05BSVAFW111B-FO
		08-ISO-FS18F-HE		
79	1.14E-009	XCOM-AFZ-AWIB	86-INSTRFCRF-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
80	1.07E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
81	1.07E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
82	1.03E-009	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
83	1.03E-009	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
84	9.94E-010	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPMRKPRCCF23	08-ISO-FS18F-HE	
85	9.62E-010	05BPT--AFW1C-PS	IE-WI06B	05BPM--AFW1B-PS
		08-ISO-FS33F-HE		
86	9.49E-010	IE-WI06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
87	9.28E-010	IE-WI06B	01-CMAKPSCCF123	86-INSTRRCRF-HE
		08-ISO-FS18F-HE		
88	9.02E-010	XCOM-SLCWI06M	XCOM-OCWI06BM	XCOM-AFX-2WI4
		XCOM-AFZ-BWI4	IE-WI06B	33-PM---SI1B-PS
		08-ISO-FS54F-HE		
89	8.72E-010	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-ISO-FS18F-HE
90	8.72E-010	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-ISO-FS18F-HE
91	8.72E-010	IE-WI06B	01-CMSIAC1B--PR	27BCV-SWT251-FC
		86-INSTRRCRF-HE	08-ISO-FS18F-HE	
92	8.62E-010	XCOM-SLCWI06M	XCOM-OCWI06BM	XCOM-AFX-2WI4
		XCOM-AFZ-BWI4	IE-WI06B	33-CV---SI6A-FC
		08-ISO-FS54F-HE		
93	8.61E-010	86-INSTRFCRF-HE	IE-WI06B	05BPM--AFW1B-PS
		08-ISO-FS33F-HE		
94	8.41E-010	XCOM-AFZ-BWIB	05BPMRKPRCCF23	IE-WI06B
		08-ISO-FS33F-HE		
95	8.33E-010	IE-WI06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRFCRF-HE	08-ISO-FS33F-HE	
96	8.33E-010	IE-WI06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRFCRF-HE	08-ISO-FS33F-HE	

Table 9 (continued)
Feedwater Break (Large Fire Protection Discharge)
in Turbine Building CDF Cutsets (WI06B)

97	8.32E-010	IE-WI06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
98	8.32E-010	IE-WI06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
99	8.32E-010	IE-WI06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
100	8.32E-010	IE-WI06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE

Table 10
Feedwater Break (Moderate Fire Protection Discharge) in Turbine Building CDF Cutsets (WX06B)

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==============================================================================
WinNUPRA 3.0 Production      File: WX06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = WX06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 990
   Top event unavailability  (rare event)       = 1.156E-007
------------------------------------------------------------------------------
     1   5.05E-008   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD1CF-HE
                     XEQN-AFSWX064     IE-WX06B          08-ISO-FS2HF-HE
     2   1.50E-008   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05BPT--AFW1C-PS   08-ISO-FS2HF-HE
     3   1.34E-008   XCOM-AFZ-BWXB     86-INSTRFCRF-HE   XEQN-AFSWX064
                     IE-WX06B          08-ISO-FS2HF-HE
     4   5.26E-009   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05B-CST-SWS--HE   08-ISO-FS2HF-HE
     5   3.26E-009   IE-WX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS55F-HE
     6   3.26E-009   IE-WX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS97F-HE
     7   3.26E-009   IE-WX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS97F-HE
     8   3.26E-009   IE-WX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS55F-HE
     9   2.48E-009   IE-WX06B          36--LHS-DIAG-HE   08-ISO-FS55F-HE
    10   2.48E-009   IE-WX06B          36--LHS-DIAG-HE   08-ISO-FS97F-HE
    11   1.97E-009   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05BPT--AFW1C-PR   08-ISO-FS2HF-HE
    12   1.77E-009   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05BMVI-MS102-FO   08-ISO-FS2HF-HE
    13   1.32E-009   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     36--LHS-DIAG-HE   08-ISO-FS2HF-HE
    14   6.46E-010   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05B-CST-DIAG-HE   08-ISO-FS2HF-HE
    15   6.09E-010   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05BFAFWB-CAL-AE   08-ISO-FS2HF-HE
    16   6.09E-010   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05BFAFWA-CAL-AE   08-ISO-FS2HF-HE
    17   3.73E-010   XCOM-AFZ-BWXB     XEQN-AFSWX064     IE-WX06B
                     05BSVAFW111C-FO   08-ISO-FS2HF-HE
    18   3.19E-010   IE-WX06B          01-CMSIAC1A--PR   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS97F-HE
    19   3.19E-010   IE-WX06B          01-CMSIAC1A--PS   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS55F-HE
    20   3.19E-010   IE-WX06B          01-CMSIAC1A--PR   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS55F-HE
    21   3.19E-010   IE-WX06B          01-CMSIAC1A--PS   01-CMSIAC1B--TM
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS97F-HE
    22   2.60E-010   IE-WX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRFCRF-HE   08-ISO-FS97F-HE
    23   2.60E-010   IE-WX06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--TM   86-INSTRRCRF-HE   08-ISO-FS55F-HE
    24   2.60E-010   IE-WX06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
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Table 10 (continued)
Feedwater Break (Moderate Fire Protection Discharge)
in Turbine Building CDF Cutsets (WX06B)

		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS55F-HE
25	2.60E-010	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS97F-HE
26	1.65E-010	05B-FRACTDP-OFF	05B-MDPTD1CF-HE	IE-WX06B
		05BPM--AFW1B-PR	08-ISO-FS55F-HE	
27	1.34E-010	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
28	1.34E-010	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
29	1.34E-010	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
30	1.34E-010	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
31	1.34E-010	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS55F-HE
32	1.34E-010	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS97F-HE
33	1.34E-010	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS55F-HE
34	1.34E-010	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS97F-HE
35	1.17E-010	IE-WX06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-ISO-FS55F-HE		
36	1.17E-010	IE-WX06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		08-ISO-FS97F-HE		
37	1.01E-010	IE-WX06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
38	1.01E-010	IE-WX06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
39	8.07E-011	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		06-CV-KFOCCF12	08-ISO-FS2HF-HE	
40	7.44E-011	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		38-BY-BRA101-OP	08-ISO-FS2HF-HE	
41	7.27E-011	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		IE-WX06B	05BPM--AFW1B-PR	08-ISO-FS97F-HE
42	6.08E-011	IE-WX06B	05BPMSKPSCCF23	08-ISO-FS97F-HE
43	6.08E-011	IE-WX06B	05BPMSKPSCCF23	08-ISO-FS55F-HE
44	5.50E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRFCRF-HE	08-ISO-FS97F-HE	
45	5.50E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-ISO-FS55F-HE	
46	5.50E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRFCRF-HE	08-ISO-FS97F-HE	
47	5.50E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-ISO-FS55F-HE	
48	3.73E-011	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BCVD-AFW1C-FO	08-ISO-FS2HF-HE	
49	3.23E-011	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPMSKPSCCF23	08-ISO-FS2HF-HE	

Table 10 (continued)
Feedwater Break (Moderate Fire Protection Discharge)
in Turbine Building CDF Cutsets (WX06B)

50	2.54E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS97F-HE
51	2.54E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS55F-HE
52	2.54E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS55F-HE
53	2.54E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS97F-HE
54	2.29E-011	XCOM-AFZ-BWXB	IE-WX06B	05BPMRKPRCCF23
		08-ISO-FS97F-HE		
55	2.28E-011	IE-WX06B	05BPM--AFW1B-PS	05BPT--AFW1C-PS
		08-ISO-FS55F-HE		
56	2.28E-011	IE-WX06B	05BPM--AFW1B-PS	05BPT--AFW1C-PS
		08-ISO-FS97F-HE		
57	2.16E-011	XCOM-AFZ-BWXB	IE-WX06B	05BPM--AFW1B-PR
		05BPT--AFW1C-PS	08-ISO-FS97F-HE	
58	2.10E-011	XCOM-AFZ-AWXB	IE-WX06B	05BPMRKPRCCF23
		08-ISO-FS55F-HE		
59	2.06E-011	XCOM-AFZ-BWXB	XEQN-AFSWX064	XEQN-OCWX06B4
		IE-WX06B	16-BATCLG--F-HE	35-MV-CVC301-FO
		STBY-CCWPA	08-ISO-FS2HF-HE	
60	2.04E-011	86-INSTRFCRF-HE	IE-WX06B	05BPM--AFW1B-PS
		08-ISO-FS97F-HE		
61	2.04E-011	86-INSTRFCRF-HE	IE-WX06B	05BPM--AFW1B-PS
		08-ISO-FS55F-HE		
62	1.98E-011	XCOM-AFZ-AWXB	IE-WX06B	05BPM--AFW1B-PR
		05BPT--AFW1C-PS	08-ISO-FS55F-HE	
63	1.97E-011	IE-WX06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	08-ISO-FS55F-HE	
64	1.97E-011	IE-WX06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRFCRF-HE	08-ISO-FS97F-HE	
65	1.97E-011	IE-WX06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	08-ISO-FS55F-HE	
66	1.97E-011	IE-WX06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRFCRF-HE	08-ISO-FS97F-HE	
67	1.97E-011	IE-WX06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
68	1.97E-011	IE-WX06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
69	1.97E-011	IE-WX06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
70	1.97E-011	IE-WX06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
71	1.97E-011	IE-WX06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
72	1.97E-011	IE-WX06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
73	1.97E-011	IE-WX06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE

Table 10 (continued)
Feedwater Break (Moderate Fire Protection Discharge)
in Turbine Building CDF Cutsets (WX06B)

74	1.97E-011	IE-WX06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
75	1.94E-011	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	IE-WX06B
		05BPM--AFW1B-PR	08-ISO-FS97F-HE	
76	1.77E-011	XCOM-AFZ-AWXB	86-INSTRFCRF-HE	IE-WX06B
		05BPM--AFW1B-PR	08-ISO-FS55F-HE	
77	1.42E-011	IE-WX06B	05BSVAFW111B-FO	05BPT--AFW1C-PS
		08-ISO-FS97F-HE		
78	1.42E-011	IE-WX06B	05BSVAFW111B-FO	05BPT--AFW1C-PS
		08-ISO-FS55F-HE		
79	1.31E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS97F-HE
80	1.31E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS97F-HE
81	1.31E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS55F-HE
82	1.31E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS55F-HE
83	1.30E-011	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPMRKPRCCF23	08-ISO-FS2HF-HE	
84	1.27E-011	86-INSTRFCRF-HE	IE-WX06B	05BSVAFW111B-FO
		08-ISO-FS55F-HE		
85	1.27E-011	86-INSTRFCRF-HE	IE-WX06B	05BSVAFW111B-FO
		08-ISO-FS97F-HE		
86	1.07E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS97F-HE
87	1.07E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS55F-HE
88	1.07E-011	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS55F-HE
89	1.07E-011	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS97F-HE
90	1.04E-011	XCOM-AFZ-BWXB	IE-WX06B	03-XV--MU2A--FC
		16-BATCLG--F-HE	08-ISO-FS97F-HE	
91	9.89E-012	IE-WX06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
92	9.89E-012	IE-WX06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS97F-HE
93	9.67E-012	IE-WX06B	01-CMAKPSCCF123	86-INSTRFCRF-HE
		08-ISO-FS97F-HE		
94	9.67E-012	IE-WX06B	01-CMAKPSCCF123	86-INSTRRCRF-HE
		08-ISO-FS55F-HE		
95	9.51E-012	XCOM-AFZ-AWXB	IE-WX06B	03-XV--MU2A--FC
		16-BATCLG--F-HE	08-ISO-FS55F-HE	
96	9.09E-012	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-ISO-FS55F-HE
97	9.09E-012	IE-WX06B	01-CMSIAC1B--PR	27BCV-SWT251-FC
		86-INSTRRCRF-HE	08-ISO-FS55F-HE	
98	9.09E-012	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1C--PR

Table 10 (continued)
Feedwater Break (Moderate Fire Protection Discharge)
in Turbine Building CDF Cutsets (WX06B)

		27BCV-SWT242-FC	86-INSTRRCRF-HE	08-ISO-FS55F-HE
99	9.09E-012	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRFCRF-HE	08-ISO-FS97F-HE
100	9.09E-012	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRFCRF-HE	08-ISO-FS97F-HE

Table 11
Small Circulating Water System Breakin Turbine Building CDF Cutsets (CY06B)

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==============================================================================
WinNUPRA 3.0 Production      File: CY06B-CDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CY06B-CDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 1359
   Top event unavailability  (rare event)       = 1.879E-006
------------------------------------------------------------------------------
     1   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
     2   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     3   1.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
     4   1.64E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
     5   4.69E-008   XCOM-OCCY06BM     XCOM-AFX-2CY4     XCOM-AFZ-BCY4
                     SL21-CD           IE-CY06B          04-CWSTP60-F-HE
     6   2.37E-008   XCOM-AFX-2CY4     XCOM-AFZ-BCY4     06--OC6----F-HE
                     IE-CY06B          04-CWSTP60-F-HE
     7   1.68E-008   XCOM-AFZ-BCYB     XEQN-AFSCY064     IE-CY06B
                     05BPT--AFW1C-PS   04-CWSTP51-F-HE
     8   1.51E-008   XCOM-AFZ-BCYB     86-INSTRFCRF-HE   XEQN-AFSCY064
                     IE-CY06B          04-CWSTP51-F-HE
     9   1.44E-008   XCOM-AFZ-BCY4     IE-CY06B          05BPT--AFW1C-PS
                     04-CWSTP60-F-HE
    10   7.32E-009   IE-CY06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   04-CWSTP29-F-HE
    11   7.32E-009   IE-CY06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   04-CWSTP29-F-HE
    12   5.89E-009   XCOM-AFZ-BCYB     XEQN-AFSCY064     IE-CY06B
                     05B-CST-SWS--HE   04-CWSTP51-F-HE
    13   5.56E-009   36--LHS-DIAG-HE   IE-CY06B          04-CWSTP29-F-HE
    14   5.05E-009   XCOM-AFZ-BCY4     IE-CY06B          05B-CST-SWS--HE
                     04-CWSTP60-F-HE
    15   2.89E-009   IE-CY06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   04-CWSTP45-F-HE
    16   2.89E-009   IE-CY06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   04-CWSTP45-F-HE
    17   2.21E-009   XCOM-AFZ-BCYB     XEQN-AFSCY064     IE-CY06B
                     05BPT--AFW1C-PR   04-CWSTP51-F-HE
    18   2.20E-009   36--LHS-DIAG-HE   IE-CY06B          04-CWSTP45-F-HE
    19   1.99E-009   XCOM-AFZ-BCYB     XEQN-AFSCY064     IE-CY06B
                     05BMVI-MS102-FO   04-CWSTP51-F-HE
    20   1.89E-009   XCOM-AFZ-BCY4     IE-CY06B          05BPT--AFW1C-PR
                     04-CWSTP60-F-HE
    21   1.70E-009   XCOM-AFZ-BCY4     IE-CY06B          05BMVI-MS102-FO
                     04-CWSTP60-F-HE
    22   1.47E-009   XCOM-AFZ-BCYB     XEQN-AFSCY064     IE-CY06B
                     36--LHS-DIAG-HE   04-CWSTP51-F-HE
    23   1.26E-009   XCOM-AFZ-BCY4     IE-CY06B          36--LHS-DIAG-HE
                     04-CWSTP60-F-HE
    24   1.09E-009   05B-FRACTDP-OFF   05B-MDPTD36F-HE   IE-CY06B
                     05BPM--AFW1B-PR   04-CWSTP29-F-HE
    25   9.37E-010   XCOM-SLCCY06M     XCOM-OCCY06BM     XCOM-AFX-2CY4
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Table 11 (continued)
Small Circulating Water System Breakin Turbine Building CDF Cutsets (CY06B)

		XCOM-AFZ-BCY4	27A-ORR----F-HE	IE-CY06B
		04-CWSTP60-F-HE		
26	7.24E-010	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-DIAG-HE	04-CWSTP51-F-HE	
27	7.16E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
28	7.16E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
29	6.82E-010	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BFAFWB-CAL-AE	04-CWSTP51-F-HE	
30	6.82E-010	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BFAFWA-CAL-AE	04-CWSTP51-F-HE	
31	6.21E-010	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-DIAG-HE
		04-CWSTP60-F-HE		
32	5.85E-010	XCOM-AFZ-BCY4	IE-CY06B	05BFAFWA-CAL-AE
		04-CWSTP60-F-HE		
33	5.85E-010	XCOM-AFZ-BCY4	IE-CY06B	05BFAFWB-CAL-AE
		04-CWSTP60-F-HE		
34	5.83E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP29-F-HE
35	5.83E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP29-F-HE
36	4.18E-010	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BSVAFW111C-FO	04-CWSTP51-F-HE	
37	3.75E-010	XCOM-SLCCY06M	XCOM-OCCY06BM	XCOM-AFX-2CY4
		XCOM-AFZ-BCY4	IE-CY06B	33-PM---SI1B-TM
		04-CWSTP60-F-HE		
38	3.58E-010	XCOM-AFZ-BCY4	IE-CY06B	05BSVAFW111C-FO
		04-CWSTP60-F-HE		
39	3.01E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP29-F-HE
40	3.01E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
41	3.01E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP29-F-HE
42	3.01E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
43	2.83E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
44	2.83E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
45	2.63E-010	IE-CY06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		04-CWSTP29-F-HE		
46	2.31E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP45-F-HE
47	2.31E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP45-F-HE
48	2.27E-010	IE-CY06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
49	1.96E-010	XCOM-SLCCY06M	XCOM-OCCY06BM	XCOM-AFX-2CY4

Table 11 (continued)
Small Circulating Water System Breakin Turbine Building CDF Cutsets (CY06B)

		XCOM-AFZ-BCY4	IE-CY06B	33-PM---SI1B-PS
		04-CWSTP60-F-HE		
50	1.89E-010	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	05BPM--AFW1B-PR	04-CWSTP45-F-HE
51	1.87E-010	XCOM-SLCCY06M	XCOM-OCCY06BM	XCOM-AFX-2CY4
		XCOM-AFZ-BCY4	IE-CY06B	33-CV---SI6A-FC
		04-CWSTP60-F-HE		
52	1.53E-010	XCOM-SLCCY06M	XCOM-OCCY06BM	XCOM-AFX-2CY4
		XCOM-AFZ-BCY4	IE-CY06B	33-PM---SI1B-PR
		04-CWSTP60-F-HE		
53	1.50E-010	XCOM-SLCCY06M	XCOM-OCCY06BM	XCOM-AFX-2CY4
		XCOM-AFZ-BCY4	IE-CY06B	33-XV---SI7B-AE
		04-CWSTP60-F-HE		
54	1.36E-010	05BPMSKPSCCF23	IE-CY06B	04-CWSTP29-F-HE
55	1.23E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	04-CWSTP29-F-HE	
56	1.23E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	04-CWSTP29-F-HE	
57	1.19E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
58	1.19E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	04-CWSTP45-F-HE
59	1.19E-010	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	04-CWSTP45-F-HE
60	1.19E-010	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
61	1.04E-010	IE-CY06B	01-CMSKPRCCF123	86-INSTRFCRF-HE
		04-CWSTP45-F-HE		
62	9.03E-011	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		06-CV-KFOCCF12	04-CWSTP51-F-HE	
63	8.97E-011	IE-CY06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
64	8.33E-011	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		38-BY-BRA101-OP	04-CWSTP51-F-HE	
65	8.31E-011	XCOM-SLCCY06M	XCOM-OCCY06BM	XCOM-AFX-2CY4
		XCOM-AFZ-BCY4	IE-CY06B	33--MAN-HPI--HE
		04-CWSTP60-F-HE		
66	7.74E-011	XCOM-AFZ-BCY4	IE-CY06B	06-CV-KFOCCF12
		04-CWSTP60-F-HE		
67	7.14E-011	XCOM-AFZ-BCY4	IE-CY06B	38-BY-BRA101-OP
		04-CWSTP60-F-HE		
68	5.70E-011	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP29-F-HE
69	5.70E-011	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP29-F-HE
70	5.39E-011	05BPMSKPSCCF23	IE-CY06B	04-CWSTP45-F-HE
71	5.11E-011	05BPT--AFW1C-PS	IE-CY06B	05BPM--AFW1B-PS
		04-CWSTP29-F-HE		
72	4.87E-011	IE-CY06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRFCRF-HE	04-CWSTP45-F-HE	

Table 11 (continued)
Small Circulating Water System Breakin Turbine Building CDF Cutsets (CY06B)

73	4.87E-011	IE-CY06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRFCRF-HE	04-CWSTP45-F-HE	
74	4.57E-011	86-INSTRFCRF-HE	IE-CY06B	05BPM--AFW1B-PS
		04-CWSTP29-F-HE		
75	4.42E-011	IE-CY06B	01-CMSIAC1C--PR	01-CMSKPRCCF12
		86-INSTRRCRF-HE	04-CWSTP29-F-HE	
76	4.42E-011	IE-CY06B	01-CMSIAC1B--PR	01-CMSKPRCCF13
		86-INSTRRCRF-HE	04-CWSTP29-F-HE	
77	4.42E-011	IE-CY06B	01-AV-SW420B-FO	01-CMSIAC1A--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
78	4.42E-011	IE-CY06B	01-AV-SW420B-FO	01-CMSIAC1A--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
79	4.42E-011	IE-CY06B	01-AV-SW420C-FO	01-CMSIAC1A--PS
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
80	4.42E-011	IE-CY06B	01-AV-SW420C-FO	01-CMSIAC1A--PR
		01-CMSIAC1B--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
81	4.18E-011	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BCVD-AFW1C-FO	04-CWSTP51-F-HE	
82	3.61E-011	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPMSKPSCCF23	04-CWSTP51-F-HE	
83	3.58E-011	XCOM-AFZ-BCY4	IE-CY06B	05BCVD-AFW1C-FO
		04-CWSTP60-F-HE		
84	3.18E-011	05BPT--AFW1C-PS	IE-CY06B	05BSVAFW111B-FO
		04-CWSTP29-F-HE		
85	3.17E-011	XCOM-AFZ-ACYB	05BPMRKPRCCF23	IE-CY06B
		04-CWSTP29-F-HE		
86	3.10E-011	XCOM-AFZ-BCY4	IE-CY06B	05BPMSKPSCCF23
		04-CWSTP60-F-HE		
87	2.99E-011	XCOM-AFZ-ACYB	05BPT--AFW1C-PS	IE-CY06B
		05BPM--AFW1B-PR	04-CWSTP29-F-HE	
88	2.94E-011	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP29-F-HE
89	2.94E-011	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	04-CWSTP29-F-HE
90	2.84E-011	86-INSTRFCRF-HE	IE-CY06B	05BSVAFW111B-FO
		04-CWSTP29-F-HE		
91	2.67E-011	XCOM-AFZ-ACYB	86-INSTRFCRF-HE	IE-CY06B
		05BPM--AFW1B-PR	04-CWSTP29-F-HE	
92	2.40E-011	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP29-F-HE
93	2.40E-011	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	04-CWSTP29-F-HE
94	2.32E-011	05B-FRACTDP-OFF	05B-MDPTD36F-HE	IE-CY06B
		05BPMRKPRCCF23	04-CWSTP29-F-HE	
95	2.25E-011	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP45-F-HE
96	2.25E-011	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	04-CWSTP45-F-HE
97	2.22E-011	IE-CY06B	01-CMSIAC1A--TM	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE

Table 11 (continued)
Small Circulating Water System Breakin Turbine Building CDF Cutsets (CY06B)

98	2.17E-011	IE-CY06B	01-CMAKPSCCF123	86-INSTRRCRF-HE
		04-CWSTP29-F-HE		
99	2.06E-011	XCOM-SLCCY06M	XCOM-OCCY06BM	XCOM-AFX-2CY4
		XCOM-AFZ-BCY4	IE-CY06B	33-PM-KPSCCF12
		04-CWSTP60-F-HE		
100	2.04E-011	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1C--PR
		27BCV-SWT242-FC	86-INSTRRCRF-HE	04-CWSTP29-F-HE

Table 12
Basic Event Descriptions

```
==============================================================================
WinNUPRA 3.0 Production      Licensed to: KEWAUNEE      Last saved: 11/17/2005
File: C:\Dominion\Kewaunee\New Base\data\FLOOD.BED
==============================================================================
BASIC EVENT ID   POINT EST.  TYPE DESCRIPTION
==============================================================================
-GAFW300         1.000E+000   7   AFW SUCCESS
-GCHG1300        1.000E+000   7   CHARGING SUCCESFUL
-GEPS120         1.000E+000   7   BUS 5 SUCCESS (2)
-GEPS1210        1.000E+000   7   BUS 5 SUCCESS
-GEPS1211        1.000E+000   7   BUS 6 SUCCESS
-GEPS710         1.000E+000   7   BUS 6 SUCCESS (2)
01--IAS-STBY-HE  1.580E-002   3   OPERATOR FAILS TO START STANDBY AIR COMPRESSOR
01--IAS-STBYFHE  1.600E-001   3   OPERATOR FAILS TO START STANDBY AIR COMPRESSOR (FIRE)
01-AC-ACC1516LK  2.399E-004   4   ACC-15, ACC-16 ACCUMULATOR LEAKS EXCESSIVELY
01-AC-PR2A---LK  2.399E-004   4   INDEPENDENT FAILUREPR-2A AIR ACCUMULATOR LEAKS
01-AC-PR2B---LK  2.399E-004   4   INDEPENDENT FAILUREPR-2B AIR ACCUMULATOR LEAKS
01-AC-SW4A---LK  2.399E-004   4   SW-4A AIR ACCUMULATOR LEAKS EXCESSIVELY
01-AC-SW4B---LK  2.399E-004   4   SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY
01-ACCKLKCCF12   5.640E-006   4   DOUBLE COMMON CAUSE FAILURE (CCF)01-ACCKLKCCF12
01-ACRKLKCCF12   5.640E-006   3   DOUBLE COMMON CAUSE FAILURE (CCF)PR-2A/B ACCUM LEAK
01-ACSW1040A1LK  2.399E-004   4   INDEPENDENT FAILURESW-1040A-1 AIR ACCUMULATOR LEAKS
01-ACSW1040B1LK  2.399E-004   4   INDEPENDENT FAILURESW-1040B-1 AIR ACCUMULATOR LEAKS
01-AV-IA101--OC  1.032E-005   4   AOV IA-101 TRANSFERS CLOSED
01-AV-SW420A-FO  2.168E-003   3   INDEPENDENT FAILUREAOV SW-420A FAILS TO OPEN
01-AV-SW420B-FO  2.168E-003   3   INDEPENDENT FAILUREAOV SW-420B FAILS TO OPEN
01-AV-SW420C-FO  2.168E-003   3   INDEPENDENT FAILUREAOV SW-420C FAILS TO OPEN
01-AVSA121---FO  2.168E-003   3   AOV SA-121 FAILS TOOPEN
01-AVSA200---FC  4.758E-004   3   AOV SA-200 FAILS TOCLOSE
01-AVSA400---FC  4.758E-004   3   AOV SA-400 FAILS TOCLOSE
01-AVSA60----OC  1.032E-005   4   AOV SA-60 TRANSFERSCLOSED
01-AVSKFOCCF12   7.410E-005   3   DOUBLE COMMON CAUSE FAILURE (CCF)SW-420A/B FTO
01-AVSKFOCCF123  3.060E-005   3   TRIPLE COMMON CAUSE FAILURE (CCF)SW-420A/B/C FTO
01-AVSKFOCCF13   7.410E-005   3   DOUBLE COMMON CAUSE FAILURE (CCF)SW-420A/C FTO
01-AVSKFOCCF23   7.410E-005   3   DOUBLE COMMON CAUSE FAILURE (CCF)SW-420B/C FTO
01-CM-KPRCCF12   1.510E-004   3   DOUBLE COMMON CAUSE FAILURE (CCF)SIAC F/G FTR
01-CM-KPSCCF12   1.780E-004   3   DOUBLE COMMON CAUSE FAILURE (CCF)SIAC F/G FTS
01-CM-SIAC1F-PR  6.440E-003   4   INDEPENDENT FAILUREAIR COMPRESSOR F FAILS TO RUN
01-CM-SIAC1F-PS  3.788E-003   3   INDEPENDENT FAILUREAIR COMPRESSOR F FAILS TO START
01-CM-SIAC1F-TM  8.900E-002   3   AIR COMPRESSOR F UNAVAILABLE DUE TO TEST OR
MAINTENANCE
01-CM-SIAC1G-PR  6.440E-003   4   INDEPENDENT FAILUREAIR COMPRESSOR G FAILS TO RUN
01-CM-SIAC1G-PS  3.788E-003   3   INDEPENDENT FAILUREAIR COMPRESSOR G FAILS TO START
01-CM-SIAC1G-TM  2.960E-002   3   AIR COMPRESSOR G UNAVAILABLE DUE TO TEST OR
MAINTENANCE
01-CMAKPSCCF12   1.790E-004   3   DOUBLE COMMON CAUSE FAILURE (CCF)SIAC A/B FTS
01-CMAKPSCCF123  3.820E-004   3   TRIPLE COMMON CAUSE FAILURE (CCF)SIAC A/B/C FTS
01-CMAKPSCCF13   1.790E-004   3   DOUBLE COMMON CAUSE FAILURE (CCF)SIAC A/C FTS
01-CMAKPSCCF23   1.790E-004   3   DOUBLE COMMON CAUSE FAILURE (CCF)SIAC B/C FTS
01-CMSIAC1A--PR  1.000E+000   3   INDEPENDENT FAILUREAIR COMPRESSOR A FAILS TO RUN
01-CMSIAC1A--PS  1.000E+000   3   INDEPENDENT FAILUREAIR COMPRESSOR A FAILS TO START
01-CMSIAC1A--TM  3.100E-002   3   AIR COMPRESSOR A UNAVAILABLE DUE TO TEST OR
MAINTENANCE
01-CMSIAC1B--PR  3.588E-001   4   INDEPENDENT FAILUREAIR COMPRESSOR B FAILS TO RUN
01-CMSIAC1B--PS  1.476E-002   3   INDEPENDENT FAILUREAIR COMPRESSOR B FAILS TO START
01-CMSIAC1B--TM  3.510E-002   3   AIR COMPRESSOR B UNAVAILABLE DUE TO TEST OR
MAINTENANCE
01-CMSIAC1C--PR  3.588E-001   4   INDEPENDENT FAILUREAIR COMPRESSOR C FAILS TO RUN
01-CMSIAC1C--PS  1.476E-002   3   INDEPENDENT FAILUREAIR COMPRESSOR C FAILS TO START
01-CMSIAC1C--TM  2.860E-002   3   AIR COMPRESSOR C UNAVAILABLE DUE TO TEST OR
MAINTENANCE
01-CMSKPRCCF12   2.170E-003   3   DOUBLE COMMON CAUSE FAILURE (CCF)SIAC A/B FTR
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Table 12
Basic Event Descriptions (continued)

01-CMSKPRCCF123	4.630E-003	3	TRIPLE COMMON CAUSE FAILURE (CCF)SIAC A/B/C FTR
01-CMSKPRCCF13	2.170E-003	3	DOUBLE COMMON CAUSE FAILURE (CCF)SIAC A/C FTR
01-CMSKPRCCF23	2.170E-003	3	DOUBLE COMMON CAUSE FAILURE (CCF)SIAC B/C FTR
01-CV-IA102--FO	5.000E-005	3	CHECK VALVE IA-102 FAILS TO OPEN
01-CV-IA102--OC	1.200E-007	4	CHECK VALVE IA-102 TRANSFERS CLOSED
01-CV-IA103--FO	5.000E-005	3	CHECK VALVE IA-103 FAILS TO OPEN
01-CV-IA103--OC	1.200E-007	4	CHECK VALVE IA-103 TRANSFERS CLOSED
01-CV-IA150-2FC	6.452E-002	3	INDEPENDENT FAILURECHECK VALVE IA-150-2 FTC
01-CV-IA150-2FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE IA-150-2 FTO
01-CV-IA151-2FC	6.452E-002	3	INDEPENDENT FAILURECHECK VALVE IA-151-2 FTC
01-CV-IA151-2FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE IA-151-2 FTO
01-CV-IA311--FO	5.000E-005	3	CHECK VALVE IA-311 FAILS TO OPEN
01-CV-IA422--FC	9.999E-004	3	CHECK VALVE IA-422 FAILS TO TO CLOSE
01-CV-IA482--FO	5.000E-005	3	CHECK VALVE IA-482 FAILS TO OPEN
01-CV-IA501-2FC	6.452E-002	3	CHECK VALVE IA-501-2 FAILS TO CLOSE
01-CV-IA503-2FC	6.452E-002	3	CHECK VALVE IA-503-2 FAILS TO CLOSE
01-CV-SA63---FC	9.999E-004	3	CHECK VALVE SA-63 FAILS TO CLOSE
01-CV5KFCCCF12	5.050E-003	3	DOUBLE COMMON CAUSE FAILURE (CCF)IA-150-2/151-2 FTC
01-CVAKFCCCF12	5.050E-003	3	DOUBLE COMMON CAUSE FAILURE (CCF)01-CVAKFCCCF12
01-CVCKFCCCF12	7.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)IA-330-2/471-1 FTC
01-CVIA1403-2FC	6.452E-002	3	INDEPENDENT FAILURECHECK VALVE IA-1403-2 FTC
01-CVIA1403-4FC	6.452E-002	3	INDEPENDENT FAILURECHECK VALVE IA-1403-4 FTC
01-CVIA1430-2FC	9.999E-004	3	CHECK VALVE IA-1430-2 FAILS TO CLOSE
01-CVIA1493-2FC	6.452E-002	3	CHECK VALVE IA-1493-2 FAILS TO CLOSE
01-CVIA330-2-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE IA-330-2 FTC
01-CVIA471-1-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE IA-471-1 FTC
01-CVOKFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)IA-150-2/151-2 FTO
01-FL-A-B-C--PL	2.399E-004	4	AIR DRYER/FILTER FAILURE
01-IAS-MAN---HE	4.036E-001	3	OPERATOR FAILS TO LOCALLY ESTABLISH IA DURING FIRE
01-PP-SAS----RP	1.673E-006	4	STATION AIR SYSTEM PIPING FAILURE
01-PSAKOPCC1234	4.380E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)SIACS EXCEPT 16121
01-PSAKOPCC1235	4.380E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)SIACS EXCEPT 16107
01-PSAKOPCC1245	4.380E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)SIACS EXCEPT 16105
01-PSAKOPCC1345	4.380E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)SIACS EXCEPT 15517J
01-PSAKOPCC2345	4.380E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)SIACS EXCEPT 15516J
01-PSAKOPCCF1-5	4.374E-009	3	GLOBAL FAILURE OF SIAC PRESS SWTCHS
01-PSAKOPCCF12	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 15516J/17J FTOP
01-PSAKOPCCF123	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15516J/17J/16105
01-PSAKOPCCF124	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15516J/17J/16107
01-PSAKOPCCF125	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15516J/17J/16121
01-PSAKOPCCF13	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 15516J/16105
01-PSAKOPCCF134	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15516J/16105/07
01-PSAKOPCCF135	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15516J/16105/21
01-PSAKOPCCF14	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 15516J/16107
01-PSAKOPCCF145	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15516J/16107/21
01-PSAKOPCCF15	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 15516J/16121
01-PSAKOPCCF23	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 15517J/16105
01-PSAKOPCCF234	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15517J/16105/07
01-PSAKOPCCF235	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15517J/16105/21
01-PSAKOPCCF24	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 15517J/16107
01-PSAKOPCCF245	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 15517J/16107/21

Table 12
Basic Event Descriptions (continued)

01-PSAKOPCCF25	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 15517J/16121
01-PSAKOPCCF34	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 16105/16107 FTOP
01-PSAKOPCCF345	5.144E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)PS 16105/07/21
01-PSAKOPCCF35	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 16105/16121 FTOP
01-PSAKOPCCF45	1.364E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS 16107/16121 FTOP
01-PSPS15516JOP	2.999E-007	3	INDEPENDENT FAILUREPRESSURE SWITCH PS-15516J
01-PSPS15517JOP	2.999E-007	3	INDEPENDENT FAILUREPRESSURE SWITCH PS-15517J
01-PSPS16105-OP	2.999E-007	3	INDEPENDENT FAILUREPRESSURE SWITCH PS-16105
01-PSPS16107-OP	2.999E-007	3	INDEPENDENT FAILUREPRESSURE SWITCH PS-16107
01-PSPS16121-OP	2.999E-007	3	INDEPENDENT FAILUREPRESSURE SWITCH PS-16121
01-SV-SW402A-FO	4.999E-004	3	INDEPENDENT FAILURESOV SW-402A FAILS TO OPEN
01-SV-SW402B-FO	4.999E-004	3	INDEPENDENT FAILURESOV SW-402B FAILS TO OPEN
01-SV-SW403C-FO	4.999E-004	3	INDEPENDENT FAILURESOV SW-403C FAILS TO OPEN
01-SVSKFOCCF12	6.050E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-402A/B FTO
01-SVSKFOCCF123	1.290E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-402A/B/403C FTO
01-SVSKFOCCF13	6.050E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-402A/403C FTO
01-SVSKFOCCF23	6.050E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-402B/403C FTO
01-VC-SA121--OP	7.197E-005	4	CONTROLLER FOR AOV SA-121 FAILURE
01-XV-IA104--OC	8.834E-008	4	MANUAL VALVE IA-104TRANSFERS CLOSED
01-XV-IA1400-OC	8.834E-008	4	MANUAL VALVE IA-1400 TRANSFERS CLOSED
01-XV-IA1440-OC	8.834E-008	4	MANUAL VALVE IA-1440 TRANSFERS CLOSED
01-XV-IA160--OC	8.834E-008	4	MANUAL VALVE IA-160TRANSFERS CLOSED
01-XV-IA1A---FC	1.000E-004	3	MANUAL VALVE IA-1A FAILS TO CLOSE
01-XV-IA200--FC	1.000E-004	3	MANUAL VALVE IA-200FAILS TO CLOSE
01-XV-IA310--FO	1.000E-004	3	MANUAL VALVE IA-310FAILS TO OPEN
01-XV-IA400--FC	1.000E-004	3	MANUAL VALVE IA-400FAILS TO CLOSE
01-XV-IA500--OC	8.834E-008	4	MANUAL VALVE IA-500TRANSFERS CLOSED
01-XV-IA520--OC	8.834E-008	4	MANUAL VALVE IA-520TRANSFERS CLOSED
01-XV-IA5A---FC	1.000E-004	3	MANUAL VALVE IA-5A FAILS TO CLOSE
01-XV-SA100A-FC	1.000E-004	3	MANUAL VALVE SA-100A FAILS TO CLOSE
01-XV-SA101B-FC	1.000E-004	3	MANUAL VALVE SA-101B FAILS TO CLOSE
01-XV-SA110--FC	1.000E-004	3	MANUAL VALVE SA-110FAILS TO CLOSE
01-XV-SA62---FC	1.000E-004	3	MANUAL VALVE SA-62 FAILS TO CLOSE
01-XVIA101-1-FO	1.000E-004	3	MANUAL VALVE IA-101-1 FAILS TO OPEN
01-XVSA107A1-FC	1.000E-004	3	MANUAL VALVE SA-107A1 FAILS TO CLOSE
01-XVSA107A2-FC	1.000E-004	3	MANUAL VALVE SA-107A2 FAILS TO CLOSE
02-AV-KFCCCF12	9.420E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-3A/3B FTC
02-AV-SW1601-OC	1.032E-005	4	AOV SW-1601 TRANSFERS CLOSED
02-AV-SW3A---FC	4.758E-004	3	INDEPENDENT FAILUREAOV SW-3A FAILS TO CLOSE
02-AV-SW3A---OC	1.032E-005	4	AOV SW-3A TRANSFERS CLOSED
02-AV-SW3B---FC	4.758E-004	3	INDEPENDENT FAILUREAOV SW-3B FAILS TO CLOSE
02-AV-SW3B---OC	1.032E-005	4	AOV SW-3B TRANSFERS CLOSED
02-AV-SW4A---FC	4.758E-004	3	AOV SW-4A FAILS TO CLOSE
02-AV-SW4A---FO	2.168E-003	3	AOV SW-4A FAILS TO OPEN
02-AV-SW4A---OC	1.032E-005	4	AOV SW-4A TRANSFERS CLOSED
02-AV-SW4B---FC	4.758E-004	3	AOV SW-4B FAILS TO CLOSE
02-AV-SW4B---FO	2.168E-003	3	AOV SW-4B FAILS TO OPEN
02-AV-SW4B---OC	1.032E-005	4	AOV SW-4B TRANSFERS CLOSED
02-AVSKFOCCF12	1.050E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-301A/B FTO
02-AVSKOCCCF12	2.420E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1306A/B TRN CLS
02-AVSW1306A-OC	1.032E-005	4	INDEPENDENT FAILUREAOV SW-1306A TRANSFERS CLOSED
02-AVSW1306B-OC	1.032E-005	4	INDEPENDENT FAILUREAOV SW-1306B TRANSFERS CLOSED
02-AVSW301A--FO	2.168E-003	3	INDEPENDENT FAILUREAOV SW-301A FAILS TO OPEN
02-AVSW301B--FO	2.168E-003	3	INDEPENDENT FAILUREAOV SW-301B FAILS TO OPEN
02-CN-KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)21005AX, 6AX CNT FL
02-CN21005AX-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 21005AX CONTACTS FAIL

Table 12
Basic Event Descriptions (continued)

02-CN21006AX-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 21006AX CONTACTS FAIL
02-CV--SW1A1-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SW1A1 FAILS TO CLOSE
02-CV--SW1A1-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-1A1 FAILS TO OPEN
02-CV--SW1A2-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SW-1A2 FAILS TO CLOSE
02-CV--SW1A2-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-1A2 FAILS TO OPEN
02-CV--SW1B1-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SW-1B1 FAILS TO CLOSE
02-CV--SW1B1-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-1B1 FAILS TO OPEN
02-CV--SW1B2-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SW-1B2 FAILS TO CLOSE
02-CV--SW1B2-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-1B2 FAILS TO OPEN
02-CV-KFCCCF1-4	5.100E-005	3	GLOBAL FAILURE OF 02-CV-KFCCCF1-4
02-CV-KFCCCF12	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)02-CV-KFCCCF12
02-CV-KFCCCF123	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)02-CV-KFCCCF123
02-CV-KFCCCF124	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)02-CV-KFCCCF124
02-CV-KFCCCF13	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A1/1B1 FTC
02-CV-KFCCCF134	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)02-CV-KFCCCF134
02-CV-KFCCCF14	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A1/1B2 FTC
02-CV-KFCCCF23	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A2/1B1 FTC
02-CV-KFCCCF234	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)02-CV-KFCCCF234
02-CV-KFCCCF24	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A2/1B2 FTC
02-CV-KFCCCF34	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)02-CV-KFCCCF34
02-CV-KFOCCF12	2.140E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-400A/B2 FTO
02-CV-KFOCCF123	8.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-400A/B2/01C2 FTO
02-CV-KFOCCF13	2.140E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-400A/401C2 FTO
02-CV-KFOCCF23	2.140E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-400B2/401C2 FTO
02-CV-SW400A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-400AFAILS TO OPEN
02-CV-SW400B2FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-400B2 FTO
02-CV-SW401C2FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-401C2 FTO
02-CV-SW501A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-501AFAILS TO OPEN
02-CV-SW501B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SW-501BFAILS TO OPEN
02-CVSKFOCCF1-4	8.530E-006	3	GLOBAL FAILURE OF SW-1A1/1A2/1B1/1B2
02-CVSKFOCCF12	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A1/1A2 FTO
02-CVSKFOCCF123	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1A1/1A2/1B1 FTO
02-CVSKFOCCF124	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1A1/1A2/1B2 FTO
02-CVSKFOCCF13	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A1/1B1 FTO
02-CVSKFOCCF134	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1A1/1B1/1B2 FTO
02-CVSKFOCCF14	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A1/1B2 FTO
02-CVSKFOCCF23	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A2/1B1 FTO
02-CVSKFOCCF234	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1A2/1B1/1B2 FTO
02-CVSKFOCCF24	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A2/1B2 FTO
02-CVSKFOCCF34	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1B1/1B2 FTO
02-CVWKFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1A1/1A2 FTO
02-FL-KPSCCF1-4	2.600E-005	3	GLOBAL FAILURE OF TWS A1/A2/B1/B2 FTS
02-FL-KPSCCF12	9.940E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A1/A2 FTS
02-FL-KPSCCF123	4.710E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A1/A2/B1 FTS
02-FL-KPSCCF124	4.710E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A1/A2/B2 FTS
02-FL-KPSCCF13	9.940E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A1/B1 FTS
02-FL-KPSCCF134	4.710E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A1/B1/B2 FTS
02-FL-KPSCCF14	9.940E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A1/B2 FTS
02-FL-KPSCCF23	9.940E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A2/B1 FTS
02-FL-KPSCCF234	4.710E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A2/B1/B2 FTS
02-FL-KPSCCF24	9.940E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A2/B2 FTS
02-FL-KPSCCF34	9.940E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS B1/B2 FTS
02-FL-TWS----PL	1.200E-004	4	TRAVELING WATER SCREENS PLUGGED
02-FLT-TW1A1-PR	8.159E-004	4	INDEPENDENT FAILURETRAVELING WATER SCREEN A1 FTR
02-FLT-TW1A1-PS	1.400E-003	3	INDEPENDENT FAILURETRAVELING WATER SCREEN A1 FTS
02-FLT-TW1A2-PR	8.159E-004	4	INDEPENDENT FAILURETRAVELING WATER SCREEN A2 FTR

Table 12
Basic Event Descriptions (continued)

02-FLT-TW1A2-PS	1.400E-003	3	INDEPENDENT FAILURETRAVELING WATER SCREEN A2 FTS
02-FLT-TW1B1-PR	8.159E-004	4	INDEPENDENT FAILURETRAVELING WATER SCREEN B1 FTR
02-FLT-TW1B1-PS	1.400E-003	3	INDEPENDENT FAILURETRAVELING WATER SCREEN B1 FTS
02-FLT-TW1B2-PR	8.159E-004	4	INDEPENDENT FAILURETRAVELING WATER SCREEN B2 FTR
02-FLT-TW1B2-PS	1.400E-003	3	INDEPENDENT FAILURETRAVELING WATER SCREEN B2 FTS
02-FLTKPRCCF1-4	7.590E-006	3	GLOBAL FAILURE OF TWS TO RUN
02-FLTKPRCCF12	2.900E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A1/A2 FTR
02-FLTKPRCCF123	1.370E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A1/A2/B1 FTR
02-FLTKPRCCF124	1.370E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A1/A2/B2 FTR
02-FLTKPRCCF13	2.900E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A1/B1 FTR
02-FLTKPRCCF134	1.370E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A1/B1/B2 FTR
02-FLTKPRCCF14	2.900E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A1/B2 FTR
02-FLTKPRCCF23	2.900E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A2/B1 FTR
02-FLTKPRCCF234	1.370E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)TWS A2/B1/B2 FTR
02-FLTKPRCCF24	2.900E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS A2/B2 FTR
02-FLTKPRCCF34	2.900E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TWS B1/B2 FTR
02-MV-KFOCCF12	4.500E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1300A/B FTO
02-MV-KOCCCF12	2.820E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SW-10A/B TRANS CLSD
02-MV-SW10A--OC	1.200E-006	4	INDEPENDENT FAILUREMOV SW-10A TRANSFERS CLOSED
02-MV-SW10B--OC	1.200E-006	4	INDEPENDENT FAILUREMOV SW-10B TRANSFERS CLOSED
02-MV-SW502--FO	6.968E-004	3	INDEPENDENT FAILUREMOV SW-502 FAILS TO OPEN
02-MV-SW601A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SW-601A FAILS TO OPEN
02-MV-SW601B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SW-601B FAILS TO OPEN
02-MV-SW903A-OC	1.200E-006	4	INDEPENDENT FAILUREMOV SW-903A TRANSFERS CLOSED
02-MV-SW903ABAE	5.327E-004	3	OPERATOR FAILS TO OPEN MOVS SW-903A/BAFTER TEST
02-MV-SW903B-OC	1.200E-006	4	INDEPENDENT FAILUREMOV SW-903B TRANSFERS CLOSED
02-MV-SW903C-OC	1.200E-006	4	INDEPENDENT FAILUREMOV SW-903C TRANSFERS CLOSED
02-MV-SW903CDAE	5.327E-004	3	OPERATOR FAILS TO OPEN MOVS SW-903C/DAFTER TEST
02-MV-SW903D-OC	1.200E-006	4	INDEPENDENT FAILUREMOV SW-903D TRANSFERS CLOSED
02-MV9KOCCCF1-4	1.120E-008	3	GLOBAL FAILURE OF SW-903A/B/C/D TR CL
02-MV9KOCCCF12	4.260E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-903A/B TRAN CLS
02-MV9KOCCCF123	2.020E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-903A/B/C TRN CLS
02-MV9KOCCCF124	2.020E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-903A/B/D TRN CLS
02-MV9KOCCCF13	4.260E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-903A/C TRAN CLS
02-MV9KOCCCF134	2.020E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-903A/C/D TRN CLS
02-MV9KOCCCF14	4.260E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-903A/D TRAN CLS
02-MV9KOCCCF23	4.260E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-903B/C TRAN CLS
02-MV9KOCCCF234	2.020E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-903B/C/D TRN CLS
02-MV9KOCCCF24	4.260E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-903B/D TRAN CLS
02-MV9KOCCCF34	4.260E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-903C/D TRAN CLS
02-MVSKFOCCF12	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-502/601A FTO
02-MVSKFOCCF123	3.720E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-502/601A/B FTO
02-MVSKFOCCF13	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-502/601B FTO
02-MVSKFOCCF23	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-601A/B FTO
02-MVSW1300A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SW-1300A FAILS TO OPEN
02-MVSW1300B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SW-1300B FAILS TO OPEN
02-PM-SW1A1--AE	7.991E-004	3	OPERATOR FAILS TO RESTORE SW PUMP A1 AFTER TEST
02-PM-SW1A1--PR	1.397E-004	4	INDEPENDENT FAILURESERVICE WATER PUMP A1 FAILS TO RUN
02-PM-SW1A1--PS	1.449E-003	3	INDEPENDENT FAILURESERVICE WATER PUMP A1 FAILS TO START
02-PM-SW1A1--TM	6.560E-003	3	SW PUMP A1 UNAVAILABLE DUE TO TEST OR MAINTENANCE
02-PM-SW1A2--AE	7.991E-004	3	OPERATOR FAILS TO RESTORE SW PUMP A2 AFTER TEST
02-PM-SW1A2--PR	1.397E-004	4	INDEPENDENT FAILURESERVICE WATER PUMP A2 FAILS TO RUN
02-PM-SW1A2--PS	1.449E-003	3	INDEPENDENT FAILURESERVICE WATER PUMP A2 FAILS TO START
02-PM-SW1A2--TM	1.190E-002	3	SW PUMP A2 UNAVAILABLE DUE TO TEST OR MAINTENANCE

Table 12
Basic Event Descriptions (continued)

02-PM-SW1B1--AE	7.991E-004	3	OPERATOR FAILS TO RESTORE SW PUMP B1 AFTER TEST
02-PM-SW1B1--PR	1.397E-004	4	INDEPENDENT FAILURESERVICE WATER PUMP B1 FAILS TO RUN
02-PM-SW1B1--PS	1.449E-003	3	INDEPENDENT FAILURESERVICE WATER PUMP B1 FAILS TO START
02-PM-SW1B1--TM	1.020E-002	3	SW PUMP B1 UNAVAILABLE DUE TO TEST OR MAINTENANCE
02-PM-SW1B2--AE	7.991E-004	3	OPERATOR FAILS TO RESTORE SW PUMP B2 AFTER TEST
02-PM-SW1B2--PR	1.397E-004	4	INDEPENDENT FAILURESERVICE WATER PUMP B2 FAILS TO RUN
02-PM-SW1B2--PS	1.449E-003	3	INDEPENDENT FAILURESERVICE WATER PUMP B2 FAILS TO START
02-PM-SW1B2--TM	1.140E-002	3	SW PUMP B2 UNAVAILABLE DUE TO TEST OR MAINTENANCE
02-PMRKPRCCF1-4	3.220E-007	4	GLOBAL FAILURE OF SW PUMPS TO RUN
02-PMRKPRCCF12	7.210E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A1/A2 FTR
02-PMRKPRCCF123	2.260E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A1/A2/B1 FTR
02-PMRKPRCCF124	2.260E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A1/A2/B2 FTR
02-PMRKPRCCF13	7.210E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A1/B1 FTR
02-PMRKPRCCF134	2.260E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A1/B1/B2 FTR
02-PMRKPRCCF14	7.210E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A1/B2 FTR
02-PMRKPRCCF23	7.210E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A2/B1 FTR
02-PMRKPRCCF234	2.260E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A2/B1/B2 FTR
02-PMRKPRCCF24	7.210E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A2/B2 FTR
02-PMRKPRCCF34	7.210E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)SWP B1/B2 FTR
02-PMSKPSCCF1-4	9.770E-006	3	GLOBAL FAILURE OF SWPS FAIL TO START
02-PMSKPSCCF12	3.000E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A1/A2 FTS
02-PMSKPSCCF123	4.090E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A1/A2/B1 FTS
02-PMSKPSCCF124	4.090E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A1/A2/B2 FTS
02-PMSKPSCCF13	3.000E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A1/B1 FTS
02-PMSKPSCCF134	4.090E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A1/B1/B2 FTS
02-PMSKPSCCF14	3.000E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A1/B2 FTS
02-PMSKPSCCF23	3.000E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A2/B1 FTS
02-PMSKPSCCF234	4.090E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SWP A2/B1/B2 FTS
02-PMSKPSCCF24	3.000E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SWP A2/B2 FTS
02-PMSKPSCCF34	3.000E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SWP B1/B2 FTS
02-PP-KRPCCF12	1.920E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW PIPING
02-PP-SWTA---RP	8.160E-008	4	INDEPENDENT FAILURESERVICE WATER TRAINA PIPING FAILURE
02-PP-SWTB---RP	8.160E-008	4	INDEPENDENT FAILURESERVICE WATER TRAINB PIPING FAILURE
02-PS2KOPCCF12	1.410E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)PS-16004/16005 FTOP
02-PSPS16003-OP	2.999E-007	3	FAILURE OF PRESSURESWITCH PS-16003
02-PSPS16004-OP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-16004
02-PSPS16005-OP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-16005
02-RE-KRBCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)21005AX,6AX MECH BN
02-RE21005AX-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 21005AX MECHANICALLY BOUND
02-RE21006AX-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 21006AX MECHANICALLY BOUND
02-SV-33040--CO	1.200E-005	4	INDEPENDENT FAILURESOV 33040 TRANSFERSOPEN
02-SV-33040--OC	1.200E-005	4	SOV 33040 TRANSFERSCLOSED
02-SV-33041--CO	1.200E-005	4	INDEPENDENT FAILURESOV 33041 TRANSFERSOPEN
02-SV-33041--OC	1.200E-005	4	SOV 33041 TRANSFERSCLOSED
02-SV-KCOCCF12	2.820E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)SOVS 33040/41 TR OP
02-SV33043---FO	4.999E-004	3	SOV 33043 FAILS TO OPEN
02-SV33044---FO	4.999E-004	3	SOV 33044 FAILS TO OPEN
02-SVSKFOCCF1-4	9.300E-006	3	GLOBAL FAILURE OF SW-202A1 FTO
02-SVSKFOCCF12	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-202A1/A2 FTO
02-SVSKFOCCF123	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-202A1/A2/B1 FTO
02-SVSKFOCCF124	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-202A1/A2/B2 FTO
02-SVSKFOCCF13	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-202A1/B1 FTO

Table 12
Basic Event Descriptions (continued)

02-SVSKFOCCF134	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-202A1/B1/B2 FTO
02-SVSKFOCCF14	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-202A1/B2 FTO
02-SVSKFOCCF23	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-202A2/B1 FTO
02-SVSKFOCCF234	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW-202A2/B1/B2 FTO
02-SVSKFOCCF24	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-202A2/B2 FTO
02-SVSKFOCCF34	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-202B1/B2 FTO
02-SVSW202A1-FO	4.999E-004	3	INDEPENDENT FAILURESOV SW-202A1 FAILS TO OPEN
02-SVSW202A2-FO	4.999E-004	3	INDEPENDENT FAILURESOV SW-202A2 FAILS TO OPEN
02-SVSW202B1-FO	4.999E-004	3	INDEPENDENT FAILURESOV SW-202B1 FAILS TO OPEN
02-SVSW202B2-FO	4.999E-004	3	INDEPENDENT FAILURESOV SW-202B2 FAILS TO OPEN
02-SW-RCVR-BMHE	2.125E-002	3	OPERATOR FAILS TO RECOVER SERVICE WATER BEFORE BOIL
02-SW-RCVR-DMHE	1.602E-002	3	OPERATOR FAILS TO RECOVER SERVICE WATER BEFORE CD
02-SW4A-B29F-HE	2.000E-002	3	CLOSE SW-4A SW-4B DURING FLOOD - 29 MIN.
02-SW4A-B45F-HE	2.000E-002	3	CLOSE SW-4A SW-4B DURING FLOOD - 45 MIN.
02-SW4A-B51F-HE	2.000E-002	3	CLOSE SW-4A SW-4B DURING FLOOD - 51 MIN.
02-SW4A-B60F-HE	2.000E-002	3	CLOSE SW-4A SW-4B DURING FLOOD - 60 M N.
02-SW4A-B66F-HE	2.000E-002	3	CLOSE SW-4A SW-4B DURING FLOOD - 66 MIN.
02-SWS-DSP---HE	3.833E-003	3	OPERATOR FAILS TO ESTABLISH SERVICE WATER USING DSP
02-SWS-MAN---HE	2.985E-002	3	OPERATOR FAILS TO ESTABLISH SW MANUALLY -- FIRE
02-TP--21005-FA	7.197E-005	4	INDEPENDENT FAILUREPRESSURE TRANS. 21005 FAILS
02-TP--21006-FA	7.197E-005	4	INDEPENDENT FAILUREPRESSURE TRANS. 21006 FAILS
02-TP-KFACCF12	1.690E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)TRNS 21005, 6 FAIL
02-TURB-HDR--HE	8.576E-003	3	OPERATOR FAILS TO SWITCH TURBINE BUILDING SW HEADER
02-TURB-HDR-SHE (SEISMIC)	1.000E+000	3	OPERATOR FAILS TO SWITCH TURBINE BLDGSW HEADER
02-XV-SW500ABAE TST	5.327E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVES SW-500A/B AFTER
02-XV-SW600A-AE TEST	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE SW-600A AFTER
02-XV-SW600B-AE TEST	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE SW-600B AFTER
02-XV-SW700B-OC	8.834E-008	4	MANUAL VALVE SW-700B TRANSFERS CLOSED
02-XV-SW722--OC	8.834E-008	4	MANUAL VALVE SW-722 TRANSFERS CLOSED
03-AS-HTLVLC-OP	7.197E-005	4	CONTROL SIGNAL TO AOV MU-3A FAILS
03-AV--C701--FO	2.168E-003	3	AOV C-701 FAILS TO OPEN
03-AV--MU3A--CO	1.032E-005	4	AOV MU-3A TRANSFERSOPEN
03-AV--MU3A--FO	2.168E-003	3	INDEPENDENT FAILUREAOV MU-3A FAILS TO OPEN
03-AV--MU3B--CO	1.032E-005	4	AOV MU-3B TRANSFERSOPEN
03-AV--MU3B--FO	2.168E-003	3	INDEPENDENT FAILUREAOV MU-3B FAILS TO OPEN
03-AV-KFOCCF12	1.050E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-3A/B FTO
03-CV--C2A---FC	9.999E-004	3	CHECK VALVE C-2A FAILS TO CLOSE
03-CV--C2B---FC	9.999E-004	3	CHECK VALVE C-2B FAILS TO CLOSE
03-CV-KOCCCF12	7.260E-010	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311A/B TRN CLS
03-CV-KOCCCF123	1.550E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)MU-311A/B/C TRN CL
03-CV-KOCCCF13	7.260E-010	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311A/C TRN CLS
03-CV-KOCCCF23	7.260E-010	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311B/C TRN CLS
03-CV-MU311A-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE MU-311AFAILS TO CLOSE
03-CV-MU311A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE MU-311AFAILS TO OPEN
03-CV-MU311A-OC CLOSED	1.200E-007	4	INDEPENDENT FAILURECHECK VALVE MU-311ATRANSFERS
03-CV-MU311B-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE MU-311BFAILS TO CLOSE
03-CV-MU311B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE MU-311BFAILS TO OPEN
03-CV-MU311B-OC CLOSED	1.200E-007	4	INDEPENDENT FAILURECHECK VALVE MU-311BTRANSFERS
03-CV-MU311C-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE MU-311CFAILS TO CLOSE
03-CV-MU311C-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE MU-311CFAILS TO OPEN

Table 12
Basic Event Descriptions (continued)

03-CV-MU311C-OC	1.200E-007	4	INDEPENDENT FAILURECHECK VALVE MU-311CTRANSFERS CLOSED
03-CVCKFCCCF12	2.310E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311A/B FTC
03-CVCKFCCCF123	5.580E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)MU-311A/B/C FTC
03-CVCKFCCCF13	2.310E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311A/C FTC
03-CVCKFCCCF23	2.310E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311B/C FTC
03-CVOKFCCCF12	2.140E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311A/B FTO
03-CVOKFCCCF123	8.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)MU-311A/B/C FTO
03-CVOKFCCCF13	2.140E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311A/C FTO
03-CVOKFCCCF23	2.140E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-311B/C FTO
03-CVS-MU301-FC	9.999E-004	3	CHECK VALVE MU-301 FAILS TO CLOSE
03-CVS-MU301-FO	5.000E-005	3	CHECK VALVE MU-301 FAILS TO OPEN
03-CVS-MU301-OC	1.200E-007	4	CHECK VALVE MU-301 TRANSFERS CLOSED
03-PM--CDP1A-PR	2.496E-004	4	INDEPENDENT FAILURECONDENSATE PUMP A FAILS TO RUN
03-PM--CDP1B-PR	2.496E-004	4	INDEPENDENT FAILURECONDENSATE PUMP B FAILS TO RUN
03-PM-KPRCCF12	1.730E-005	4	DOUBLE COMMON CAUSE FAILURE (CCF)CD PUMPS FTR
03-SV-33188--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33188 FAILS TO CLOSE
03-SV-33873--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33873 FAILS TO CLOSE
03-SV-KFCCCF12	2.350E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SV-33188/33873 FTC
03-TK----CST-RP	6.482E-007	4	CONDENSATE STORAGE TANK RUPTURE
03-XV---MU1A-OC	8.834E-008	4	MANUAL VALVE MU-1A TRANSFERS CLOSED
03-XV---MU1B-OC	8.834E-008	4	MANUAL VALVE MU-1B TRANSFERS CLOSED
03-XV--MU2A--FC	1.000E-004	3	MANUAL VALVE MU-2A FAILS TO CLOSE
03-XV--MU2B--FC	1.000E-004	3	MANUAL VALVE MU-2B FAILS TO CLOSE
03-XV--MU300-OC	8.834E-008	4	MANUAL VALVE MU-300TRANSFERS CLOSED
03-XV-KOCCCF12	5.340E-010	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-310A/B TRN CLS
03-XV-KOCCCF123	1.140E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)MU-310A/B/C TRN CL
03-XV-KOCCCF13	5.340E-010	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-310A/C TRN CLS
03-XV-KOCCCF23	5.340E-010	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-310B/C TRN CLS
03-XV-MU310A-OC	8.834E-008	4	INDEPENDENT FAILUREMANUAL VALVE MU-310A TRN CLOSED
03-XV-MU310B-OC	8.834E-008	4	INDEPENDENT FAILUREMANUAL VALVE MU-310B TRN CLOSED
03-XV-MU310C-OC	8.834E-008	4	INDEPENDENT FAILUREMANUAL VALVE MU-310A TRN CLOSED
04--LO-LEVEL-FB	5.140E-004	3	LOW FOREBAY LEVEL
04--MAN-CPT--HE	2.984E-003	3	OPERATOR FAILS TO TRIP CIRCULATING WATER PUMP
04-CN-26829A-RC	2.999E-004	3	RELAY 26829A CONTACTS FAIL
04-CN-26829B-RC	2.999E-004	3	RELAY 26829B CONTACTS FAIL
04-CN-26830A-RC	2.999E-004	3	RELAY 26830A CONTACTS FAIL
04-CN-26830B-RC	2.999E-004	3	RELAY 26830B CONTACTS FAIL
04-CN-26831A-RC	2.999E-004	3	RELAY 26831A CONTACTS FAIL
04-CN-26831B-RC	2.999E-004	3	RELAY 26831B CONTACTS FAIL
04-CN-26832A-RC	2.999E-004	3	RELAY 26832A CONTACTS FAIL
04-CN-26832B-RC	2.999E-004	3	RELAY 26832B CONTACTS FAIL
04-CW-MDAFPAMHE	1.000E-001	3	Operator Fails to Control MDAFP Med CW Brk AC Avail
04-CW-TRIP-F-HE	1.000E+000	3	FAIL TO ISOL LRG CIRC WTR BRK BEFOREFAILURE OF 480V BUS
04-CWSTP13-F-HE	2.600E-001	3	TRIP CW PUMP DURINGFLOOD EVENT - 13 MINUTES
04-CWSTP19-F-HE	1.200E-001	3	TRIP CW PUMP DURINGFLOOD EVENT - 19 M INUTES
04-CWSTP22-F-HE	1.200E-001	3	TRIP CW PUMP DURINGFLOOD EVENT - 22 M INUTES
04-CWSTP25-F-HE	1.200E-001	3	TRIP CW PUMP DURINGFLOOD EVENT - 25 M INUTES
04-CWSTP29-F-HE	4.300E-002	3	TRIP CW PUMP DURINGFLOOD EVENT - 29 M INUTES
04-CWSTP45-F-HE	1.700E-002	3	TRIP CW PUMP DURINGFLOOD EVENT - 45 M INUTES
04-CWSTP51-F-HE	1.400E-002	3	TRIP CW PUMP DURINGFLOOD EVENT - 51 M INUTES
04-CWSTP60-F-HE	1.200E-002	3	TRIP CW PUMP DURINGFLOOD EVENT - 60 M INUTES
04-CWSTP66-F-HE	1.200E-002	3	TRIP CW PUMP DURINGFLOOD EVENT - 66 M INUTES
04-LC--26829-OP	2.400E-005	4	INDEPENDENT FAILUREFOREBAY LEVEL CHANNEL A1 FAILS
04-LC--26830-OP	2.400E-005	4	INDEPENDENT FAILUREFOREBAY LEVEL CHANNEL A2 FAILS

Table 12
Basic Event Descriptions (continued)

04-LC--26831-OP	2.400E-005	4	INDEPENDENT FAILUREFOREBAY LEVEL CHANNEL B1 FAILS
04-LC--26832-OP	2.400E-005	4	INDEPENDENT FAILUREFOREBAY LEVEL CHANNEL B2 FAILS
04-LC-KOPCCF1-4	4.460E-007	3	GLOBAL FAILURE OF FOREBAY LEVEL CHANS
04-LC-KOPCCF12	1.700E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A1/A2
04-LC-KOPCCF123	8.080E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A1/A2/B1
04-LC-KOPCCF124	8.080E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A1/A2/B2
04-LC-KOPCCF13	1.700E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A1/B1
04-LC-KOPCCF134	8.080E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A1/B1/B2
04-LC-KOPCCF14	1.700E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A1/B2
04-LC-KOPCCF23	1.700E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A2/B1
04-LC-KOPCCF234	8.080E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A2/B1/B2
04-LC-KOPCCF24	1.700E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)FB LEV CHN A2/B2
04-LC-KOPCCF34	1.700E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)FB LEV CHN B1/B2
04-LS-KFOCCF1-4	5.600E-009	3	GLOBAL FAILURE OF FB LEVEL SWTS FTO
04-LS-KFOCCF12	2.140E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)LS 26829/30-71 FTO
04-LS-KFOCCF123	1.010E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LS 26829/30/31-71
04-LS-KFOCCF124	1.010E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LS 26829/30/32-71
04-LS-KFOCCF13	2.140E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)LS 26829/31-71 FTO
04-LS-KFOCCF134	1.010E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LS 26829/31/32-71
04-LS-KFOCCF14	2.140E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)LS 26829/32-71 FTO
04-LS-KFOCCF23	2.140E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)LS 26830/31-71 FTO
04-LS-KFOCCF234	1.010E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LS 26830/31/32-71
04-LS-KFOCCF24	2.140E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)LS 26830/32-71 FTO
04-LS-KFOCCF34	2.140E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)LS 26831/32-71 FTO
04-LSLS26829-FO	3.010E-007	3	INDEPENDENT FAILURELEVEL SWITCH 26829-71 FTO
04-LSLS26830-FO	3.010E-007	3	INDEPENDENT FAILURELEVEL SWITCH 26830-71 FTO
04-LSLS26831-FO	3.010E-007	3	INDEPENDENT FAILURELEVEL SWITCH 26831-71 FTO
04-LSLS26832-FO	3.010E-007	3	INDEPENDENT FAILURELEVEL SWITCH 26832-71 FTO
04-RE-26829A-RF	3.279E-003	4	RELAY 26830A FAILS TO OPERATE
04-RE-26829B-RF	3.279E-003	4	RELAY 26829B FAILS TO OPERATE
04-RE-26830A-RF	3.279E-003	4	RELAY 26830A FAILS TO OPERATE
04-RE-26830B-RF	3.279E-003	4	RELAY 26830B FAILS TO OPERATE
04-RE-26831A-RF	3.279E-003	4	RELAY 26831A FAILS TO OPERATE
04-RE-26831B-RF	3.279E-003	4	RELAY 26831B FAILS TO OPERATE
04-RE-26832A-RF	3.279E-003	4	RELAY 26832A FAILS TO OPERATE
04-RE-26832B-RF	3.279E-003	4	RELAY 26832B FAILS TO OPERATE
05A-MF1------HE	1.447E-002	3	OPERATOR FAILS TO START FW PUMPS AND ESTABLISH FLOW
05A-MF2------HE	4.307E-003	3	OPERATOR FAILS TO ESTABLISH MAIN FEEDWATER
05AAM--LM462-FA	3.358E-004	4	INDEPENDENT FAILUREISOLATION AMPLIFIERLM-462 FAILS
05AAM--LM472-FA	3.358E-004	4	INDEPENDENT FAILUREISOLATION AMPLIFIERLM-472 FAILS
05AAM-KFACCF1-4	3.120E-006	3	GLOBAL FAILURE OF LM-462/63B/72/73B
05AAM-KFACCF12	1.190E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)LM-462/472
05AAM-KFACCF123	5.660E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)LM-462/463B/472
05AAM-KFACCF124	5.660E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)LM-462/472/473B
05AAM-KFACCF13	1.190E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)LM-462/463B
05AAM-KFACCF134	5.660E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)LM-462/463B/473B
05AAM-KFACCF14	1.190E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)LM-462/473B
05AAM-KFACCF23	1.190E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)LM-463B/472
05AAM-KFACCF234	5.660E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)LM-463B/472/473B
05AAM-KFACCF24	1.190E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)LM-472/473B
05AAM-KFACCF34	1.190E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)LM-463B/473B
05AAM-LM463B-FA	3.358E-004	4	INDEPENDENT FAILUREISOLATION AMPLIFIERLM-463B FAILS
05AAM-LM473B-FA	3.358E-004	4	INDEPENDENT FAILUREISOLATION AMPLIFIERLM-473B FAILS
05AAV---FW7A-FC	4.758E-004	3	INDEPENDENT FAILUREAOV FW-7A FAILS TO CLOSE
05AAV---FW7A-FO	2.168E-003	3	INDEPENDENT FAILUREAOV FW-7A FAILS TO OPEN
05AAV---FW7A-OC	1.032E-005	4	INDEPENDENT FAILUREAOV FW-7A TRANSFERSCLOSED

Table 12
Basic Event Descriptions (continued)

05AAV---FW7B-FC	4.758E-004	3	INDEPENDENT FAILUREAOV FW-7B FAILS TO CLOSE
05AAV---FW7B-FO	2.168E-003	3	INDEPENDENT FAILUREAOV FW-7B FAILS TO OPEN
05AAV---FW7B-OC	1.032E-005	4	INDEPENDENT FAILUREAOV FW-7B TRANSFERSCLOSED
05AAV--FW10A-FO	2.168E-003	3	INDEPENDENT FAILUREAOV FW-10A FAILS TOOPEN
05AAV--FW10B-FO	2.168E-003	3	INDEPENDENT FAILUREAOV FW-10B FAILS TOOPEN
05AAV-FW101A-FO	2.168E-003	3	INDEPENDENT FAILUREAOV FW-101A FAILS TO OPEN
05AAV-FW101B-FO	2.168E-003	3	INDEPENDENT FAILUREAOV FW-101B FAILS TO OPEN
05AAV-KFOCCF12	1.050E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-101A/B FTO
05AAVCKFCCCF12	9.420E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-7A/B FTC
05AAVOKFOCCF1-4	1.620E-005	3	GLOBAL FAILURE OF FW-7A/B/10A/B T OP
05AAVOKFOCCF12	3.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-7A/B FTO
05AAVOKFOCCF123	3.080E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)FW-7A/B/10A FTO
05AAVOKFOCCF124	3.080E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)FW-7A/B/10B FTO
05AAVOKFOCCF13	3.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-7A/10A FTO
05AAVOKFOCCF134	3.080E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)FW-7A/10A/B FTO
05AAVOKFOCCF14	3.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-7A/10B FTO
05AAVOKFOCCF23	3.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-7B/10A FTO
05AAVOKFOCCF234	3.080E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)FW-7B/10A/B FTO
05AAVOKFOCCF24	3.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-7B/10B FTO
05AAVOKFOCCF34	3.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-10A/B FTO
05AAVTKOCCCF12	2.420E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-7A/B TRAN CLOSED
05ACV-FW13A--FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE FW-13A FAILS TO CLOSE
05ACV-FW13A--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE FW-13A FAILS TO OPEN
05ACV-FW13B--FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE FW-13B FAILS TO CLOSE
05ACV-FW13B--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE FW-13B FAILS TO OPEN
05ACV-KFCCCF12	7.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-13A/B FTC
05ACV-KFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-13A/B FTO
05ACV1KFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FW-1A/B FTO
05ACVD-FW1A--FC	9.999E-004	3	CHECK VALVE FW-1A FAILS TO CLOSE
05ACVD-FW1A--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE FW-1A FAILS TO OPEN
05ACVD-FW1B--FC	9.999E-004	3	CHECK VALVE FW-1B FAILS TO CLOSE
05ACVD-FW1B--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE FW-1B FAILS TO OPEN
05ADC--LQ461-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY LQ-461 FAILS
05ADC--LQ462-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY LQ-462 FAILS
05ADC--LQ463-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY LQ-463 FAILS
05ADC--LQ471-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY LQ-471 FAILS
05ADC--LQ472-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY LQ-472 FAILS
05ADC--LQ473-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY LQ-473 FAILS
05ADCAKFACC12345	4.606E-009	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)LQ-461/62/63/71/72
05ADCAKFACC12346	4.606E-009	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)LQ-461/62/63/71/73
05ADCAKFACC12356	4.606E-009	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)LQ-461/62/63/72/73
05ADCAKFACC12456	4.606E-009	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)LQ-461/62/71/72/73
05ADCAKFACC13456	4.606E-009	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)LQ-461/63/71/72/73
05ADCAKFACC23456	4.606E-009	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)LQ-462/63/71/72/73
05ADCAKFACCF1-6	6.164E-008	3	GLOBAL FAILURE OF LQ-461/2/3/71/2/3
05ADCAKFACCF12	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-461/462
05ADCAKFACCF123	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/463
05ADCAKFACCF1234	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/463/471

Table 12
Basic Event Descriptions (continued)

05ADCAKFACCF1235	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/463/472
05ADCAKFACCF1236	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/463/473
05ADCAKFACCF124	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/471
05ADCAKFACCF1245	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/471/472
05ADCAKFACCF1246	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/471/473
05ADCAKFACCF125	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/472
05ADCAKFACCF1256	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/472/473
05ADCAKFACCF126	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/462/473
05ADCAKFACCF13	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-461/463
05ADCAKFACCF134	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/463/471
05ADCAKFACCF1345	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/463/471/472
05ADCAKFACCF1346	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/463/471/473
05ADCAKFACCF135	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/463/472
05ADCAKFACCF1356	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/463/472/473
05ADCAKFACCF136	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/463/473
05ADCAKFACCF14	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-461/471
05ADCAKFACCF145	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/471/472
05ADCAKFACCF1456	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-461/471/472/473
05ADCAKFACCF146	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/471/473
05ADCAKFACCF15	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-461/472
05ADCAKFACCF156	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-461/472/473
05ADCAKFACCF16	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-461/473
05ADCAKFACCF23	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-462/463
05ADCAKFACCF234	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-462/463/471
05ADCAKFACCF2345	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-462/463/471/472
05ADCAKFACCF2346	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-462/463/471/473
05ADCAKFACCF235	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-462/463/472
05ADCAKFACCF2356	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-462/463/472/473
05ADCAKFACCF236	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-462/463/473
05ADCAKFACCF24	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-462/471
05ADCAKFACCF245	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-462/471/472
05ADCAKFACCF2456	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-462/471/472/473
05ADCAKFACCF246	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-462/471/473
05ADCAKFACCF25	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-462/472
05ADCAKFACCF256	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-462/472/473
05ADCAKFACCF26	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-462/473
05ADCAKFACCF34	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-463/471
05ADCAKFACCF345	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-463/471/472
05ADCAKFACCF3456	2.960E-009	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)LQ-463/471/472/473
05ADCAKFACCF346	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-463/471/473
05ADCAKFACCF35	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-463/472
05ADCAKFACCF356	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-463/472/473

Table 12
Basic Event Descriptions (continued)

05ADCAKFACCF36	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-463/473
05ADCAKFACCF45	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-471/472
05ADCAKFACCF456	5.110E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)LQ-471/472/473
05ADCAKFACCF46	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-471/473
05ADCAKFACCF56	1.472E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)LQ-472/473
05AMV--FW12A-FC	1.905E-003	3	INDEPENDENT FAILUREMOV FW-12A FAILS TOCLOSE
05AMV--FW12A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV FW-12A FAILS TOOPEN
05AMV--FW12A-OC	1.200E-006	4	INDEPENDENT FAILUREMOV FW-12A TRANSFERS CLOSED
05AMV--FW12B-FC	1.905E-003	3	INDEPENDENT FAILUREMOV FW-12B FAILS TOCLOSE
05AMV--FW12B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV FW-12B FAILS TOOPEN
05AMV--FW12B-OC	1.200E-006	4	INDEPENDENT FAILUREMOV FW-12B TRANSFERS CLOSED
05AMV1KFOCCF12	4.500E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AMV1KFOCCF12
05AMV1KOCCCF12	2.820E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AMV1KOCCCF12
05AMV2KFOCCF12	4.500E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AMV2KFOCCF12
05AMV2KOCCCF12	2.820E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AMV2KOCCCF12
05AMVCKFCCCF12	8.570E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AMVCKFCCCF12
05AMVD-FW2A--FO	6.968E-004	3	INDEPENDENT FAILUREMOV FW-2A FAILS TO OPEN
05AMVD-FW2A--OC	1.200E-006	4	INDEPENDENT FAILUREMOV FW-2A TRANSFERSCLOSED
05AMVD-FW2B--FO	6.968E-004	3	INDEPENDENT FAILUREMOV FW-2B FAILS TO OPEN
05AMVD-FW2B--OC	1.200E-006	4	INDEPENDENT FAILUREMOV FW-2B TRANSFERSCLOSED
05APM--FWP1A-PR	2.496E-004	4	INDEPENDENT FAILUREFEEDWATER PUMP A FAILS TO RUN
05APM--FWP1A-PS	1.400E-003	3	INDEPENDENT FAILUREFEEDWATER PUMP A FAILS TO START
05APM--FWP1B-PR	2.496E-004	4	INDEPENDENT FAILUREFEEDWATER PUMP B FAILS TO RUN
05APM--FWP1B-PS	1.400E-003	3	INDEPENDENT FAILUREFEEDWATER PUMP B FAILS TO START
05APMALOP1A--PR	3.401E-005	4	INDEPENDENT FAILUREFEEDWATER PUMP A ALOP FTR
05APMALOP1A--PS	1.400E-003	3	INDEPENDENT FAILUREFEEDWATER PUMP A ALOP FTS
05APMALOP1B--PR	3.401E-005	4	INDEPENDENT FAILUREFEEDWATER PUMP B ALOP FTR
05APMALOP1B--PS	1.400E-003	3	INDEPENDENT FAILUREFEEDWATER PUMP B ALOP FTS
05APMOKPRCCF12	2.350E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)FWP ALOPS A, B
05APMOKPSCCF12	1.670E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)05APMOKPSCCF12
05APMRKPRCCF12	1.730E-005	4	DOUBLE COMMON CAUSE FAILURE (CCF)05APMRKPRCCF12
05APMSKPSCCF12	1.670E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)05APMSKPSCCF12
05ASV-33074--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33074 FAILS TO CLOSE
05ASV-33074--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33074 FAILS TO OPEN
05ASV-33075--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33075 FAILS TO CLOSE
05ASV-33075--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33075 FAILS TO OPEN
05ASV-33077--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33077 FAILS TO CLOSE
05ASV-33077--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33077 FAILS TO OPEN
05ASV-33078--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33078 FAILS TO CLOSE
05ASV-33078--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33078 FAILS TO OPEN
05ASV-33080--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33080 FAILS TO CLOSE
05ASV-33081--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33081 FAILS TO CLOSE
05ASV-33082--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33082 FAILS TO CLOSE
05ASV-33083--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33083 FAILS TO CLOSE
05ASV-KFCCCF1-4	9.300E-006	3	GLOBAL FAILURE OF 05ASV-KFCCCF1-4
05ASV-KFCCCF12	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF12
05ASV-KFCCCF123	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF123
05ASV-KFCCCF124	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF124
05ASV-KFCCCF13	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF13
05ASV-KFCCCF134	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF134
05ASV-KFCCCF14	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF14
05ASV-KFCCCF23	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF23
05ASV-KFCCCF234	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF234
05ASV-KFCCCF24	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF24
05ASV-KFCCCF34	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASV-KFCCCF34
05ASVCKFCCCF1-4	9.300E-006	3	GLOBAL FAILURE OF 05ASVCKFCCCF1-4

Table 12
Basic Event Descriptions (continued)

05ASVCKFCCCF12	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF12
05ASVCKFCCCF123	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF123
05ASVCKFCCCF124	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF124
05ASVCKFCCCF13	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF13
05ASVCKFCCCF134	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF134
05ASVCKFCCCF14	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF14
05ASVCKFCCCF23	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF23
05ASVCKFCCCF234	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF234
05ASVCKFCCCF24	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF24
05ASVCKFCCCF34	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVCKFCCCF34
05ASVOKFOCCF1-4	9.300E-006	3	GLOBAL FAILURE OF 05ASVOKFOCCF1-4
05ASVOKFOCCF12	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF12
05ASVOKFOCCF123	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF123
05ASVOKFOCCF124	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF124
05ASVOKFOCCF13	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF13
05ASVOKFOCCF134	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF134
05ASVOKFOCCF14	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF14
05ASVOKFOCCF23	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF23
05ASVOKFOCCF234	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF234
05ASVOKFOCCF24	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF24
05ASVOKFOCCF34	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASVOKFOCCF34
05ASW--TS462-CO	3.719E-004	4	INDEPENDENT FAILURESWITCH TS/LM462 CONTACTS XFER OPEN
05ASW--TS472-CO	3.719E-004	4	INDEPENDENT FAILURESWITCH TS/LM472 CONTACTS XFER OPEN
05ASW-KCOCCF12	8.740E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASW-KCOCCF12
05ASW-TS463B-CO	1.119E-003	4	INDEPENDENT FAILURESWITCH TS/LM463B CONTACTS XFER OPEN
05ASW-TS473B-CO	1.119E-003	4	INDEPENDENT FAILURESWITCH TS/LM473B CONTACTS XFER OPEN
05ASW1KCOCCF12	2.630E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ASW1KCOCCF12
05ATL--LT461-FA	9.999E-007	4	INDEPENDENT FAILURELEVEL TRANSMITTER LT-461 FAILS
05ATL--LT462-FA	9.999E-007	4	INDEPENDENT FAILURELEVEL TRANSMITTER LT-462 FAILS
05ATL--LT463-FA	9.999E-007	4	INDEPENDENT FAILURELEVEL TRANSMITTER LT-463 FAILS
05ATL--LT471-FA	9.999E-007	4	INDEPENDENT FAILURELEVEL TRANSMITTER LT-471 FAILS
05ATL--LT472-FA	9.999E-007	4	INDEPENDENT FAILURELEVEL TRANSMITTER LT-472 FAILS
05ATL--LT473-FA	9.999E-007	4	INDEPENDENT FAILURELEVEL TRANSMITTER LT-473 FAILS
05ATLAKFACC12345	4.606E-010	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACC12345
05ATLAKFACC12346	4.606E-010	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACC12346
05ATLAKFACC12356	4.606E-010	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACC12356
05ATLAKFACC12456	4.606E-010	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACC12456
05ATLAKFACC13456	4.606E-010	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACC13456
05ATLAKFACC23456	4.606E-010	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACC23456
05ATLAKFACCF1-6	6.164E-009	3	GLOBAL FAILURE OF 05ATLAKFACCF1-6
05ATLAKFACCF12	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF12
05ATLAKFACCF123	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF123
05ATLAKFACCF1234	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1234
05ATLAKFACCF1235	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1235
05ATLAKFACCF1236	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1236
05ATLAKFACCF124	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF124
05ATLAKFACCF1245	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1245
05ATLAKFACCF1246	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1246
05ATLAKFACCF125	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF125
05ATLAKFACCF1256	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1256
05ATLAKFACCF126	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF126
05ATLAKFACCF13	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF13
05ATLAKFACCF134	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF134
05ATLAKFACCF1345	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1345

Table 12
Basic Event Descriptions (continued)

05ATLAKFACCF1346	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1346
05ATLAKFACCF135	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF135
05ATLAKFACCF1356	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1356
05ATLAKFACCF136	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF136
05ATLAKFACCF14	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF14
05ATLAKFACCF145	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF145
05ATLAKFACCF1456	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF1456
05ATLAKFACCF146	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF146
05ATLAKFACCF15	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF15
05ATLAKFACCF156	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF156
05ATLAKFACCF16	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF16
05ATLAKFACCF23	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF23
05ATLAKFACCF234	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF234
05ATLAKFACCF2345	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF2345
05ATLAKFACCF2346	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF2346
05ATLAKFACCF235	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF235
05ATLAKFACCF2356	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF2356
05ATLAKFACCF236	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF236
05ATLAKFACCF24	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF24
05ATLAKFACCF245	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF245
05ATLAKFACCF2456	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF2456
05ATLAKFACCF246	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF246
05ATLAKFACCF25	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF25
05ATLAKFACCF256	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF256
05ATLAKFACCF26	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF26
05ATLAKFACCF34	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF34
05ATLAKFACCF345	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF345
05ATLAKFACCF3456	2.960E-010	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF3456
05ATLAKFACCF346	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF346
05ATLAKFACCF35	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF35
05ATLAKFACCF356	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF356
05ATLAKFACCF36	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF36
05ATLAKFACCF45	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF45
05ATLAKFACCF456	5.110E-010	3	TRIPLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF456
05ATLAKFACCF46	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF46
05ATLAKFACCF56	1.472E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05ATLAKFACCF56
05AVC-FW10A--OP	7.197E-005	4	INDEPENDENT FAILURECONTROLLER FOR AOV FW-10A FAILURE
05AVC-FW10B--OP	7.197E-005	4	INDEPENDENT FAILURECONTROLLER FOR AOV FW-10B FAILURE
05AVC-FW7A---OP	7.197E-005	4	INDEPENDENT FAILURECONTROLLER FOR AOV FW-7A FAILURE
05AVC-FW7B---OP	7.197E-005	4	INDEPENDENT FAILURECONTROLLER FOR AOV FW-7B FAILURE
05AVC-KOPCCF1-4	1.340E-006	3	GLOBAL FAILURE OF 05AVC-KOPCCF1-4
05AVC-KOPCCF12	5.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF12
05AVC-KOPCCF123	2.420E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF123
05AVC-KOPCCF124	2.420E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF124
05AVC-KOPCCF13	5.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF13
05AVC-KOPCCF134	2.420E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF134
05AVC-KOPCCF14	5.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF14
05AVC-KOPCCF23	5.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF23
05AVC-KOPCCF234	2.420E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF234
05AVC-KOPCCF24	5.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF24
05AVC-KOPCCF34	5.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)05AVC-KOPCCF34
05B-AF4------HE	2.860E-002	3	OPERATOR FAILS TO ESTABLISH AUXILIARYFEEDWATER
05B-AFW-ISO--HE	1.968E-002	3	OPERATOR FAILS TO ISOLATE STEAM FROM BROKEN SG TO TDAFWP
05B-AFW-LTC--HE	1.000E-006	3	OPERATOR FAILS TO PROVIDE LONG-TERM COOLING VIA AFW,RHR

Table 12
Basic Event Descriptions (continued)

05B-AFW-SLB--HE	1.925E-002	3	OPERATOR FAILS TO RESTART AFW PUMPS IN STEAM LINE BREAK
05B-AFW-SLB-SHE	1.000E+000	3	OPERATOR FAILS TO RESTART AFW PUMPS IN SLB (SEISMIC)
05B-BYALOP-F-HE	4.400E-001	3	FAIL TO BYPASS AFW ALOP PERMISSIVE LARGE FW BREAK
05B-CST-DIAG-HE	8.656E-004	3	OPERATOR FAILS TO DIAGNOSE NEED FOR ALTERNATE AFW SRC
05B-CST-DIAGSHE	1.000E+000	3	OPERATOR FAILS TO DIAGNOSE NEED FOR ALTERNATE AFW - SEI
05B-CST-SWS--HE	7.043E-003	3	OPERATOR FAILS TO SWITCH AFW FROM CSTTO SWS
05B-CST-SWS-SHE	1.000E+000	3	OPERATOR FAILS TO SWITCH AFW FROM CSTTO SWS (SEISMIC)
05B-FRACTDP-OFF	9.000E-001	3	PROB OF CONDITIONS WHERE TDAFP IS SECURED
05B-MDPTD1CF-HE	1.600E-001	3	Start TD AFW Pump before loss of MD AFW Pump - 108 min.
05B-MDPTD2HF-HE	4.100E-002	3	Start TD AFW Pump before loss of MD AFW Pump - 2 Hr.
05B-MDPTD36F-HE	4.700E-001	3	Start DT AFW Pump before loss of MD AFW Pump - 36 min.
05B-MDPTD49F-HE	4.700E-001	3	Start TD AFW Pump before loss of MD AFW Pump - 49 min.
05B-MDPTD61F-HE	3.100E-001	3	Start TD AFW Pump before loss of MD AFW Pump - 61 min.
05B-MU3A-CHW-HE	2.470E-002	3	OPERATOR FAILS TO ISOLATE AOV MU-3A ON HIGH CNDSR LEVEL
05B-MU3A-SBO-HE	3.781E-003	3	OPERATOR FAILS TO ISOLATE AOV MU-3A DURING BLACKOUT
05B-MU3A-TIA-HE	9.800E-003	3	OPERATOR FAILS TO ISOLATE AOV MU-3A DURING LOSS OF AIR
05B-SG-RFLX-MHE	8.069E-002	3	OPERATOR FAILS TO ESTABLISH SG REFLUX COOLING
05B-TDAFW-PS-HE	7.040E-003	3	OP FAILS TO START TDAFW PMP BEFORE LOSS OF MD PMP
05B-TDAFWSG-MHE	7.319E-002	3	OPERATOR FAILS TO ALIGN TD AFW PUMP TO S/G
05BAFW-DSP---HE	4.649E-003	3	OPERATOR FAILS TO ESTABLISH AUXILIARYFEEDWATER FROM DSP
05BAFW-MAN---HE	8.051E-002	3	OPERATOR FAILS TO ESTABLISH AUXILIARYFEEDWATER MANUALLY
05BAV--AFW2A-OC	1.032E-005	4	INDEPENDENT FAILUREAOV AFW-2A TRANSFERS CLOSED
05BAV--AFW2B-OC	1.032E-005	4	INDEPENDENT FAILUREAOV AFW-2B TRANSFERS CLOSED
05BAV-KOCCCF12	2.420E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BAV-KOCCCF12
05BCN-32029--RC	2.999E-004	3	INDEPENDENT FAILUREACTUATOR 32029 CONTACT FAILS
05BCN-32030--RC	2.999E-004	3	INDEPENDENT FAILUREACTUATOR 32030 CONTACT FAILS
05BCN-32031--RC	2.999E-004	3	INDEPENDENT FAILUREACTUATOR 32031 CONTACT FAILS
05BCN-33X165-CO	3.284E-003	4	TURBINE DRIVEN AUX FEED PUMP DISCHPRESSURE TRIP FAILS
05BCN-33X165-RC	2.999E-004	3	RELAY 33X/1-165 CONTACTS FAIL
05BCN-62T165-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 62T/1-165 CONTACTS FAIL
05BCN-62T1652RC	2.999E-004	3	INDEPENDENT FAILURERELAY 62T2/1-165 CONTACTS FAIL
05BCN-62T504-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 62T/1-504 CONTACTS FAIL
05BCN-62T5041RC	2.999E-004	3	INDEPENDENT FAILURERELAY 62T1/1-504 CONTACTS FAIL
05BCN-62T604-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 62T/1-604 CONTACTS FAIL
05BCN-62T6041RC	2.999E-004	3	INDEPENDENT FAILURERELAY 62T1/1-604 CONTACTS FAIL
05BCN0KRCCCF12	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BCN0KRCCCF12
05BCN0KRCCCF123	7.740E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BCN0KRCCCF123
05BCN0KRCCCF13	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BCN0KRCCCF13
05BCN0KRCCCF23	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BCN0KRCCCF23
05BCN1KRCCCF12	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)CN ON 32029/30 FAIL
05BCN1KRCCCF123	7.740E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)SW TO AFW MOV CN FL
05BCN1KRCCCF13	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)CN ON 32029/31 FAIL
05BCN1KRCCCF23	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)CN ON 32030/31 FAIL
05BCN62T1165-CO	3.284E-003	4	TURBINE DRIVEN AUX FEED PUMP DISCHPRESSURE TRIP FAILS
05BCN62T1165-RC	2.999E-004	3	RELAY 62T1/1-165 CONTACTS FAIL
05BCNCKRCCCF12	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BCNCKRCCCF12

Table 12
Basic Event Descriptions (continued)

05BCNCKRCCCF123	7.740E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BCNCKRCCCF123
05BCNCKRCCCF13	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BCNCKRCCCF13
05BCNCKRCCCF23	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BCNCKRCCCF23
05BCNDKRCCCF12	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)15536J/37J CN FAIL
05BCNDKRCCCF123	7.740E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)15536J/37J/38J CN
05BCNDKRCCCF13	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)15536J/38J CN FAIL
05BCNDKRCCCF23	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)15537J/38J CN FAIL
05BCNPS15502JRC	2.999E-004	3	INDEPENDENT FAILUREPS PS-15502J CONTACTS FAIL
05BCNPS15503JRC	2.999E-004	3	INDEPENDENT FAILUREPS PS-15503J CONTACTS FAIL
05BCNPS15504JRC	2.999E-004	3	INDEPENDENT FAILUREPS PS-15504J CONTACTS FAIL
05BCNPS15536JRC	2.999E-004	3	INDEPENDENT FAILUREPS PS-15536J CONTACTS FAIL
05BCNPS15537JRC	2.999E-004	3	INDEPENDENT FAILUREPS PS-15537J CONTACTS FAIL
05BCNPS15538JRC	2.999E-004	3	INDEPENDENT FAILUREPS PS-15586J CONTACTS FAIL
05BCNSKRCCCF12	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW SPT TDCN A/B
05BCNSKRCCCF123	7.740E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)AFW SPT TDCN
05BCNSKRCCCF13	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW SPT TDCN A/TD
05BCNSKRCCCF23	3.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW SPT TDCN B/TD
05BCV-KFOCCF12	1.310E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-101A/B FTO
05BCV-KFOCCF123	1.360E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)AFW-101A/B/C FTO
05BCV-KFOCCF13	1.310E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-101A/C FTO
05BCV-KFOCCF23	1.310E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-101B/C FTO
05BCV-KOCCCF12	2.700E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW4A/B TRN CLOSED
05BCVAFW101A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-101A FTO
05BCVAFW101B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-101B FTO
05BCVAFW101C-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-101C FTO
05BCVD-AFW1A-FC	9.999E-004	3	CHECK VALVE AFW-1A FAILS TO CLOSE
05BCVD-AFW1A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-1A FAILS TO OPEN
05BCVD-AFW1B-FC	9.999E-004	3	CHECK VALVE AFW-1B FAILS TO CLOSE
05BCVD-AFW1B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-1B FAILS TO OPEN
05BCVD-AFW1C-FC	9.999E-004	3	CHECK VALVE AFW-1C FAILS TO CLOSE
05BCVD-AFW1C-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-1C FAILS TO OPEN
05BCVD-MU311C-FC	1.000E-003	3	CHECK VALVE MU-311CFAILS TO CLOSE
05BCVDKFOCCF12	1.310E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-1A/B FTO
05BCVDKFOCCF123	1.360E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)AFW-1A/B/C FTO
05BCVDKFOCCF13	1.310E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-1A/C FTO
05BCVDKFOCCF23	1.310E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-1B/C FTO
05BCVI-AFW4A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-4A FAILS TO OPEN
05BCVI-AFW4A-OC	1.200E-007	4	INDEPENDENT FAILURECHECK VALVE AFW-4A TRANSFERS CLOSED
05BCVI-AFW4B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE AFW-4B FAILS TO OPEN
05BCVI-AFW4B-OC	1.200E-007	4	INDEPENDENT FAILURECHECK VALVE AFW-4B TRANSFERS CLOSED
05BCVIKFOCCF12	1.490E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BCVIKFOCCF12
05BFAFWA-CAL-AE	8.158E-004	3	TECHNICIAN MISCALIBRATES AFW TRAIN A FLOW
05BFAFWB-CAL-AE	8.158E-004	3	TECHNICIAN MISCALIBRATES AFW TRAIN B FLOW
05BMV-AFW10A-FC	1.905E-003	3	MOV AFW-10A FAILS TO CLOSE
05BMV-AFW10A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV AFW-10A FAILS TO OPEN
05BMV-AFW10A-OC	1.200E-006	4	INDEPENDENT FAILUREMOV AFW-10A TRANSFERS CLOSED
05BMV-AFW10B-FC	1.905E-003	3	MOV AFW-10B FAILS TO CLOSE
05BMV-AFW10B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV AFW-10B FAILS TO OPEN
05BMV-AFW10B-OC	1.200E-006	4	INDEPENDENT FAILUREMOV AFW-10B TRANSFERS CLOSED
05BMV-KFOCCF12	4.500E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-10A/B FTO
05BMV-KOCCCF12	2.820E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW-10A/B TRN CLS
05BMVI-MS102-FO	2.375E-003	3	MOV MS-102 FAILS TOOPEN
05BPM--AFW1A-PR	8.159E-004	4	INDEPENDENT FAILUREAUXILIARY FEEDWATERPUMP A FAILS TO RUN

Table 12
Basic Event Descriptions (continued)

05BPM--AFW1A-PS	8.049E-004	3	INDEPENDENT FAILUREAUXILIARY FEEDWATERPUMP A FTS
05BPM--AFW1A-TM	1.680E-003	3	AFW PUMP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
05BPM--AFW1B-PR	8.159E-004	4	INDEPENDENT FAILUREAUXILIARY FEEDWATERPUMP B FAILS TO RUN
05BPM--AFW1B-PS	8.049E-004	3	INDEPENDENT FAILUREAUXILIARY FEEDWATERPUMP B FTS
05BPM--AFW1B-TM	2.050E-003	3	AFW PUMP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
05BPMALOP1A--PR	3.401E-005	4	INDEPENDENT FAILUREAFW PUMP A AUX LUBEOIL PUMP FTR
05BPMALOP1A--PS	1.110E-003	3	INDEPENDENT FAILUREAFW PUMP A AUX LUBEOIL PUMP FTS
05BPMALOP1B--PR	3.401E-005	4	INDEPENDENT FAILUREAFW PUMP B AUX LUBEOIL PUMP FTR
05BPMALOP1B--PS	1.110E-003	3	INDEPENDENT FAILUREAFW PUMP B AUX LUBEOIL PUMP FTS
05BPMALOP1C--PR	3.401E-005	4	INDEPENDENT FAILURETD AFW PUMP AUX LUBE OIL PUMP FTR
05BPMALOP1C--PS	1.110E-003	3	INDEPENDENT FAILURETD AFW PUMP AUX LUBE OIL PUMP FTS
05BPMLKPRCCF12	4.220E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)AFW ALOP A,B FTR
05BPMLKPRCCF123	2.030E-006	4	TRIPLE COMMON CAUSE FAILURE (CCF)AFW ALOP A,B,TD FTR
05BPMLKPRCCF13	4.220E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)AFW ALOP A,TD FTR
05BPMLKPRCCF23	4.220E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)AFW ALOP B,TD FTR
05BPMOKPSCCF12	2.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMOKPSCCF12
05BPMOKPSCCF123	1.050E-004	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BPMOKPSCCF123
05BPMOKPSCCF13	2.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMOKPSCCF13
05BPMOKPSCCF23	2.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMOKPSCCF23
05BPMRKPRCCF12	1.230E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMRKPRCCF12
05BPMRKPRCCF123	1.450E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BPMRKPRCCF123
05BPMRKPRCCF13	1.740E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMRKPRCCF13
05BPMRKPRCCF23	1.740E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMRKPRCCF23
05BPMSKPSCCF12	2.290E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMSKPSCCF12
05BPMSKPSCCF123	1.380E-004	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BPMSKPSCCF123
05BPMSKPSCCF13	4.320E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMSKPSCCF13
05BPMSKPSCCF23	4.320E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPMSKPSCCF23
05BPS-KOPCCF12	3.630E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPS-KOPCCF12
05BPS-KOPCCF123	7.740E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BPS-KOPCCF123
05BPS-KOPCCF13	3.630E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPS-KOPCCF13
05BPS-KOPCCF23	3.630E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BPS-KOPCCF23
05BPSPS15502JOP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-15505J
05BPSPS15503JOP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-15503J
05BPSPS15504JOP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-15504J
05BPSPS15536JOP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-15536J
05BPSPS15537JOP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-15537J
05BPSPS15538JOP	2.999E-007	3	INDEPENDENT FAILUREFAILURE OF PRESSURESWITCH PS-15538J
05BPSSKOPCCF12	3.630E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)15536J/37J FTOP
05BPSSKOPCCF123	7.740E-009	3	TRIPLE COMMON CAUSE FAILURE (CCF)15536J/37J/38J FTO
05BPSSKOPCCF13	3.630E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)15536J/38J FTOP
05BPSSKOPCCF23	3.630E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)15537J/38J FTOP
05BPT--AFW1C-PR	2.637E-003	4	INDEPENDENT FAILURETD AFW PUMP FAILS TO RUN
05BPT--AFW1C-PS	2.013E-002	3	INDEPENDENT FAILURETD AFW PUMP FAILS TO START
05BPT--AFW1C-TM	3.930E-003	3	TD AFW PUMP UNAVAILABLE DUE TO TEST OR MAINTENANCE
05BRE-62T165-RB	3.279E-003	4	INDEPENDENT FAILURERELAY 62T/1-165 MECH BOUND
05BRE-62T1652RB	3.279E-003	4	INDEPENDENT FAILURERELAY 62T2/1-165 MECH BOUND
05BRE-62T504-RB	3.279E-003	4	INDEPENDENT FAILURERELAY 62T/1-504 MECH BOUND
05BRE-62T5041RB	3.279E-003	4	INDEPENDENT FAILURERELAY 62T1/1-504 MECH BOUND
05BRE-62T604-RB	3.279E-003	4	INDEPENDENT FAILURERELAY 62T/1-604 MECH BOUND

Table 12
Basic Event Descriptions (continued)

05BRE-62T6041RB	3.279E-003	4	INDEPENDENT FAILURERELAY 62T1/1-604 MECH BOUND
05BRE-KRBCCF12	1.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BRE-KRBCCF12
05BRE-KRBCCF123	4.230E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BRE-KRBCCF123
05BRE-KRBCCF13	1.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BRE-KRBCCF13
05BRE-KRBCCF23	1.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BRE-KRBCCF23
05BRE62T1165-RB	3.279E-003	4	RELAY 62T1/1-165 MECHANICALLY BOUND
05BRESKRBCCF12	1.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW SPT TDRS A/B
05BRESKRBCCF123	4.230E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)AFW SPT TDRS
05BRESKRBCCF13	1.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW SPT TDRS A/TD
05BRESKRBCCF23	1.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)AFW SPT TDRS B/TD
05BSB-ADPTBY-FA FAILS	6.548E-003	4	INDEPENDENT FAILUREAFWP A DISCH P TRIPBYPASS SWITCH
05BSB-ASPTBY-FA FAILS	6.548E-003	4	INDEPENDENT FAILUREAFWP A SUCT P TRIP BYPASS SWITCH
05BSB-BDPTBY-FA FAILS	6.548E-003	4	INDEPENDENT FAILUREAFWP B DISCH P TRIPBYPASS SWITCH
05BSB-BSPTBY-FA FAILS	6.548E-003	4	INDEPENDENT FAILUREAFWP B SUCT P TRIP BYPASS SWITCH
05BSB-CDPTBY-FA FAILS	6.548E-003	4	INDEPENDENT FAILURETD AFWP DISCH PTRIPBYPASS SWITCH
05BSB-CSPTBY-FA FAILS	6.548E-003	4	INDEPENDENT FAILURETD AFWP SUCT P TRIPBYPASS SWITCH
05BSB-KFACCF12	3.960E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BSB-KFACCF12
05BSB-KFACCF123	8.450E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BSB-KFACCF123
05BSB-KFACCF13	3.960E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BSB-KFACCF13
05BSB-KFACCF23	3.960E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BSB-KFACCF23
05BSBSKFACCF12	3.960E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SUCT P T A/B FAIL
05BSBSKFACCF123	8.450E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)SUCT P T A/B/TD FL
05BSBSKFACCF13	3.960E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SUCT P T A/TD FAIL
05BSBSKFACCF23	3.960E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SUCT P T B/TD FAIL
05BSV-KFOCCF12	6.050E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BSV-KFOCCF12
05BSV-KFOCCF123	1.290E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)05BSV-KFOCCF123
05BSV-KFOCCF13	6.050E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BSV-KFOCCF13
05BSV-KFOCCF23	6.050E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)05BSV-KFOCCF23
05BSVAFW111A-FO	4.999E-004	3	INDEPENDENT FAILURESOV AFW-111A FAILS TO OPEN
05BSVAFW111B-FO	4.999E-004	3	INDEPENDENT FAILURESOV AFW-111B FAILS TO OPEN
05BSVAFW111C-FO	4.999E-004	3	INDEPENDENT FAILURESOV AFW-111C FAILS TO OPEN
06--IS2------HE	4.280E-003	3	OPERATOR FAILS TO ISOLATE 1 OF 2 STEAM GENERATORS
06--OC1------HE INJECT	3.655E-002	3	OPERATOR FAILS TO CD AND DEPRES RCS FOR LOW PRES
06--OC1-----SHE	1.000E+000	3	OPERATOR FAILS TO CD AND DEPRES RCS FOR LPI (SEISMIC)
06--OC2------HE	4.722E-002	3	OPERATOR FAILS TO CD AND DEPRES RCS FOR CHARGING
06--OC2----F-HE	7.400E-002	3	LOCAL OPERATION OF S/G PORV
06--OC3------HE	2.330E-002	3	OPERATOR FAILS TO CD AND DEPRES RCS TO STOP TUBE LEAK
06--OC4------HE	1.850E-001	3	OPERATOR FAILS TO CD AND DEPRES RCS IN ECA-3.1/3.2
06--OC6----F-HE	9.200E-002	3	FAIL TO COOLDOWN PER ES-1.2
06--OCD-SLB--HE BREAK	7.737E-002	3	OPERATOR FAILS TO DEPRESSURIZE AFTER A STEAM LINE
06--OCD-SLB-SHE	1.000E+000	3	OPERATOR FAILS TO DEPRESSURIZE AFTER AN SLB - SEISMIC
06-AV---MS1A-FC	2.000E-003	3	INDEPENDENT FAILUREAOV MS-1A FAILS TO CLOSE
06-AV---MS1B-FC	2.000E-003	3	INDEPENDENT FAILUREAOV MS-1B FAILS TO CLOSE
06-AV-KFCCCF12	4.900E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-AV-KFCCCF12
06-AV-KFOCCF1-4	1.300E-005	3	GLOBAL FAILURE OF 06-AV-KFOCCF1-4
06-AV-KFOCCF12	2.600E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF12
06-AV-KFOCCF123	2.470E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF123
06-AV-KFOCCF124	2.470E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF124

Table 12
Basic Event Descriptions (continued)

06-AV-KFOCCF13	2.600E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF13
06-AV-KFOCCF134	2.470E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF134
06-AV-KFOCCF14	2.600E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF14
06-AV-KFOCCF23	2.600E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF23
06-AV-KFOCCF234	2.470E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF234
06-AV-KFOCCF24	2.600E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF24
06-AV-KFOCCF34	4.480E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-AV-KFOCCF34
06-AV-SD11A1-FO	1.740E-003	3	INDEPENDENT FAILUREAOV SD-11A1 FAILS TO OPEN
06-AV-SD11B1-FO	1.740E-003	3	INDEPENDENT FAILUREAOV SD-11B1 FAILS TO OPEN
06-AV-SD3A---FO	3.000E-003	3	INDEPENDENT FAILUREAOV SD-3A FAILS TO OPEN
06-AV-SD3B---FO	3.000E-003	3	INDEPENDENT FAILUREAOV SD-3B FAILS TO OPEN
06-NOINDAFWF-HE	6.400E-001	3	Operator fails to feed S/G without Level indication
06-CN---MSA1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSA1 CONATCTSFAIL
06-CN---MSA2-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSA2 CONATCTSFAIL
06-CN---MSB1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSB1 CONATCTSFAIL
06-CN---MSB2-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSB2 CONATCTSFAIL
06-CN--MSA1X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSA1X CONTACTS FAIL
06-CN--MSA2X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSA2X CONTACTS FAIL
06-CN--MSB1X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSB1X CONTACTS FAIL
06-CN--MSB2X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY MSB2X CONTACTS FAIL
06-CN1KRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 06-CN1KRCCCF1-4
06-CN1KRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF12
06-CN1KRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF123
06-CN1KRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF124
06-CN1KRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF13
06-CN1KRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF134
06-CN1KRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF14
06-CN1KRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF23
06-CN1KRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF234
06-CN1KRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF24
06-CN1KRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN1KRCCCF34
06-CN2KRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 06-CN2KRCCCF1-4
06-CN2KRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF12
06-CN2KRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF123
06-CN2KRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF124
06-CN2KRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF13
06-CN2KRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF134
06-CN2KRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF14
06-CN2KRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF23
06-CN2KRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF234
06-CN2KRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF24
06-CN2KRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CN2KRCCCF34
06-CV---MS1A-FC	9.999E-004	3	NON-RETURN CHECK VALVE IN MS-1A FAILS TO CLOSE
06-CV---MS1B-FC	9.999E-004	3	NON-RETURN CHECK VALVE IN MS-1B FAILS TO CLOSE
06-CV-KFOCCF12	1.080E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-CV-KFOCCF12
06-CV-KOCCCF12	2.700E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)MS-101A/B TRN CLSD
06-CV-MS101A-FC	9.999E-004	3	CHECK VALVE MS-101AFAILS TO CLOSE
06-CV-MS101A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE MS-101AFAILS TO OPEN
06-CV-MS101A-OC	1.200E-007	4	INDEPENDENT FAILURECHECK VALVE MS-101ATRANSFERS
CLOSED			
06-CV-MS101B-FC	9.999E-004	3	CHECK VALVE MS-101BFAILS TO CLOSE
06-CV-MS101B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE MS-101BFAILS TO OPEN
06-CV-MS101B-OC	1.200E-007	4	INDEPENDENT FAILURECHECK VALVE MS-101BTRANSFERS
CLOSED			
06-MV-KOCCCF12	2.820E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)MS-100A/B TRANS CLS
06-MV-MS100A-FC	1.905E-003	3	MOV MS-100A FAILS TO CLOSE

Table 12
Basic Event Descriptions (continued)

06-MV-MS100A-OC	1.200E-006	4	INDEPENDENT FAILUREMOV MS-100A TRANSFERS CLOSED
06-MV-MS100B-FC	1.905E-003	3	MOV MS-100B FAILS TO CLOSE
06-MV-MS100B-OC	1.200E-006	4	INDEPENDENT FAILUREMOV MS-100B TRANSFERS CLOSED
06-RE---MSA1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSA1 FAILS TOOPERATE
06-RE---MSA2-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSA2 FAILS TOOPERATE
06-RE---MSB1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSB1 FAILS TOOPERATE
06-RE---MSB2-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSB2 FAILS TOOPERATE
06-RE--MSA1X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSA1X FAILS TO OPERATE
06-RE--MSA2X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSA2X FAILS TO OPERATE
06-RE--MSB1X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSB1X FAILS TO OPERATE
06-RE--MSB2X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY MSB2X FAILS TO OPERATE
06-RE1KRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 06-RE1KRFCCF1-4
06-RE1KRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF12
06-RE1KRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF123
06-RE1KRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF124
06-RE1KRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF13
06-RE1KRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF134
06-RE1KRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF14
06-RE1KRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF23
06-RE1KRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF234
06-RE1KRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF24
06-RE1KRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE1KRFCCF34
06-RE2KRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 06-RE2KRFCCF1-4
06-RE2KRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF12
06-RE2KRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF123
06-RE2KRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF124
06-RE2KRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF13
06-RE2KRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF134
06-RE2KRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF14
06-RE2KRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF23
06-RE2KRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF234
06-RE2KRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF24
06-RE2KRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-RE2KRFCCF34
06-SV-33177--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33177 FAILS TO OPEN
06-SV-33178--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33178 FAILS TO OPEN
06-SV-33185--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33185 FAILS TO OPEN
06-SV-33186--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33186 FAILS TO OPEN
06-SV-KFOCCF1-4	9.300E-006	3	GLOBAL FAILURE OF 06-SV-KFOCCF1-4
06-SV-KFOCCF12	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF12
06-SV-KFOCCF123	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF123
06-SV-KFOCCF124	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF124
06-SV-KFOCCF13	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF13
06-SV-KFOCCF134	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF134
06-SV-KFOCCF14	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF14
06-SV-KFOCCF23	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF23
06-SV-KFOCCF234	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF234
06-SV-KFOCCF24	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF24
06-SV-KFOCCF34	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-SV-KFOCCF34
06-SY--MSIAB-FA	1.415E-004	3	MAIN STEAM ISOLATION SIGNAL FAILS
06-VC-KOPCCF12	4.360E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-VC-KOPCCF12
06-VC-KOPCCF123	9.290E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)06-VC-KOPCCF123
06-VC-KOPCCF13	4.360E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-VC-KOPCCF13
06-VC-KOPCCF23	4.360E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)06-VC-KOPCCF23
06-VC-SD3A---OP	7.197E-005	4	INDEPENDENT FAILURECONTROLLER FOR AOV SD-3A FAILURE
06-VC-SD3B---OP	7.197E-005	4	INDEPENDENT FAILURECONTROLLER FOR AOV SD-3B FAILURE
06-VC-STMDMP-OP	7.197E-005	4	INDEPENDENT FAILURESTEAM DUMP CONTROL FAILURE

Table 12
Basic Event Descriptions (continued)

07-MV---BT2A-FC	1.905E-003	3	INDEPENDENT FAILUREMOV BT-2A FAILS TO CLOSE
07-MV---BT2B-FC	1.905E-003	3	INDEPENDENT FAILUREMOV BT-2B FAILS TO CLOSE
07-MV---BT3A-FC	1.905E-003	3	INDEPENDENT FAILUREMOV BT-3A FAILS TO CLOSE
07-MV---BT3B-FC	1.905E-003	3	INDEPENDENT FAILUREMOV BT-3B FAILS TO CLOSE
07-MV-KFCCCF1-4	4.930E-005	3	GLOBAL FAILURE OF 07-MV-KFCCCF1-4
07-MV-KFCCCF12	2.460E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF12
07-MV-KFCCCF123	1.090E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF123
07-MV-KFCCCF124	1.090E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF124
07-MV-KFCCCF13	2.460E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF13
07-MV-KFCCCF134	1.090E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF134
07-MV-KFCCCF14	2.460E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF14
07-MV-KFCCCF23	2.460E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF23
07-MV-KFCCCF234	1.090E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF234
07-MV-KFCCCF24	2.460E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF24
07-MV-KFCCCF34	2.460E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)07-MV-KFCCCF34
08-FPISO29-F-HE	1.000E+000	3	ISOL FIRE PUMP DURING FLOOD EVENT - 29MINUTES
08-FPISO45-F-HE	6.600E-002	3	ISOL FIRE PUMP DURING FLOOD EVENT - 45MINUTES
08-FPISO56-F-HE	2.400E-002	3	ISOL FIRE PUMP DURING FLOOD EVENT - 56MINUTES
08-FPISO68F-HE	1.600E-002	3	ISOL FIRE PUMP DURING FLOOD EVENT - 68 MINUTES
08-FPSISO1CF-HE	3.000E-002	3	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT(SM)-100 MIN
08-FPSISO29F-HE	1.000E+000	3	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 29 MIN.
08-FPSISO2CF-HE	3.000E-002	3	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT(SM)-150 MIN
08-FPSISO3CF-HE	3.000E-002	3	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT(SM)-170 MIN
08-FPSISO45F-HE	6.600E-002	3	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 45 MIN.
08-FPSISO56F-HE	3.000E-002	3	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 56 MIN.
08-FPSISO68F-HE	3.000E-002	3	ISOLATE FIRE SPRINKLERS DURING FLOOD/ MS EVENT - 68 MIN.
08-ISO-FS18F-HE	1.000E+000	3	ISOLATE SPRINKLERS LARGE FLOOD/FW EVENT IN 18 MIN
08-ISO-FS2HF-HE	1.700E-002	3	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 2 HR.
08-ISO-FS33F-HE	4.400E-001	3	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 33 MIN
08-ISO-FS40F-HE	1.300E-001	3	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 40 MIN
08-ISO-FS54F-HE	3.000E-002	3	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 54 MIN.
08-ISO-FS55F-HE	3.000E-002	3	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT (SM) - 55 MIN.
08-ISO-FS97F-HE	3.000E-002	3	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT (SM) - 97 MIN.
10--MAN-EDG--HE	8.400E-004	3	OPERATOR FAILS TO START AND LOAD DIESEL MANUALLY
10-BY-TDGB---OP	1.782E-005	4	TSC DIESEL STARTUP BATTERY FAILURE
10-DGA-DSP---HE	1.115E-002	3	OPERATOR FAILS TO START AND LOAD DIESEL FROM DSP
10-DGB-MAN---HE	5.010E-002	3	OPERATOR FAILS TO START AND LOAD DIESEL MANUALLY
10-GE-DG1A---AE	1.629E-003	3	OPERATOR FAILS TO RESTORE DG A AFTER TEST
10-GE-DG1A---PR	3.904E-002	4	INDEPENDENT FAILUREDIESEL GENERATOR A FAILS TO RUN
10-GE-DG1A---PS	5.627E-003	3	INDEPENDENT FAILUREDIESEL GENERATOR A FAILS TO START
10-GE-DG1A---TM	1.330E-002	3	DIESEL GENERATOR A UNAVAILABLE DUE TO TEST OR MAINTENANCE
10-GE-DG1B---AE	1.629E-003	3	OPERATOR FAILS TO RESTORE DG B AFTER TEST
10-GE-DG1B---PR	3.904E-002	4	INDEPENDENT FAILUREDIESEL GENERATOR B FAILS TO RUN
10-GE-DG1B---PS	5.627E-003	3	INDEPENDENT FAILUREDIESEL GENERATOR B FAILS TO START
10-GE-DG1B---TM	1.180E-002	3	DIESEL GENERATOR B UNAVAILABLE DUE TO TEST OR MAINTENANCE

Table 12
Basic Event Descriptions (continued)

10-GE-TSC-DG-AE	8.558E-003	3	OPERATOR FAILS TO RESTORE TSC DIESEL AFTER TEST
10-GE-TSC-DG-PR	3.587E-002	4	TSC DIESEL GENERATOR FAILS TO RUN
10-GE-TSC-DG-PS	7.610E-003	3	TSC DIESEL GENERATOR FAILS TO START
10-GE-TSC-DG-TM	1.470E-002	3	TSC DG UNAVAILABLE DUE TO TEST OR MAINTENANCE
10-GERKPRCCF12	3.010E-003	4	DOUBLE COMMON CAUSE FAILURE (CCF)10-GERKPRCCF12
10-GESKPSCCF12	3.410E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)10-GESKPSCCF12
10-SS-28265--OP SW	2.999E-007	3	INDEPENDENT FAILUREDIESEL GENERATOR A SPEED SENSITIVE
10-SS-28266--OP SW	2.999E-007	3	INDEPENDENT FAILUREDIESEL GENERATOR B SPEED SENSITIVE
10-SS-KOPCCF12	7.050E-009	3	DOUBLE COMMON CAUSE FAILURE (CCF)10-SS-KOPCCF12
14-AD-CHAN-1-FA	1.116E-004	4	INDEPENDENT FAILURECHANNEL 1 COMPARATOR FAILS
14-AD-CHAN-2-FA	1.116E-004	4	INDEPENDENT FAILURECHANNEL 2 COMPARATOR FAILS
14-AD-CHAN-3-FA	1.116E-004	4	INDEPENDENT FAILURECHANNEL 3 COMPARATOR FAILS
14-AD-KFACCF12	6.780E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-AD-KFACCF12
14-AD-KFACCF123	1.440E-006	4	TRIPLE COMMON CAUSE FAILURE (CCF)14-AD-KFACCF123
14-AD-KFACCF13	6.780E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-AD-KFACCF13
14-AD-KFACCF23	6.780E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-AD-KFACCF23
14-AM-CHAN-1-FA	1.116E-004	4	INDEPENDENT FAILURECHANNEL 1 R/I CONVERTER FAILS
14-AM-CHAN-2-FA	1.116E-004	4	INDEPENDENT FAILURECHANNEL 2 R/I CONVERTER FAILS
14-AM-CHAN-3-FA	1.116E-004	4	INDEPENDENT FAILURECHANNEL 3 R/I CONVERTER FAILS
14-AM-KFACCF12	6.780E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-AM-KFACCF12
14-AM-KFACCF123	1.440E-006	4	TRIPLE COMMON CAUSE FAILURE (CCF)14-AM-KFACCF123
14-AM-KFACCF13	6.780E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-AM-KFACCF13
14-AM-KFACCF23	6.780E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-AM-KFACCF23
14-CN-ABZXA--RC ABZXA	2.999E-004	3	INDEPENDENT FAILURETRAIN A BOUNDARY DAMPER RELAY
14-CN-ABZXB--RC ABZXB	2.999E-004	3	INDEPENDENT FAILURETRAIN B BOUNDARY DAMPER RELAY
14-CN-KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-CN-KRCCCF12
14-CN-SE-A/A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SE-A/A CONTACTS FAIL
14-CN-SE-A/B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SE-A/B CONTACTS FAIL
14-CN-SE10X--RC	2.999E-004	3	INDEPENDENT FAILURERELAY SE10X CONTACTS FAIL
14-CN-SE20X--RC	2.999E-004	3	INDEPENDENT FAILURERELAY SE20X CONTACTS FAIL
14-CN26XA/T1-RC	2.999E-004	3	INDEPENDANT FAILURERELAY 26XA/T1 CONTACTS FAIL
14-CN26XA/T2-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 26XA/T2 CONTACTS FAIL
14-CN26XA/T3-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 26XA/T3 CONTACTS FAIL
14-CN26XB/T1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 26XB/T1 CONTACTS FAIL
14-CN26XB/T2-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 26XB/T2 CONTACTS FAIL
14-CN26XB/T3-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 26XB/T3 CONTACTS FAIL
14-CNAKRCCC12345 CNF	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T12
14-CNAKRCCC12346 CNF	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T13
14-CNAKRCCC12356 CNF	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T23
14-CNAKRCCC12456 CNF	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T123
14-CNAKRCCC13456 CNF	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T123
14-CNAKRCCC23456 CNF	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T123
14-CNAKRCCCF1-6	3.691E-006	3	GLOBAL FAILURE OF CONTACTS26XA/T123,B/T123
14-CNAKRCCCF12	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XA/T2 CNF
14-CNAKRCCCF123	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T123 CNF

Table 12
Basic Event Descriptions (continued)

14-CNAKRCCCF1234	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T1 CNF
14-CNAKRCCCF1235	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T2 CNF
14-CNAKRCCCF1236	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T3 CNF
14-CNAKRCCCF124	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T1 CNF
14-CNAKRCCCF1245	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T12 CNF
14-CNAKRCCCF1246	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T13 CNF
14-CNAKRCCCF125	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T2 CNF
14-CNAKRCCCF1256	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T23 CNF
14-CNAKRCCCF126	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T3 CNF
14-CNAKRCCCF13	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XA/T3 CNF
14-CNAKRCCCF134	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T1 CNF
14-CNAKRCCCF1345	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T12 CNF
14-CNAKRCCCF1346	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T13 CNF
14-CNAKRCCCF135	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T13,A/T2 CNF
14-CNAKRCCCF1356	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T23 CNF
14-CNAKRCCCF136	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T13,A/T3 CNF
14-CNAKRCCCF14	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XB/T1 CNF
14-CNAKRCCCF145	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T12 CNF
14-CNAKRCCCF1456	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T123 CNF
14-CNAKRCCCF146	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T13 CNF
14-CNAKRCCCF15	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XB/T2 CNF
14-CNAKRCCCF156	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T23 CNF
14-CNAKRCCCF16	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XB/T3 CNF
14-CNAKRCCCF23	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T2,26XA/T3 CNF
14-CNAKRCCCF234	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T1 CNF
14-CNAKRCCCF2345	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T12 CNF
14-CNAKRCCCF2346	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T13 CNF
14-CNAKRCCCF235	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T2 CNF
14-CNAKRCCCF2356	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T23 CNF
14-CNAKRCCCF236	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T3 CNF
14-CNAKRCCCF24	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XB/T1 CNF
14-CNAKRCCCF245	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T12 CNF
14-CNAKRCCCF2456	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T123 CNF
14-CNAKRCCCF246	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T13 CNF
14-CNAKRCCCF25	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T2,26XB/T2 CNF
14-CNAKRCCCF256	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T23 CNF
14-CNAKRCCCF26	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T2,26XB/T3 CNF
14-CNAKRCCCF34	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T3,26XB/T1 CNF
14-CNAKRCCCF345	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T12 CNF
14-CNAKRCCCF3456	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T123 CNF
14-CNAKRCCCF346	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T13 CNF

Table 12
Basic Event Descriptions (continued)

14-CNAKRCCCF35	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T3,26XB/T2 CNF
14-CNAKRCCCF356	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T23 CNF
14-CNAKRCCCF36	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T3,26XB/T3 CNF
14-CNAKRCCCF45	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XB/T1,26XB/T2 CNF
14-CNAKRCCCF456	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XB/T123 CNF
14-CNAKRCCCF46	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XB/T1,26XB/T3 CNF
14-CNAKRCCCF56	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XB/T2,26XB/T3 CNF
14-CNMKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 14-CNMKRCCCF1-4
14-CNMKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF12
14-CNMKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF123
14-CNMKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF124
14-CNMKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF13
14-CNMKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF134
14-CNMKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF14
14-CNMKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF23
14-CNMKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF234
14-CNMKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF24
14-CNMKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-CNMKRCCCF34
14-DM-ACC10--FC	3.000E-003	3	INDEPENDENT FAILUREDAMPER ACC-10 FAIL TO CLOSE
14-DM-ACC11--FC	3.000E-003	3	INDEPENDENT FAILUREDAMPER ACC-11 FAIL TO CLOSE
14-DM-KFCCCF12	1.410E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)ACC-10, ACC-11 FTC
14-DM-TAV21--OC	7.198E-006	4	DAMPER TAV-21 TRANSFERS CLOSED
14-DM-TAV22--OC	7.198E-006	4	DAMPER TAV-22 TRANSFERS CLOSED
14-RE-ABZXA2-RF	1.859E-004	4	INDEPENDENT FAILURETRAIN A BOUNDARY DAMPER RELAY ABZXA2
14-RE-ABZXB3-RF	1.859E-004	4	INDEPENDENT FAILURETRAIN B BOUNDARY DAMPER RELAY ABZXB3
14-RE-KRFCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)RELAY ABZXA2,ABZXB3
14-RE-SE-A/A-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SE-A/A FAILS TO OPERATE
14-RE-SE-A/B-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SE-A/B FAILS TO OPERATE
14-RE-SE10X--RF	1.859E-004	4	INDEPENDENT FAILURERELAY SE10X FAILS TO OPERATE
14-RE-SE20X--RF	1.859E-004	4	INDEPENDENT FAILURERELAY SE20X FAILS TO OPERATE
14-RE26XA/T1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 26XA/T1 FAILSTO OPERATE
14-RE26XA/T2-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 26XA/T2 FAILSTO OPERATE
14-RE26XA/T3-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 26XA/T3 FAILSTO OPERATE
14-RE26XB/T1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 26XB/T1 FAILSTO OPERATE
14-RE26XB/T2-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 26XB/T2 FAILSTO OPERATE
14-RE26XB/T3-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 26XB/T3 FAILSTO OPERATE
14-REAKRFCC12345	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T12 FLR
14-REAKRFCC12346	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T13 FLR
14-REAKRFCC12356	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T23 FLR
14-REAKRFCC12456	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T123 FLR
14-REAKRFCC13456	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T123 FLR
14-REAKRFCC23456	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T123 FLR
14-REAKRFCCF1-6	1.147E-006	3	GLOBAL FAILURE OF RELAYS 26XA/T123,B/T123
14-REAKRFCCF12	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XA/T2 FLR
14-REAKRFCCF123	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T123 FLR
14-REAKRFCCF1234	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T1 FLR

Table 12
Basic Event Descriptions (continued)

14-REAKRFCCF1235	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T2 FLR
14-REAKRFCCF1236	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T123,B/T3 FLR
14-REAKRFCCF124	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T1 FLR
14-REAKRFCCF1245	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T12 FLR
14-REAKRFCCF1246	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T13 FLR
14-REAKRFCCF125	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T2 FLR
14-REAKRFCCF1256	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T23 FLR
14-REAKRFCCF126	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T12,B/T3 FLR
14-REAKRFCCF13	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XA/T3 FLR
14-REAKRFCCF134	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T1 FLR
14-REAKRFCCF1345	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T12 FLR
14-REAKRFCCF1346	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T13 FLR
14-REAKRFCCF135	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T2 FLR
14-REAKRFCCF1356	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T23 FLR
14-REAKRFCCF136	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T13,B/T3 FLR
14-REAKRFCCF14	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XB/T1 FLR
14-REAKRFCCF145	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T12 FLR
14-REAKRFCCF1456	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T123 FLR
14-REAKRFCCF146	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T13 FLR
14-REAKRFCCF15	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XB/T2 FLR
14-REAKRFCCF156	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T1,B/T23 FLR
14-REAKRFCCF16	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T1,26XB/T3 FLR
14-REAKRFCCF23	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T2,26XA/T3 FLR
14-REAKRFCCF234	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T1 FLR
14-REAKRFCCF2345	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T12 FLR
14-REAKRFCCF2346	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T13 FLR
14-REAKRFCCF235	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T2 FLR
14-REAKRFCCF2356	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T23 FLR
14-REAKRFCCF236	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T23,B/T3 FLR
14-REAKRFCCF24	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T2,26XB/T1 FLR
14-REAKRFCCF245	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T12 FLR
14-REAKRFCCF2456	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T123 FLR
14-REAKRFCCF246	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T13 FLR
14-REAKRFCCF25	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T2,26XB/T2 FLR
14-REAKRFCCF256	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T2,B/T23 FLR
14-REAKRFCCF26	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T2,26XB/T3 FLR
14-REAKRFCCF34	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T3,26XB/T1 FLR
14-REAKRFCCF345	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T12 FLR
14-REAKRFCCF3456	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T123 FLR
14-REAKRFCCF346	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T16 FLR
14-REAKRFCCF35	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T3,26XB/T2 FLR
14-REAKRFCCF356	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XA/T3,B/T23 FLR

Table 12
Basic Event Descriptions (continued)

14-REAKRFCCF36	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XA/T3,26XB/T3 FLR
14-REAKRFCCF45	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XB/T1,26XB/T2 FLR
14-REAKRFCCF456	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)26XB/T123 FLR
14-REAKRFCCF46	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XB/T1,26XB/T3 FLR
14-REAKRFCCF56	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)26XB/T2,26XB/T3 FLR
14-REMKRFCCF1-4	1.730E-006	4	GLOBAL FAILURE OF 14-REMKRFCCF1-4
14-REMKRFCCF12	6.600E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF12
14-REMKRFCCF123	3.130E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF123
14-REMKRFCCF124	3.130E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF124
14-REMKRFCCF13	6.600E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF13
14-REMKRFCCF134	3.130E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF134
14-REMKRFCCF14	6.600E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF14
14-REMKRFCCF23	6.600E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF23
14-REMKRFCCF234	3.130E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF234
14-REMKRFCCF24	6.600E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF24
14-REMKRFCCF34	6.600E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-REMKRFCCF34
14-SV-33439--OC	1.200E-005	4	SOV 33439 TRANSFER CLOSED
14-SV-33440--OC	1.200E-005	4	SOV 33440 TRANSFER CLOSED
14-SV-33443--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33443 FAILS TO OPEN
14-SV-33444--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33444 FAILS TO OPEN
14-SV-KFOCCF12	2.350E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)14-SV-KFOCCF12
14-TT-CHAN-1-FA	1.115E-003	4	INDEPENDENT FAILURECHANNEL 1 RTD FAILS
14-TT-CHAN-2-FA	1.115E-003	4	INDEPENDENT FAILURECHANNEL 2 RTD FAILS
14-TT-CHAN-3-FA	1.115E-003	4	INDEPENDENT FAILURECHANNEL 3 RTD FAILS
14-TT-KFACCF12	6.780E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-TT-KFACCF12
14-TT-KFACCF123	1.440E-005	4	TRIPLE COMMON CAUSE FAILURE (CCF)14-TT-KFACCF123
14-TT-KFACCF13	6.780E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-TT-KFACCF13
14-TT-KFACCF23	6.780E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)14-TT-KFACCF23
16-BATCLG--F-HE	7.900E-002	3	Establish Battery Room Cooling - Flood
16-DM-KFOCCF12	1.410E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-DM-KFOCCF12
16-DM-KOCCCF12	1.690E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)TAV-FD-18/20 TRN CL
16-DM-TAV20--OC	7.198E-006	4	DAMPER TAV-20 TRANSFERS CLOSED
16-DM-TAV2A--OC	7.198E-006	4	INDEPENDENT FAILUREDAMPER TAV-2A TRANSFERS CLOSED
16-DM-TAV2B--OC	7.198E-006	4	INDEPENDENT FAILUREDAMPER TAV-2B TRANSFERS CLOSED
16-DM-TAV2C--OC	7.198E-006	4	INDEPENDENT FAILUREDAMPER TAV-2C TRANSFERS CLOSED
16-DM-TAV60A-FO	3.000E-003	3	INDEPENDENT FAILUREDAMPER TAV-60A FAILS TO OPEN
16-DM-TAV60B-FO	3.000E-003	3	INDEPENDENT FAILUREDAMPER TAV-60B FAILS TO OPEN
16-DM-TAV62A-OC	1.288E-006	4	DAMPER TAV-62A TRANSFERS CLOSED
16-DM-TAV62B-OC	1.288E-006	4	DAMPER TAV-62B TRANSFERS CLOSED
16-DM-TAV63A-FO	3.000E-003	3	DAMPER TAV-63A FAILS TO OPEN
16-DMSKOCCCF12	4.360E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)TAV-2A/B TRN CLSD
16-DMSKOCCCF123	9.290E-008	4	TRIPLE COMMON CAUSE FAILURE (CCF)TAV-2A/B/C TRN CLS
16-DMSKOCCCF13	4.360E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)TAV-2A/C TRN CLSD
16-DMSKOCCCF23	4.360E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)TAV-2B/C TRN CLSD
16-DMTAVFD16-OC	7.198E-006	4	DAMPER TAV-FD-16 TRANSFERS CLOSED
16-DMTAVFD17-OC	7.198E-006	4	DAMPER TAV-FD-17 TRANSFERS CLOSED
16-DMTAVFD18-OC	7.198E-006	4	INDEPENDENT FAILUREDAMPER TAV-FD-18 TRANSFERS CLOSED
16-DMTAVFD20-OC	7.198E-006	4	INDEPENDENT FAILUREDAMPER TAV-FD-20 TRANSFERS CLOSED
16-DMTAVFD21-OC	7.198E-006	4	DAMPER TAV-FD-21 TRANSFERS CLOSED
16-FN-AFP1A--PL	7.198E-006	4	INDEPENDENT FAILUREAFW PUMP A FAN COILUNIT PLUGGED
16-FN-AFP1A--PR	5.506E-004	4	INDEPENDENT FAILUREAFW PUMP A FAN COILUNIT FAILS TO RUN
16-FN-AFP1A--PS	9.886E-004	3	INDEPENDENT FAILUREAFW PUMP A FAN COILUNIT FAILS TO START
16-FN-BRFC1A-PL	7.198E-006	4	INDEPENDENT FAILUREBATTERY ROOM FCU A PLUGGED
16-FN-BRFC1A-PR	5.506E-004	4	INDEPENDENT FAILUREBATTERY ROOM FAN COIL UNIT A FTR

Table 12
Basic Event Descriptions (continued)

16-FN-BRFC1A-PS	9.886E-004	3	INDEPENDENT FAILUREBATTERY ROOM FAN COIL UNIT A FTS
16-FN-BRFC1B-PL	7.198E-006	4	INDEPENDENT FAILUREBATTERY ROOM FCU B PLUGGED
16-FN-BRFC1B-PR	5.506E-004	4	INDEPENDENT FAILUREBATTERY ROOM FAN COIL UNIT B FTR
16-FN-BRFC1B-PS	9.886E-004	3	INDEPENDENT FAILUREBATTERY ROOM FAN COIL UNIT B FTS
16-FN-DGAF---PR	5.283E-005	4	INDEPENDENT FAILUREDIESEL ROOM A SUPPLY FAN FTR
16-FN-DGAF---PS	3.940E-003	3	INDEPENDENT FAILUREDIESEL ROOM A SUPPLY FAN FTS
16-FN-DGBF---PR	5.283E-005	4	INDEPENDENT FAILUREDIESEL ROOM B SUPPLY FAN FTR
16-FN-DGBF---PS	3.940E-003	3	INDEPENDENT FAILUREDIESEL ROOM B SUPPLY FAN FTS
16-FN-TBB1B--PL	7.198E-006	4	INDEPENDENT FAILURETURB BLDG BSMT FCU B PLUGGED
16-FN-TBB1B--PR	5.506E-004	4	INDEPENDENT FAILURETURB BLDG BSMT FAN COIL UNIT B FTR
16-FN-TBB1B--PS	9.886E-004	3	INDEPENDENT FAILURETURB BLDG BSMT FAN COIL UNIT B FTS
16-FNAKPLCCF12	3.620E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNAKPLCCF12
16-FNAKPRCCF12	7.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNAKPRCCF12
16-FNAKPSCCF12	1.290E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNAKPSCCF12
16-FNBKPLCCF12	3.620E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNBKPLCCF12
16-FNBKPRCCF12	7.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNBKPRCCF12
16-FNBKPSCCF12	1.290E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNBKPSCCF12
16-FNBREXF1A-PR	2.952E-004	4	INDEPENDENT FAILUREBATTERY ROOM EXHAUST FAN A FTR
16-FNBREXF1A-PS	3.940E-003	3	INDEPENDENT FAILUREBATTERY ROOM EXHAUST FAN A FTS
16-FNBREXF1B-PR	2.952E-004	4	INDEPENDENT FAILUREBATTERY ROOM EXHAUST FAN B FTR
16-FNBREXF1B-PS	3.940E-003	3	INDEPENDENT FAILUREBATTERY ROOM EXHAUST FAN B FTS
16-FNDKPRCCF12	6.860E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNDKPRCCF12
16-FNDKPSCCF12	5.120E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNDKPSCCF12
16-FNEKPRCCF12	3.840E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNEKPRCCF12
16-FNEKPSCCF12	5.120E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNEKPSCCF12
16-FNTBSF1A--PR	2.952E-004	4	INDEPENDENT FAILURETURBINE BUILDING SUPPLY FAN A FTR
16-FNTBSF1B--PR	2.952E-004	4	INDEPENDENT FAILURETURBINE BUILDING SUPPLY FAN B FTR
16-FNTBSF1C--PR	2.952E-004	4	INDEPENDENT FAILURETURBINE BUILDING SUPPLY FAN C FTR
16-FNTKPRCCF12	9.280E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNTKPRCCF12
16-FNTKPRCCF123	1.980E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)16-FNTKPRCCF123
16-FNTKPRCCF13	9.280E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNTKPRCCF13
16-FNTKPRCCF23	9.280E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-FNTKPRCCF23
16-MV-KFOCCF12	4.500E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-MV-KFOCCF12
16-MV-SW720A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SW-720A FAILS TO OPEN
16-MV-SW720B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SW-720B FAILS TO OPEN
16-SV-33278--OC	1.200E-005	4	SOV 33278 TRANSFERSCLOSED
16-TS-KOPCCF12	1.410E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)16-TS-KOPCCF12
16-TSTS16233-OP	2.999E-007	3	INDEPENDENT FAILURETEMPERATURE SWITCH TS-16233 FAILS
16-TSTS16234-OP	2.999E-007	3	INDEPENDENT FAILURETEMPERATURE SWITCH TS-16234 FAILS
17-DMACAFD-5-OC	7.198E-006	4	DAMPER ACA-FD-5 TRANSFERS CLOSED
17-DMACAFD15-OC	7.198E-006	4	DAMPER ACA-FD-15 TRANSFERS CLOSED
17-FN-ABB1A--PL	7.198E-006	4	INDEPENDENT FAILUREAUX BLDG BSMT FCU A PLUGGED
17-FN-ABB1A--PR	5.506E-004	4	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT A FTR
17-FN-ABB1A--PS	9.886E-004	3	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT A FTS
17-FN-ABB1B--PL	7.198E-006	4	INDEPENDENT FAILUREAUX BLDG BSMT FCU B PLUGGED
17-FN-ABB1B--PR	5.506E-004	4	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT B FTR
17-FN-ABB1B--PS	9.886E-004	3	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT B FTS
17-FN-ABB1C--PL	7.198E-006	4	INDEPENDENT FAILUREAUX BLDG BSMT FCU C PLUGGED
17-FN-ABB1C--PR	5.506E-004	4	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT C FTR
17-FN-ABB1C--PS	9.886E-004	3	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT C FTS
17-FN-ABB1D--PL	7.198E-006	4	INDEPENDENT FAILUREAUX BLDG BSMT FCU D PLUGGED
17-FN-ABB1D--PR	5.506E-004	4	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT D FTR
17-FN-ABB1D--PS	9.886E-004	3	INDEPENDENT FAILUREAUX BLDG BSMT FAN COIL UNIT D FTS
17-FN-ABM1A--PL	7.198E-006	4	INDEPENDENT FAILUREAUX BLDG MEZZ FCU A PLUGGED
17-FN-ABM1A--PR	5.506E-004	4	INDEPENDENT FAILUREAUX BLDG MEZZ FAN COIL UNIT A FTR
17-FN-ABM1A--PS	9.886E-004	3	INDEPENDENT FAILUREAUX BLDG MEZZ FAN COIL UNIT A FTS

Table 12
Basic Event Descriptions (continued)

17-FN-ABM1B--PL	7.198E-006	4	INDEPENDENT FAILUREAUX BLDG MEZZ FCU B PLUGGED
17-FN-ABM1B--PR	5.506E-004	4	INDEPENDENT FAILUREAUX BLDG MEZZ FAN COIL UNIT B FTR
17-FN-ABM1B--PS	9.886E-004	3	INDEPENDENT FAILUREAUX BLDG MEZZ FAN COIL UNIT B FTS
17-FN-CCWP1B-PL	7.198E-006	4	COMPONENT COOLING PUMP B FAN COIL UNIT PLUGGED
17-FN-CCWP1B-PR	5.506E-004	4	COMPONENT COOLING PUMP B FAN COIL UNIT FAILS TO RUN
17-FN-CCWP1B-PS	9.886E-004	3	COMPONENT COOLING PUMP B FAN COIL UNIT FAILS TO START
17-FN1KPLCCF12	3.620E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FN1KPLCCF12
17-FN2KPRCCF12	7.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FN2KPRCCF12
17-FN3KPSCCF12	1.290E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FN3KPSCCF12
17-FN4KPLCCF12	3.620E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FN4KPLCCF12
17-FN5KPRCCF12	7.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FN5KPRCCF12
17-FN6KPSCCF12	1.280E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FN6KPSCCF12
17-FNPKPLCCF1-4	3.320E-006	3	GLOBAL FAILURE OF 17-FNPKPLCCF1-4
17-FNPKPLCCF12	2.470E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF12
17-FNPKPLCCF123	2.950E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF123
17-FNPKPLCCF124	2.950E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF124
17-FNPKPLCCF13	2.470E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF13
17-FNPKPLCCF134	2.950E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF134
17-FNPKPLCCF14	2.470E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF14
17-FNPKPLCCF23	2.470E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF23
17-FNPKPLCCF234	2.950E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF234
17-FNPKPLCCF24	2.470E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF24
17-FNPKPLCCF34	2.470E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNPKPLCCF34
17-FNPMPPITA-PL	7.198E-006	4	INDEPENDENT FAILURERHR PUMP PIT FCU A PLUGGED
17-FNPMPPITA-PR	5.506E-004	4	INDEPENDENT FAILURERHR PUMP PIT FAN COIL UNIT A FTR
17-FNPMPPITA-PS	9.886E-004	3	INDEPENDENT FAILURERHR PUMP PIT FAN COIL UNIT A FTS
17-FNPMPPITB-PL	7.198E-006	4	INDEPENDENT FAILURERHR PUMP PIT FCU B PLUGGED
17-FNPMPPITB-PR	5.506E-004	4	INDEPENDENT FAILURERHR PUMP PIT FAN COIL UNIT B FTR
17-FNPMPPITB-PS	9.886E-004	3	INDEPENDENT FAILURERHR PUMP PIT FAN COIL UNIT B FTS
17-FNRKPRCCF1-4	2.660E-005	3	GLOBAL FAILURE OF 17-FNRKPRCCF1-4
17-FNRKPRCCF12	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF12
17-FNRKPRCCF123	4.820E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF123
17-FNRKPRCCF124	4.820E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF124
17-FNRKPRCCF13	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF13
17-FNRKPRCCF134	4.820E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF134
17-FNRKPRCCF14	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF14
17-FNRKPRCCF23	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF23
17-FNRKPRCCF234	4.820E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF234
17-FNRKPRCCF24	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF24
17-FNRKPRCCF34	1.020E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNRKPRCCF34
17-FNSKPSCCF1-4	4.780E-005	3	GLOBAL FAILURE OF 17-FNSKPSCCF1-4
17-FNSKPSCCF12	1.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF12
17-FNSKPSCCF123	8.660E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF123
17-FNSKPSCCF124	8.660E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF124
17-FNSKPSCCF13	1.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF13
17-FNSKPSCCF134	8.660E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF134
17-FNSKPSCCF14	1.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF14
17-FNSKPSCCF23	1.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF23
17-FNSKPSCCF234	8.660E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF234
17-FNSKPSCCF24	1.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF24
17-FNSKPSCCF34	1.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-FNSKPSCCF34
17-SV-SW1261-FO	4.999E-004	3	SOV SW-1261 FAILS TO OPEN
17-TS-KOPCCF12	1.410E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)17-TS-KOPCCF12
17-TSTS16391-OP	2.999E-007	3	FAILURE OF TEMPERATURE SWITCH TS-16391
18-AVLOCA100BFC	4.758E-004	3	AOV LOCA-100B FAILSTO CLOSE
18-AVLOCA201BFC	4.758E-004	3	AOV LOCA-201B FAILSTO CLOSE

Table 12
Basic Event Descriptions (continued)

18-CVSA7004B-FC	9.999E-004	3	CHECK VALVE SA-7004B FAILS TO CLOSE
18-DC--PQ945-FA	1.900E-004	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-945 FAILS
18-DC--PQ946-FA	1.900E-004	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-946 FAILS
18-DC--PQ947-FA	1.900E-004	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-947 FAILS
18-DC--PQ948-FA	1.900E-004	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-948 FAILS
18-DC--PQ949-FA	1.900E-004	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-949 FAILS
18-DC--PQ950-FA	1.900E-004	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-950 FAILS
18-DC1KFACCF12	4.470E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-945/PQ-946 FAIL
18-DC2KFACCF12	4.470E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-947/PQ-948 FAIL
18-DC3KFACCF12	4.470E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-949/PQ-950 FAIL
18-DM-KFOCCF1-4	5.580E-005	3	GLOBAL FAILURE OF 18-DM-KFOCCF1-4
18-DM-KFOCCF12	2.130E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF12
18-DM-KFOCCF123	1.010E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF123
18-DM-KFOCCF124	1.010E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF124
18-DM-KFOCCF13	2.130E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF13
18-DM-KFOCCF134	1.010E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF134
18-DM-KFOCCF14	2.130E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF14
18-DM-KFOCCF23	2.130E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF23
18-DM-KFOCCF234	1.010E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF234
18-DM-KFOCCF24	2.130E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF24
18-DM-KFOCCF34	2.130E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-DM-KFOCCF34
18-DMRBV150A-FO	3.000E-003	3	INDEPENDENT FAILUREDAMPER RBV-150A FAILS TO OPEN
18-DMRBV150B-FO	3.000E-003	3	INDEPENDENT FAILUREDAMPER RBV-150B FAILS TO OPEN
18-DMRBV150C-FO	3.000E-003	3	INDEPENDENT FAILUREDAMPER RBV-150C FAILS TO OPEN
18-DMRBV150D-FO	3.000E-003	3	INDEPENDENT FAILUREDAMPER RBV-150D FAILS TO OPEN
18-FCU-DSP---HE	1.890E-002	3	OPERATOR FAILS TO START CNTMNT FAN COIL UNITS FROM DSP
18-FCU-MAN---HE	2.400E-002	3	OPERATOR FAILS TO START CNTMNT FAN COIL UNITS MANUALLY
18-FN-FCU1A--PR	6.283E-005	4	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT A FAILS
18-FN-FCU1A--PS	2.037E-003	3	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT A FAILS
18-FN-FCU1A--TM	4.980E-004	3	CFCU A UNAVAILABLE DUE TO TEST OR MAINTENANCE
18-FN-FCU1B--PR	6.283E-005	4	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT B FAILS
18-FN-FCU1B--PS	2.037E-003	3	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT B FAILS
18-FN-FCU1B--TM	2.880E-004	3	CFCU B UNAVAILABLE DUE TO TEST OR MAINTENANCE
18-FN-FCU1C--PR	6.283E-005	4	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT C FAILS
18-FN-FCU1C--PS	2.037E-003	3	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT C FAILS
18-FN-FCU1C--TM	1.480E-003	3	CFCU C UNAVAILABLE DUE TO TEST OR MAINTENANCE
18-FN-FCU1D--PR	6.283E-005	4	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT D FAILS
18-FN-FCU1D--PS	2.037E-003	3	INDEPENDENT FAILURECONTAINMENT FAN COIL UNIT D FAILS
18-FN-FCU1D--TM	1.070E-003	3	CFCU D UNAVAILABLE DUE TO TEST OR MAINTENANCE
18-FNRKPRCCF1-4	3.040E-006	4	GLOBAL FAILURE OF 18-FNRKPRCCF1-4
18-FNRKPRCCF12	1.160E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF12
18-FNRKPRCCF123	5.500E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF123
18-FNRKPRCCF124	5.500E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF124
18-FNRKPRCCF13	1.160E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF13
18-FNRKPRCCF134	5.500E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF134
18-FNRKPRCCF14	1.160E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF14
18-FNRKPRCCF23	1.160E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF23
18-FNRKPRCCF234	5.500E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF234
18-FNRKPRCCF24	1.160E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF24
18-FNRKPRCCF34	1.160E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNRKPRCCF34
18-FNSKPSCCF1-4	9.860E-005	3	GLOBAL FAILURE OF 18-FNSKPSCCF1-4
18-FNSKPSCCF12	3.770E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF12
18-FNSKPSCCF123	1.790E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF123
18-FNSKPSCCF124	1.790E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF124

Table 12
Basic Event Descriptions (continued)

18-FNSKPSCCF13	3.770E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF13
18-FNSKPSCCF134	1.790E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF134
18-FNSKPSCCF14	3.770E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF14
18-FNSKPSCCF23	3.770E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF23
18-FNSKPSCCF234	1.790E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF234
18-FNSKPSCCF24	3.770E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF24
18-FNSKPSCCF34	3.770E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-FNSKPSCCF34
18-MV-LOCA2B-FC	1.905E-003	3	MOV LOCA-2B FAILS TO CLOSE
18-MVSA7003B-FC	1.905E-003	3	MOV SA-7003B FAILS TO CLOSE
18-SV-33809--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33809 FAILS TO CLOSE
18-SV-33810--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33810 FAILS TO CLOSE
18-SV-33811--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33811 FAILS TO CLOSE
18-SV-33812--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33812 FAILS TO CLOSE
18-SV-KFCCCF1-4	9.300E-006	3	GLOBAL FAILURE OF 18-SV-KFCCCF1-4
18-SV-KFCCCF12	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF12
18-SV-KFCCCF123	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF123
18-SV-KFCCCF124	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF124
18-SV-KFCCCF13	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF13
18-SV-KFCCCF134	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF134
18-SV-KFCCCF14	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF14
18-SV-KFCCCF23	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF23
18-SV-KFCCCF234	1.680E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF234
18-SV-KFCCCF24	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF24
18-SV-KFCCCF34	3.550E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)18-SV-KFCCCF34
18-TP--PT945-FA	5.698E-005	4	INDEPENDENT FAILUREPRESSURE TRANSMITTER PT-945
18-TP--PT946-FA	5.698E-005	4	INDEPENDENT FAILUREPRESSURE TRANSMITTER PT-946
18-TP--PT947-FA	5.698E-005	4	INDEPENDENT FAILUREPRESSURE TRANSMITTER PT-947
18-TP--PT948-FA	5.698E-005	4	INDEPENDENT FAILUREPRESSURE TRANSMITTER PT-948
18-TP--PT949-FA	5.698E-005	4	INDEPENDENT FAILUREPRESSURE TRANSMITTER PT-949
18-TP--PT950-FA	5.698E-005	4	INDEPENDENT FAILUREPRESSURE TRANSMITTER PT-950
18-TP1KFACCF12	1.340E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-945/PQ-946 FAIL
18-TP2KFACCF12	1.340E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-947/PQ-948 FAIL
18-TP3KFACCF12	1.340E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-949/PQ-950 FAIL
21-CV-FPC3A--FC	9.999E-004	3	CHECK VALVE FPC-3A FAILS TO CLOSE
21-CV-FPC3A--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE FPC-3A FAILS TO OPEN
21-CV-FPC3B--FC	9.999E-004	3	CHECK VALVE FPC-3B FAILS TO CLOSE
21-CV-FPC3B--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE FPC-3B FAILS TO OPEN
21-CV-KFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)FPC-3A, 3B FTO
21-CV-SW1501-FO	5.000E-005	3	CHECK VALVE SW-1501FAILS TO OPEN
21-DIASFPCL-MHE	2.800E-003	3	OPERATOR FAILS TO DIAGNOSE LOSS OF SFP COOLING
21-DIASFPLK-MHE	4.499E-003	3	OPERATOR FAILS TO DIAGNOSE A LOSS OF SFP LEVEL
21-DIASFPSW-MHE	8.999E-003	3	OPERATOR FAILS TO DIAGNOSE LOSS OF SFP COOLING (TSW)
21-FL-KPLCCF12	8.280E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SFPC FLTRS PLUGGED
21-FL-SFPCA--PL	1.200E-004	4	INDEPENDENT FAILURESPENT FUEL POOL FILTER A PLUGGED
21-FL-SFPCB--PL	1.200E-004	4	INDEPENDENT FAILURESPENT FUEL POOL FILTER B PLUGGED
21-FPCRCVR-BMHE	1.369E-001	3	OPERATOR FAILS TO RECOVER SPENT FUEL COOLING EARLY
21-FPCRCVR-DMHE	1.369E-001	3	OPERATOR FAILS TO RECOVER SPENT FUEL COOLING LATE
21-FPCREPR-B-HE	1.408E-001	3	OPERATOR FAILS TO REPAIR FPC BEFORE BOILING
21-HX-SFPC---PL	7.198E-006	4	SPENT FUEL POOL HEAT EXCHANGER PLUGGED
21-PLUGSFP--MHE	3.220E-002	3	OPERATOR FAILS TO BSFP FILTERS
21-PM-KPRCCF12	5.630E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SFPC PUMPS FTR
21-PM-KPSCCF12	1.670E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)SFPC FILTERS FTS
21-PM-SFPC1A-PR	8.159E-004	4	INDEPENDENT FAILURESPENT FUEL POOL COOLING PUMP A FTR
21-PM-SFPC1A-PS	1.400E-003	3	INDEPENDENT FAILURESPENT FUEL POOL COOLING PUMP A FTS
21-PM-SFPC1B-PR	8.159E-004	4	INDEPENDENT FAILURESPENT FUEL POOL COOLING PUMP B FTR
21-PM-SFPC1B-PS	1.400E-003	3	INDEPENDENT FAILURESPENT FUEL POOL COOLING PUMP B FTR

Table 12
Basic Event Descriptions (continued)

21-SFPRHRHX-MHE	5.920E-002	3	OPERATOR FAILS TO ALIGN SFP COOLING TO RHR HEAT EXCH.
21-SW-SFP-B-MHE	2.550E-002	3	OPERATOR FAILS TO ALIGN SW TO SFP FORMAKEUP BEFORE BOIL
21-SW-SFP-D-MHE	4.062E-003	3	OPERATOR FAILS TO ALIGN SW TO SFP FORMAKEUP BEFORE CD
21-XV-FPC100-FO	1.000E-004	3	MANUAL VALVE FPC-100 FAILS TO OPEN
21-XV-FPC300-FO	1.000E-004	3	MANUAL VALVE FPC-300 FAILS TO OPEN
21-XV-FPC301-FC	1.000E-004	3	MANUAL VALVE FPC-301 FAILS TO CLOSE
21-XV-FPC7---FC	1.000E-004	3	MANUAL VALVE FPC-7 FAILS TO CLOSE
21-XV-FPC8---FC	1.000E-004	3	MANUAL VALVE FPC-8 FAILS TO CLOSE
21-XV-FPC85--FO	1.000E-004	3	MANUAL VALVE FPC-85 FAILS TO OPEN
21-XV-SW1497-FO	1.000E-004	3	MANUAL VALVE SW-1497 FAILS TO OPEN
23--MAN-ICS--HE	6.436E-003	3	OPERATOR FAILS TO MANUALLY ACTUATE SPRAY
23--RWST-RHR-HE	1.229E-002	3	OPERATOR FAILS TO INITIATE ICS RECIRCULATION
23-AV-ICS201-FC	4.758E-004	3	INDEPENDENT FAILUREAOV ICS-201 FAILS TO CLOSE
23-AV-ICS202-FC	4.758E-004	3	INDEPENDENT FAILUREAOV ICS-202 FAILS TO CLOSE
23-AV-KFCCCF12	9.420E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-AV-KFCCCF12
23-CV--ICS3A-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE ICS-3A FAILS TO CLOSE
23-CV--ICS3B-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE ICS-3B FAILS TO CLOSE
23-CV--ICS8A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-8A FAILS TO OPEN
23-CV--ICS8B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-8B FAILS TO OPEN
23-CV--ICS9A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-9A FAILS TO OPEN
23-CV--ICS9B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-9B FAILS TO OPEN
23-CV-ICS8A--FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE ICS-8A FAILS TO CLOSE
23-CV-ICS8B--FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE ICS-8B FAILS TO CLOSE
23-CV-ICS9A--FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE ICS-9A FAILS TO CLOSE
23-CV-ICS9B--FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE ICS-9B FAILS TO CLOSE
23-CV3KFCCCF12	7.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CV3KFCCCF12
23-CVCKFCCCF1-4	5.100E-005	3	GLOBAL FAILURE OF 23-CVCKFCCCF1-4
23-CVCKFCCCF12	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF12
23-CVCKFCCCF123	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF123
23-CVCKFCCCF124	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF124
23-CVCKFCCCF13	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF13
23-CVCKFCCCF134	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF134
23-CVCKFCCCF14	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF14
23-CVCKFCCCF23	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF23
23-CVCKFCCCF234	5.550E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF234
23-CVCKFCCCF24	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF24
23-CVCKFCCCF34	1.780E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVCKFCCCF34
23-CVD-ICS4A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-4A FAILS TO OPEN
23-CVD-ICS4B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-4B FAILS TO OPEN
23-CVDKFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVDKFOCCF12
23-CVOKFOCCF1-4	8.530E-006	3	GLOBAL FAILURE OF 23-CVOKFOCCF1-4
23-CVOKFOCCF12	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF12
23-CVOKFOCCF123	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF123
23-CVOKFOCCF124	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF124
23-CVOKFOCCF13	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF13
23-CVOKFOCCF134	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF134
23-CVOKFOCCF14	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF14
23-CVOKFOCCF23	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF23
23-CVOKFOCCF234	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF234
23-CVOKFOCCF24	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF24
23-CVOKFOCCF34	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVOKFOCCF34
23-CVRHR401A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE RHR-401A FAILS TO
23-CVRHR401B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE RHR-401B FAILS TO
23-CVRKFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVRKFOCCF12
23-CVS-ICS3A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-3A FAILS TO OPEN

Table 12
Basic Event Descriptions (continued)

23-CVS-ICS3B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE ICS-3B FAILS TO OPEN
23-CVSKFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-CVSKFOCCF12
23-HX-GSC1A--PL	7.198E-006	4	INDEPENDENT FAILUREICS PUMP A GLAND COOLER FAILURE
23-HX-GSC1B--PL	7.198E-006	4	INDEPENDENT FAILUREICS PUMP B GLAND COOLER FAILURE
23-HX-KPLCCF12	3.620E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-HE-KPLCCF12
23-MV--ICS2A-FC	1.905E-003	3	INDEPENDENT FAILUREMOV ICS-2A FAILS TOCLOSE
23-MV--ICS2B-FC	1.905E-003	3	INDEPENDENT FAILUREMOV ICS-2B FAILS TOCLOSE
23-MV--ICS5A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV ICS-5A FAILS TOOPEN
23-MV--ICS5B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV ICS-5B FAILS TOOPEN
23-MV--ICS6A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV ICS-6A FAILS TOOPEN
23-MV--ICS6B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV ICS-6B FAILS TOOPEN
23-MVCKFCCCF12	8.570E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVCKFCCCF12
23-MVOKFOCCF1-4	6.560E-005	3	GLOBAL FAILURE OF 23-MVOKFOCCF1-4
23-MVOKFOCCF12	3.440E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF12
23-MVOKFOCCF123	2.190E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF123
23-MVOKFOCCF124	2.190E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF124
23-MVOKFOCCF13	3.440E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF13
23-MVOKFOCCF134	2.190E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF134
23-MVOKFOCCF14	3.440E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF14
23-MVOKFOCCF23	3.440E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF23
23-MVOKFOCCF234	2.190E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF234
23-MVOKFOCCF24	3.440E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF24
23-MVOKFOCCF34	3.440E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVOKFOCCF34
23-MVRHR400A-AE	7.991E-004	3	OPERATOR FAILS TO CLOSE MOV RHR-400A AFTER TEST
23-MVRHR400A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-400A FAILS TO OPEN
23-MVRHR400B-AE	7.991E-004	3	OPERATOR FAILS TO CLOSE MOV RHR-400B AFTER TEST
23-MVRHR400B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-400B FAILS TO OPEN
23-MVRKFOCCF12	6.930E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-MVRKFOCCF12
23-PM--ICS1A-PR	8.159E-004	4	INDEPENDENT FAILURECONTAINMENT SPRAY PUMP A FAILS TO RUN
23-PM--ICS1A-PS	1.009E-003	3	INDEPENDENT FAILURECONTAINMENT SPRAY PUMP A FAILS TO
23-PM--ICS1A-TM	2.940E-003	3	ICS PUMP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
23-PM--ICS1B-PR	8.159E-004	4	INDEPENDENT FAILURECONTAINMENT SPRAY PUMP B FAILS TO RUN
23-PM--ICS1B-PS	1.009E-003	3	INDEPENDENT FAILURECONTAINMENT SPRAY PUMP B FAILS TO
23-PM--ICS1B-TM	3.850E-003	3	ICS PUMP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
23-PMRKPRCCF12	5.630E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-PMRKPRCCF12
23-PMSKPSCCF12	1.200E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)23-PMSKPSCCF12
23-XV--ICS7A-AE	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE ICS-7A AFTER TEST
23-XV--ICS7B-AE	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE ICS-7B AFTER TEST
23-XV-ICS10A-AE	7.991E-004	3	OPERATOR FAILS TO CLOSE MANUAL VALVE ICS-10A AFTER TEST
23-XV-ICS10B-AE	7.991E-004	3	OPERATOR FAILS TO CLOSE MANUAL VALVE ICS-10B AFTER TEST
23-XVICS210A-AE	7.991E-004	3	OPERATOR FAILS TO CLOSE MANUAL VALVE ICS-210A AFTER TEST
23-XVICS210B-AE	7.991E-004	3	OPERATOR FAILS TO CLOSE MANUAL VALVE ICS-210B AFTER TEST
25--CRAC-MAN-HE	9.800E-003	3	OPERATOR FAILS TO MANUALLY TRANSFER CRAC TO SW
25--CRAC-MANSHE	1.000E+000	3	OPERATOR FAILS TO MANUALLY TRANSFER CRAC TO SW (SEIS)
25-AV-KFCCCF12	9.420E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1040A-1/B-1 FTC
25-AV-KFOCCF12	1.050E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1042A-1/B-1 FTO
25-AV-KOCCCF1-4	9.580E-008	4	GLOBAL FAILURE OF SW-1041A/A1/B/B1 TC
25-AV-KOCCCF12	3.660E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1041A/A-1 TR CLS
25-AV-KOCCCF123	1.730E-008	4	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1041A/A-1/B TC
25-AV-KOCCCF124	1.730E-008	4	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1041A/A1/B1 TC

Table 12
Basic Event Descriptions (continued)

25-AV-KOCCCF13	3.660E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1041A/B TRAN CLS
25-AV-KOCCCF134	1.730E-008	4	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1041A/B/B1 TC
25-AV-KOCCCF14	3.660E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1041A/B-1 TRN CL
25-AV-KOCCCF23	3.660E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1041A-1/B FTC
25-AV-KOCCCF234	1.730E-008	4	TRIPLE COMMON CAUSE FAILURE (CCF)SW-1041A1/B/B1 TC
25-AV-KOCCCF24	3.660E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1041A-1/B-1 TC
25-AV-KOCCCF34	3.660E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1041B/B-1 TRN C
25-AVHKFCCCF12	9.420E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)HS-2203A-1/B-1 FTC
25-AVHS2203A1FC	4.758E-004	3	INDEPENDENT FAILUREAOV HS-2203A-1 FAILS TO CLOSE
25-AVHS2203B1FC	4.758E-004	3	INDEPENDENT FAILUREAOV HS-2203B-1 FAILS TO CLOSE
25-AVIKFOCCF12	1.050E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)SW-1040A-2/B-2 FTO
25-AVSW1040A1FC	4.758E-004	3	INDEPENDENT FAILUREAOV SW-1040A-1 FAILS TO CLOSE
25-AVSW1040A2FO	2.168E-003	3	INDEPENDENT FAILUREAOV SW-1040A-2 FAILS TO OPEN
25-AVSW1040B1FC	4.758E-004	3	INDEPENDENT FAILUREAOV SW-1040B-1 FAILS TO CLOSE
25-AVSW1040B2FO	2.168E-003	3	INDEPENDENT FAILUREAOV SW-1040B-2 FAILS TO OPEN
25-AVSW1041A-OC	1.032E-005	4	INDEPENDENT FAILUREAOV SW-1041A TRANSFERS CLOSED
25-AVSW1041A1OC	1.032E-005	4	INDEPENDENT FAILUREAOV SW-1041A-1 TRANSFERS CLOSED
25-AVSW1041B-OC	1.032E-005	4	INDEPENDENT FAILUREAOV SW-1041B TRANSFERS CLOSED
25-AVSW1041B1OC	1.032E-005	4	INDEPENDENT FAILUREAOV SW-1041B-1 TRANSFERS CLOSED
25-AVSW1042A1FO	2.168E-003	3	INDEPENDENT FAILUREAOV SW-1042A-1 FAILS TO OPEN
25-AVSW1042B1FO	2.168E-003	3	INDEPENDENT FAILUREAOV SW-1042B-1 FAILS TO OPEN
25-DM-ACC15--OC	7.198E-006	4	DAMPER ACC-15 TRANSFERS CLOSED
25-DM-ACC16--OC	7.198E-006	4	DAMPER ACC-16 TRANSFERS CLOSED
25-DM-ACC4---OC	7.198E-006	4	DAMPER ACC-4 TRANSFERS CLOSED
25-FN-CRAC-A-PR	2.952E-004	4	INDEPENDENT FAILURECONTROL ROOM HVAC FAN A FAILS TO
RUN			
25-FN-CRAC-A-PS	3.940E-003	3	INDEPENDENT FAILURECONTROL ROOM HVAC FAN A FAILS TO
25-FN-CRAC-B-PR	2.952E-004	4	INDEPENDENT FAILURECONTROL ROOM HVAC FAN B FAILS TO
RUN			
25-FN-CRAC-B-PS	3.940E-003	3	INDEPENDENT FAILURECONTROL ROOM HVAC FAN B FAILS TO
25-FN-KPRCCF12	3.840E-005	4	DOUBLE COMMON CAUSE FAILURE (CCF)CRAC FANS FTR
25-FN-KPSCCF12	5.120E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)CRAC FANS FTS
25-RF-KPRCCF12	2.640E-005	4	DOUBLE COMMON CAUSE FAILURE (CCF)CRAC CHILLERS FTR
25-RF-KPSCCF12	1.100E-003	3	DOUBLE COMMON CAUSE FAILURE (CCF)CRAC CHILLERS FTS
25-RFCHILL-A-PR	2.399E-004	4	INDEPENDENT FAILURECONTROL ROOM CHILLER UNIT A
25-RFCHILL-A-PS	9.999E-003	3	INDEPENDENT FAILURECONTROL ROOM CHILLER UNIT A
25-RFCHILL-B-PR	2.399E-004	4	INDEPENDENT FAILURECONTROL ROOM CHILLER UNIT B
25-RFCHILL-B-PS	9.999E-003	3	INDEPENDENT FAILURECONTROL ROOM CHILLER UNIT B
25-SV-33908--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33908 FAILS TO CLOSE
25-SV-33909--FC	4.999E-004	3	INDEPENDENT FAILURESOV 33909 FAILS TO CLOSE
25-SV-KFCCCF12	2.350E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)25-SV-KFCCCF12
25-SY-CRAC-A-TM	2.220E-002	3	CRAC TRAIN A UNAVAILABLE DUE TO TEST OR MAINTENANCE
25-SY-CRAC-B-TM	3.640E-002	3	CRAC TRAIN B UNAVAILABLE DUE TO TEST OR MAINTENANCE
26-AV-PW52---OC	1.032E-005	4	AOV PW-52 TRANSFERSCLOSED
26-CV-KFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)PW-1A/1B FTO
26-CV-PW1A---FC	9.999E-004	3	CHECK VALVE PW-1A FAILS TO CLOSE
26-CV-PW1A---FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE PW-1A FAILS TO OPEN
26-CV-PW1B---FC	9.999E-004	3	CHECK VALVE PW-1B FAILS TO CLOSE
26-CV-PW1B---FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE PW-1B FAILS TO OPEN
26-OR-PWS----PL	3.000E-004	3	POTABLE WATER SUPPLY ORIFACE PLUGGED
26-PM-DWPA---PR	8.159E-004	4	INDEPENDENT FAILUREDEEP WELL PUMP A FAILS TO RUN
26-PM-DWPA---PS	1.400E-003	3	INDEPENDENT FAILUREDEEP WELL PUMP A FAILS TO START
26-PM-DWPB---PR	8.159E-004	4	INDEPENDENT FAILUREDEEP WELL PUMP B FAILS TO RUN
26-PM-DWPB---PS	1.400E-003	3	INDEPENDENT FAILUREDEEP WELL PUMP B FAILS TO START
26-PM-KPRCCF12	5.630E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)26-PM-KPRCCF12
26-PM-KPSCCF12	1.670E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)DEEP WELL PUMPS FTS

Table 12
Basic Event Descriptions (continued)

27A-OR2------HE	9.625E-002	3	OPERATOR FAILS TO LIMIT SI FLOW AND REFILL RWST-WITH CD
27A-OR2----LDHE	1.511E-001	3	OPERATOR FAILS TO LIMIT SI FLOW AND REFILL RWST - SLO
27A-OR2----RDHE	1.414E-001	3	OPERATOR FAILS TO LIMIT SI FLOW AND REFILL RWST - SGTR
27A-OR3------HE	2.043E-002	3	OPERATOR FAILS TO LIMIT SI FLOW AND REFILL RWST - ISL
27A-OR3-----DHE	1.604E-001	3	OPERATOR FAILS TO LIMIT SI AND REFILLRWST - ISL DEPEND
27A-ORR------HE	9.212E-002	3	OPERATOR FAILS TO LIMIT SI FLOW AND REFILL RWST - NO CD
27A-ORR----F-HE	5.000E-003	3	FAILURE TO THROTTLESI FLOW OR REFILL RWST (NO COOLDOWN)
27A-RMST-CST-HE	1.237E-003	3	OPERATOR FAILS TO CROSS-TIE CSTS AND RMSTS
27AAV-MU1007-CO	1.032E-005	4	AOV MU-1007 TRANSFERS OPEN, DIVERTING FLOW
27AAVMU1010-1CO	1.032E-005	4	AOV MU-1010-1 TRANSFERS OPEN
27ACV-KFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)MU-1002A/1002B FTO
27ACVMU1002A-FC	9.999E-004	3	CHECK VALVE MU-1002A FAILS TO CLOSE
27ACVMU1002A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE MU-1002A FTO
27ACVMU1002B-FC	9.999E-004	3	CHECK VALVE MU-1002B FAILS TO CLOSE
27ACVMU1002B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE MU-1002B FTO
27APM--RMP1A-PR	8.159E-004	4	INDEPENDENT FAILUREREACTOR MAKE-UP PUMP A FTR
27APM--RMP1A-PS	1.400E-003	3	INDEPENDENT FAILUREREACTOR MAKE-UP PUMP A FTS
27APM--RMP1B-PR	8.159E-004	4	INDEPENDENT FAILUREREACTOR MAKE-UP PUMP B FTR
27APM--RMP1B-PS	1.400E-003	3	INDEPENDENT FAILUREREACTOR MAKE-UP PUMP B FTS
27APM-KPRCCF12	5.630E-005	4	DOUBLE COMMON CAUSE FAILURE (CCF)RX MU PUMPS FTR
27APM-KPSCCF12	1.670E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)RX MU PUMPS FTS
27ATK--RMWST-RP	6.482E-007	4	REACTOR MAKEUP WATER STORAGE TANK RUPTURE
27AXV-DW20---FO	1.000E-004	3	MANUAL VALVE DW-20 FAILS TO CLOSE
27BCV-KFCCCF12	7.830E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)27BCV-KFCCCF12
27BCV-KFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)PW-83A/83B FTO
27BCV-PW83A--FC	9.999E-004	3	CHECK VALVE PW-83A FAILS TO CLOSE
27BCV-PW83A--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE PW-83A FAILS TO OPEN
27BCV-PW83B--FC	9.999E-004	3	CHECK VALVE PW-83B FAILS TO CLOSE
27BCV-PW83B--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE PW-83B FAILS TO OPEN
27BCV-SWT242-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SW(T)-242 FTC
27BCV-SWT251-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SW(T)-251 FTC
27BPM-KPRCCF12	5.630E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)27BPM-KPRCCF12
27BPM-KPSCCF12	1.670E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)PEW PUMPS FTS
27BPM-PEWPA--PR	8.159E-004	4	INDEPENDENT FAILUREPLANT EQUIPMENT WATER PUMP A FTR
27BPM-PEWPA--PS	1.400E-003	3	INDEPENDENT FAILUREPLANT EQUIPMENT WATER PUMP A FTS
27BPM-PEWPB--PR	8.159E-004	4	INDEPENDENT FAILUREPLANT EQUIPMENT WATER PUMP B FTR
27BPM-PEWPB--PS	1.400E-003	3	INDEPENDENT FAILUREPLANT EQUIPMENT WATER PUMP B FTS
2HR-FAILS-SD	2.650E-001	3	FAILURE TO RESTORE OSP WITHIN 2 HOURS - SHUTDOWN
2HR-SUCCESS-SD	7.350E-001	3	OSP RECOVERY WITHIN 2 HOURS IS SUCCESSFUL - SD
31-AV-CC302--OC	1.032E-005	4	AOV CC-302 TRANSFERS CLOSED
31-AV-CC610A-FC	4.758E-004	3	AOV CC-610A FAILS TO CLOSE
31-AV-CC610A-OC	1.032E-005	4	AOV CC-610A TRANSFERS CLOSED
31-AV-CC610B-FC	4.758E-004	3	AOV CC-610B FAILS TO CLOSE
31-AV-CC610B-OC	1.032E-005	4	AOV CC-610B TRANSFERS CLOSED
31-CCW-DSP---HE	3.255E-003	3	OPERATOR FAILS TO ESTABLISH COMPONENTCOOLING FROM DSP
31-CCW-MAN---HE	8.100E-003	3	OPERATOR FAILS TO ESTABLISH COMPONENTCOOLING MANUALLY
31-CCWRCVR-BMHE	4.306E-003	3	RECOVERY OF CCWRE
31-CCWRCVR-DMHE	2.030E-003	3	OPERATOR FAILS TO RECOVER CCW BEFORE CORE DAMAGE
31-CV---CC3A-FC	9.999E-004	3	CHECK VALVE CC-3A FAILS TO CLOSE
31-CV---CC3A-FO	5.000E-005	3	CHECK VALVE CC-3A FAILS TO OPEN
31-CV---CC3B-FC	9.999E-004	3	CHECK VALVE CC-3B FAILS TO CLOSE

Table 12
Basic Event Descriptions (continued)

31-CV---CC3B-FO	5.000E-005	3	CHECK VALVE CC-3B FAILS TO OPEN
31-HX--CCW1A-LK	2.400E-005	4	INDEPENDENT FAILURECCW HEAT EXCHANGER A SHELL LEAK
31-HX--CCW1B-LK	2.400E-005	4	INDEPENDENT FAILURECCW HEAT EXCHANGER B SHELL LEAK
31-HX-KLKCCF12	5.640E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)31-HE-KHSCCF12
31-LO-SW1300-HE	4.959E-003	3	OPERATOR FAILS TO LOCALLY OPEN MOVS SW1300A(B)
31-LO-SW1300FHE	4.959E-002	3	OPERATOR FAILS TO LOCALLY OPEN MOVS SW1300A(B) (FIRE)
31-LO-SW1300SHE	1.000E+000	3	OPERATOR FAILS TO LOCALLY OPEN MOVS SW1300A/B (SEISMIC)
31-MV-CC400A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV CC-400A FAILS TO OPEN
31-MV-CC400B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV CC-400B FAILS TO OPEN
31-MV-CC6A---FO	6.968E-004	3	MOV CC-6A FAILS TO OPEN
31-MV-CC6A---OC	1.200E-006	4	INDEPENDENT FAILUREMOV CC-6A TRANSFERSCLOSED
31-MV-CC6B---FO	6.968E-004	3	MOV CC-6B FAILS TO OPEN
31-MV-CC6B---OC	1.200E-006	4	INDEPENDENT FAILUREMOV CC-6B TRANSFERSCLOSED
31-MV-KFOCCF12	4.500E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)31-MV-KFOCCF12
31-MV-KOCCCF12	2.820E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)31-MV-KOCCCF12
31-PM--CCW1A-PR	2.004E-003	4	INDEPENDENT FAILURECOMPONENT COOLING PUMP A FTR
31-PM--CCW1A-PS	7.720E-004	3	INDEPENDENT FAILURECOMPONENT COOLING PUMP A FTS
31-PM--CCW1A-TM	4.820E-003	3	CCW PUMP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
31-PM--CCW1B-PR	2.004E-003	4	INDEPENDENT FAILURECOMPONENT COOLING PUMP B FTR
31-PM--CCW1B-PS	7.720E-004	3	INDEPENDENT FAILURECOMPONENT COOLING PUMP B FTS
31-PM--CCW1B-TM	7.110E-003	3	CCW PUMP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
31-PM-KPRCCF12	7.140E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)31-PM-KPRCCF12
31-PM-KPSCCF12	4.870E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)31-PM-KPSCCF12
31-PSPS26018-OP	2.999E-007	3	FAILURE OF PRESSURESWITCH PS-26018
31-RV-CC611A-FO	3.000E-004	3	RELIEF VALVE CC-611A FAILS TO OPEN
31-RV-CC611B-FO	3.000E-004	3	RELIEF VALVE CC-611B FAILS TO OPEN
31-SV-33014--FO	4.999E-004	3	SOV 33014 FAILS TO OPEN
31-SV-33014--OC	1.200E-005	4	SOV 33014 TRANSFERSCLOSED
31-SV-33015--FO	4.999E-004	3	SOV 33015 FAILS TO OPEN
31-SV-33015--OC	1.200E-005	4	SOV 33015 TRANSFERSCLOSED
31-SV-33785--OC	1.200E-005	4	SOV 33785 TRANSFERSCLOSED
31-XV---CC4A-AE	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE CC-4A AFTER TEST
31-XV---CC4B-AE	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE CC-4B AFTER TEST
32-AV-KCOCCF12	5.170E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)32-AV-KCOCCF12
32-AV-MDR134-CO	1.032E-005	4	INDEPENDENT FAILUREAOV MD(R)-134 TRANSFERS OPEN
32-AV-MDR1345AE	3.228E-003	3	OPERATOR FAILS TO CLOSE MD-134/135 AFTER TEST
32-AV-MDR135-CO	1.032E-005	4	INDEPENDENT FAILUREAOV MD(R)-135 TRANSFERS OPEN
32-AVRC507---CO	1.032E-005	4	INDEPENDENT FAILUREAOV RC-507 TRANSFERS OPEN
32-AVRC508---CO	1.032E-005	4	INDEPENDENT FAILUREAOV RC-508 TRANSFERS OPEN
32-AVRKCOCCF12	5.170E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)32-AVRKCOCCF12
33--1TRN-REC-HE	1.727E-002	3	OPERATOR FAILS TO ESTABLISH RECIRC (1 OF 1 TRAIN)
33--2TRN-REC-HE	2.133E-002	3	OPERATOR FAILS TO ESTABLISH RECIRC (1 OF 2 TRAINS)
33--2TRN-RECSHE	1.000E+000	3	OPERATOR FAILS TO ESTABLISH RECIRC (SEISMIC)
33--MAN-HPI--HE	4.434E-004	3	OPERATOR FAILS TO START ECCS PUMPS MANUALLY
33--MAN-HPI-SHE	1.000E+000	3	OPERATOR FAILS TO START ECCS PUMPS MANUALLY (SEISMIC)
33--ORI------HE	1.499E-002	3	OPERATOR FAILS TO RESTORE RCS INVENTORY IN SBO
33--REC-DIAG-HE	1.500E-004	3	OPERATOR FAILS TO DIAGNOSE NEED FOR CNTMNT SUMP RECIRC
33--REC-DIAGSHE	1.000E+000	3	OPERATOR FAILS TO DIAGNOSE CNTMT SUMPRECIRC (SEISMIC)
33-CV---SI6A-CO	6.567E-004	2	CHECK VALVE SI-6A TRANSFERS OPEN
33-CV---SI6A-FC	9.999E-004	3	CHECK VALVE SI-6A FAILS TO CLOSE
33-CV---SI6A-FH	2.690E-004	3	CHECK VALVE SI-6A FAILS TO HOLD ON DEMAND
33-CV---SI6A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-6A FAILS TO OPEN
33-CV---SI6A-LK	4.454E-003	2	CHECK VALVE SI-6A LEAKS
33-CV---SI6B-CO	6.567E-004	2	CHECK VALVE SI-6B TRANSFERS OPEN

Table 12
Basic Event Descriptions (continued)

33-CV---SI6B-FC	9.999E-004	3	CHECK VALVE SI-6B FAILS TO CLOSE
33-CV---SI6B-FH	2.690E-004	3	CHECK VALVE SI-6B FAILS TO HOLD ON DEMAND
33-CV---SI6B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-6B FAILS TO OPEN
33-CV---SI6B-LK	4.454E-003	2	CHECK VALVE SI-6B LEAKS
33-CV--SI12A-CO	6.567E-004	2	CHECK VALVE SI-12A TRANSFERS OPEN
33-CV--SI12A-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-12A FAILS TO CLOSE
33-CV--SI12A-FH	2.690E-004	3	CHECK VALVE SI-12A FAILS TO HOLD ON DEMAND
33-CV--SI12A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-12A FAILS TO OPEN
33-CV--SI12A-LK	4.454E-003	2	CHECK VALVE SI-12A LEAKS
33-CV--SI12B-CO	6.567E-004	2	CHECK VALVE SI-12B TRANSFERS OPEN
33-CV--SI12B-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-12B FAILS TO CLOSE
33-CV--SI12B-FH	2.690E-004	3	CHECK VALVE SI-12B FAILS TO HOLD ON DEMAND
33-CV--SI12B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-12B FAILS TO OPEN
33-CV--SI12B-LK	4.454E-003	2	CHECK VALVE SI-12B LEAKS
33-CV--SI13A-CO	6.567E-004	2	CHECK VALVE SI-13A TRANSFERS OPEN
33-CV--SI13A-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-13A FAILS TO CLOSE
33-CV--SI13A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-13A FAILS TO OPEN
33-CV--SI13A-LK	4.454E-003	2	CHECK VALVE SI-13A LEAKS
33-CV--SI13B-CO	6.567E-004	2	CHECK VALVE SI-13B TRANSFERS OPEN
33-CV--SI13B-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-13B FAILS TO CLOSE
33-CV--SI13B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-13B FAILS TO OPEN
33-CV--SI13B-LK	4.454E-003	2	CHECK VALVE SI-13B LEAKS
33-CV--SI16A-CO	6.567E-004	2	CHECK VALVE SI-16A TRANSFERS OPEN
33-CV--SI16A-FH	2.690E-004	3	CHECK VALVE SI-16A FAILS TO HOLD ON DEMAND
33-CV--SI16A-FO	5.000E-005	3	CHECK VALVE SI-16A FAILS TO OPEN
33-CV--SI16A-LK	4.454E-003	2	CHECK VALVE SI-16A LEAKS
33-CV--SI16B-CO	6.567E-004	2	CHECK VALVE SI-16B TRANSFERS OPEN
33-CV--SI16B-FH	2.690E-004	3	CHECK VALVE SI-16B FAILS TO HOLD ON DEMAND
33-CV--SI16B-LK	4.454E-003	2	CHECK VALVE SI-16B LEAKS
33-CV--SI21A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-21A FAILS TO OPEN
33-CV--SI21B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-21B FAILS TO OPEN
33-CV--SI22A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-22A FAILS TO OPEN
33-CV--SI22B-CO	6.567E-004	2	CHECK VALVE SI-22B TRANSFERS OPEN
33-CV--SI22B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-22B FAILS TO OPEN
33-CV--SI22B-LK	4.454E-003	2	CHECK VALVE SI-22B LEAKS
33-CV1KFOCCF1-4	8.600E-006	3	GLOBAL FAILURE OF 33-CV1KFOCCF1-4
33-CV1KFOCCF12	8.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF12
33-CV1KFOCCF123	2.150E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF123
33-CV1KFOCCF124	2.150E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF124
33-CV1KFOCCF13	8.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF13
33-CV1KFOCCF134	2.150E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF134
33-CV1KFOCCF14	8.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF14
33-CV1KFOCCF23	8.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF23
33-CV1KFOCCF234	2.150E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF234
33-CV1KFOCCF24	8.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF24
33-CV1KFOCCF34	8.110E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV1KFOCCF34
33-CV2KFOCCF1-4	8.530E-006	3	GLOBAL FAILURE OF 33-CV2KFOCCF1-4
33-CV2KFOCCF12	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF12
33-CV2KFOCCF123	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF123
33-CV2KFOCCF124	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF124
33-CV2KFOCCF13	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF13
33-CV2KFOCCF134	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF134
33-CV2KFOCCF14	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF14
33-CV2KFOCCF23	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF23
33-CV2KFOCCF234	8.110E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF234
33-CV2KFOCCF24	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF24

Table 12
Basic Event Descriptions (continued)

33-CV2KFOCCF34	1.010E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV2KFOCCF34
33-CV6A1213AVCO TERM	1.009E-007	3	CHECK VALVES SI-6A,SI-12A, SI-13A TRANOPEN-VARIANCE
33-CV6A1213AVLK	3.144E-005	3	CHECK VALVES SI-6A,SI-12A, SI-13A LEAKVARIANCE TERM
33-CV6A1213BVCO TERM	1.009E-007	3	CHECK VALVES SI-6A,SI-12B, SI-13B TRANOPEN-VARIANCE
33-CV6A1213BVLK	3.144E-005	3	CHECK VALVES SI-6A,SI-12B, SI-13B LEAKVARIANCE TERM
33-CV6A1604AVCO TERM	1.009E-007	3	CHECK VALVES SI-6A,SI-16A, SI-304A TRNOPEN-VARIANCE
33-CV6A1604AVLK	3.144E-005	3	CHECK VALVES SI-6A,SI-16A, SI-304A LEAK-VARIANCE TERM
33-CV6A1604BVCO TERM	1.009E-007	3	CHECK VALVES SI-6A,SI-16B, SI-304B TRNOPEN-VARIANCE
33-CV6A1604BVLK	3.144E-005	3	CHECK VALVES SI-6A,SI-16B, SI-304B LEAK-VARIANCE TERM
33-CV6B1213AVCO TERM	1.009E-007	3	CHECK VALVES SI-6B,SI-12A, SI-13A TRANOPEN-VARIANCE
33-CV6B1213AVLK	3.144E-005	3	CHECK VALVES SI-6B,SI-12A, SI-13A LEAKVARIANCE TERM
33-CV6B1213BVCO TERM	1.009E-007	3	CHECK VALVES SI-6B,SI-12B, SI-13B TRANOPEN-VARIANCE
33-CV6B1213BVLK	3.144E-005	3	CHECK VALVES SI-6B SI-12B, SI-13B LEAKVARIANCE TERM
33-CV6B1604AVCO TERM	1.009E-007	3	CHECK VALVES SI-6B,SI-16A, SI-304A TRNOPEN-VARIANCE
33-CV6B1604AVLK	3.144E-005	3	CHECK VALVES SI-6B,SI-16A, SI-304A LEAK-VARIANCE TERM
33-CV6B1604BVCO TERM	1.009E-007	3	CHECK VALVES SI-6B,SI-16B, SI-304B TRNOPEN-VARIANCE
33-CV6B1604BVLK	3.144E-005	3	CHECK VALVES SI-6B,SI-16B, SI-304B LEAK-VARIANCE TERM
33-CV6KFOCCF12	1.370E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CV6KFOCCF12
33-CVDKFCCCF1-4	0.000E+000	3	GLOBAL FAILURE OF 33-CVDKFCCCF1-4
33-CVDKFCCCF12	1.260E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF12
33-CVDKFCCCF123	0.000E+000	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF123
33-CVDKFCCCF124	0.000E+000	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF124
33-CVDKFCCCF13	1.260E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF13
33-CVDKFCCCF134	0.000E+000	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF134
33-CVDKFCCCF14	1.260E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF14
33-CVDKFCCCF23	1.260E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF23
33-CVDKFCCCF234	0.000E+000	3	TRIPLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF234
33-CVDKFCCCF24	1.260E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF24
33-CVDKFCCCF34	1.260E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-CVDKFCCCF34
33-F925--CAL-AE	4.842E-003	3	TECHNICIAN MISCALIBRATES SI FLOW CHANNEL F925
33-HPI-MAN---HE	5.550E-002	3	OPERATOR FAILS TO ESTABLISH SI MANUALLY -- FIRE
33-MV---SI5A-FC	1.905E-003	3	INDEPENDENT FAILUREMOV SI-5A FAILS TO CLOSE
33-MV---SI5B-FC	1.905E-003	3	INDEPENDENT FAILUREMOV SI-5B FAILS TO CLOSE
33-MV--SI15A-CO	1.778E-004	2	MOV SI-15A TRANSFERS OPEN
33-MV--SI15A-FH	2.690E-004	3	MOV SI-15A FAILS TOHOLD ON DEMAND
33-MV--SI15A-FO	6.968E-004	3	MOV SI-15A FAILS TOOPEN
33-MV--SI15B-CO	1.778E-004	2	MOV SI-15B TRANSFERS OPEN
33-MV--SI15B-FH	2.690E-004	3	MOV SI-15B FAILS TOHOLD ON DEMAND
33-MV-KCOCCF12	1.360E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-MV-KCOCCF12
33-MV-KFCCCF12	5.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-MV-KFCCCF12
33-MV-KFOCCF12	1.020E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-MV-KFOCCF12
33-MV-SI208--FC	1.905E-003	3	INDEPENDENT FAILUREMOV SI-208 FAILS TOCLOSE
33-MV-SI209--FC	1.905E-003	3	INDEPENDENT FAILUREMOV SI-209 FAILS TOCLOSE
33-MV2KFCCCF12	5.240E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-MV2KFCCCF12
33-MVRHR299A-CO FLOW	1.200E-006	4	INDEPENDENT FAILUREMOV RHR-299A XFERS OPEN TO DIVERT
33-MVRHR299A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-299A FAILS TO OPEN

Table 12
Basic Event Descriptions (continued)

33-MVRHR299B-CO	1.200E-006	4	INDEPENDENT FAILUREMOV RHR-299B XFERS OPEN TO DIVERT FLOW
33-MVRHR299B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-299B FAILS TO OPEN
33-PM---SI1A-PR	8.159E-004	4	INDEPENDENT FAILURESAFETY INJECTION PUMP A FTR
33-PM---SI1A-PS	1.047E-003	3	INDEPENDENT FAILURESAFETY INJECTION PUMP A FAILS TO START
33-PM---SI1A-TM	1.380E-003	3	SI PUMP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
33-PM---SI1B-PR	8.159E-004	4	INDEPENDENT FAILURESAFETY INJECTION PUMP B FTR
33-PM---SI1B-PS	1.047E-003	3	INDEPENDENT FAILURESAFETY INJECTION PUMP B FAILS TO START
33-PM---SI1B-TM	2.000E-003	3	SI PUMP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
33-PM-KPRCCF12	3.350E-005	4	DOUBLE COMMON CAUSE FAILURE (CCF)33-PM-KPRCCF12
33-PM-KPSCCF12	1.100E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-PM-KPSCCF12
33-SI-FILL--MHE	2.234E-002	3	OPERATOR FAILS TO ALIGN SI FOR REFILL
33-SIFLO-RI-MHE	4.800E-002	3	OPERATOR FAILS TO ALIGN SI FOR REFILL(REDUCED INVENTORY)
33-SW-PBMSI1-CO	4.370E-003	4	INDEPENDENT FAILURESWITCH PB/MSI-1 CONTACTS XFER OPEN
33-SW-PBMSI2-CO	4.370E-003	4	INDEPENDENT FAILURESWITCH PB/MSI-2 CONTACTS XFER OPEN
33-SW-PBRSIA-CO	4.370E-003	4	INDEPENDENT FAILURESWITCH PB/RSI-A CONTACTS XFER OPEN
33-SW-PBRSIB-CO	4.370E-003	4	INDEPENDENT FAILURESWITCH PB/RSI-B CONTACTS XFER OPEN
33-SWAKCOCCF12	1.030E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-SWAKCOCCF12
33-SWMKCOCCF12	1.030E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-SWMKCOCCF12
33-TK---RWST-RP	6.482E-007	4	RWST RUPTURE
33-TK--ACC1A-RP	2.701E-008	4	INDEPENDENT FAILUREACCUMULATOR A RUPTURE
33-TK--ACC1B-RP	2.701E-008	4	INDEPENDENT FAILUREACCUMULATOR B RUPTURE
33-TK-KRPCCF12	6.350E-010	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-TK-KRPCCF12
33-TL--RWST--AE	6.386E-006	3	TECHNICIAN MISCALIBRATES RWST LEVEL INSTRUMENTS
33-XV---SI7A-AE	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE SI-7A AFTER TEST
33-XV---SI7B-AE	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE SI-7B AFTER TEST
33-XV-KFCCCF12	4.700E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)33-XV-KFCCCF12
33-XV-SI7A---FC	1.000E-004	3	INDEPENDENT FAILUREMANUAL VALVE SI-7A FAILS TO CLOSE
33-XV-SI7B---FC	1.000E-004	3	INDEPENDENT FAILUREMANUAL VALVE SI-7B FAILS TO CLOSE
34--ISL-DIAG-HE	6.841E-003	3	OPERATOR FAILS TO DIAGNOSE ISL
34--LR1------HE	1.613E-002	3	OPERATOR FAILS TO ESTABLISH LOW PRESSURE RECIRC
34--LR1-----SHE	1.000E+000	3	OPERATOR FAILS TO ESTABLISH LPI (SEISMIC)
34--MAN-LPI--HE	3.657E-004	3	OPERATOR FAILS TO START RHR PUMPS MANUALLY
34--MAN-LPI-SHE	1.000E+000	3	OPERATOR FAILS TO START RHR PUMPS MANUALLY(SEISMIC)
34--OCV------HE	5.114E-003	3	OPERATOR FAILS TO ISOLATE BREAK
34--OIP------HE	2.128E-002	3	OPERATOR FAILS TO ISOLATE RHR PUMPS
34--RHR------HE	8.235E-002	3	OPERATOR FAILS TO ESTABLISH RHR
34--RHR-----SHE	1.000E+000	3	OPERATOR FAILS TO ESTABLISH RHR - SEISMIC
34--RHR-STOP-HE	1.337E-002	3	OPERATOR FAILS TO STOP RHR PUMP ON MINIFLOW RECIRC.
34--RHR-STOPSHE	1.000E+000	3	OPERATOR FAILS TO STOP RHR PUMP ON RECIRC. (SEISMIC)
34-AV--RHR8A-OC	1.032E-005	4	INDEPENDENT FAILUREAOV RHR-8A TRANSFERS CLOSED
34-AV--RHR8B-FO	2.168E-003	3	AOV RHR-8B FAILS TOOPEN
34-AV--RHR8B-OC	1.032E-005	4	INDEPENDENT FAILUREAOV RHR-8B TRANSFERS CLOSED
34-AV-KOCCCF12	2.420E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-AV-KOCCCF12
34-CV--RHR3A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE RHR-3A FAILS TO OPEN
34-CV--RHR3B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE RHR-3B FAILS TO OPEN
34-CV--RHR5A-CO	6.567E-004	2	CHECK VALVE RHR-5A TRANSFERS OPEN
34-CV--RHR5A-FH	2.690E-004	3	CHECK VALVE RHR-5A FAILS TO HOLD ON DEMAND
34-CV--RHR5A-LK	4.454E-003	2	CHECK VALVE RHR5A LEAKS
34-CV--RHR5B-CO	6.567E-004	2	CHECK VALVE RHR-5B TRANSFERS OPEN
34-CV--RHR5B-FH	2.690E-004	3	CHECK VALVE RHR-5B FAILS TO HOLD ON DEMAND
34-CV--RHR5B-LK	4.454E-003	2	CHECK VALVE RHR5B LEAKS
34-CV-KFOCCF1-4	6.590E-006	3	GLOBAL FAILURE OF 34-CV-KFOCCF1-4

Table 12
Basic Event Descriptions (continued)

34-CV-KFOCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF12
34-CV-KFOCCF123	5.250E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF123
34-CV-KFOCCF124	5.250E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF124
34-CV-KFOCCF13	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF13
34-CV-KFOCCF134	5.250E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF134
34-CV-KFOCCF14	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF14
34-CV-KFOCCF23	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF23
34-CV-KFOCCF234	5.250E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF234
34-CV-KFOCCF24	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF24
34-CV-KFOCCF34	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV-KFOCCF34
34-CV-SI303A-CO	6.567E-004	2	CHECK VALVE SI-303ATRANSFERS OPEN
34-CV-SI303A-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-303AFAILS TO CLOSE
34-CV-SI303A-FH	2.690E-004	3	CHECK VALVE SI-303AFAILS TO HOLD ON DEMAND
34-CV-SI303A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-303AFAILS TO OPEN
34-CV-SI303A-LK	4.454E-003	2	CHECK VALVE SI-303ALEAKS
34-CV-SI303B-CO	6.567E-004	2	CHECK VALVE SI-303BTRANSFERS OPEN
34-CV-SI303B-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-303BFAILS TO CLOSE
34-CV-SI303B-FH	2.690E-004	3	CHECK VALVE SI-303BFAILS TO HOLD ON DEMAND
34-CV-SI303B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-303BFAILS TO OPEN
34-CV-SI303B-LK	4.454E-003	2	CHECK VALVE SI-303BLEAKS
34-CV-SI304A-CO	6.567E-004	2	CHECK VALVE SI-304ATRANSFERS OPEN
34-CV-SI304A-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-304AFAILS TO CLOSE
34-CV-SI304A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-304AFAILS TO OPEN
34-CV-SI304A-LK	4.454E-003	2	CHECK VALVE SI-304ALEAKS
34-CV-SI304B-CO	6.567E-004	2	CHECK VALVE SI-304BTRANSFERS OPEN
34-CV-SI304B-FC	9.999E-004	3	INDEPENDENT FAILURECHECK VALVE SI-304BFAILS TO CLOSE
34-CV-SI304B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-304BFAILS TO OPEN
34-CV-SI304B-LK	4.454E-003	2	CHECK VALVE SI-304BLEAKS
34-CV2KFOCCF12	1.710E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)RHR-3A/B FTO
34-CV3KFCCCF1-4	4.520E-005	3	GLOBAL FAILURE OF 34-CV3KFCCCF1-4
34-CV3KFCCCF12	4.420E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF12
34-CV3KFCCCF123	2.610E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF123
34-CV3KFCCCF124	2.610E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF124
34-CV3KFCCCF13	4.420E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF13
34-CV3KFCCCF134	2.610E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF134
34-CV3KFCCCF14	4.420E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF14
34-CV3KFCCCF23	4.420E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF23
34-CV3KFCCCF234	2.610E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF234
34-CV3KFCCCF24	4.420E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF24
34-CV3KFCCCF34	4.420E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CV3KFCCCF34
34-CVD-RHR5A-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE RHR-5A FAILS TO OPEN
34-CVD-RHR5B-FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE RHR-5B FAILS TO OPEN
34-CVDKFOCCF12	1.710E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CVDKFOCCF12
34-CVIKFOCCF12	1.710E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-CVIKFOCCF12
34-CVSI301A--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-301AFAILS TO OPEN
34-CVSI301B--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE SI-301BFAILS TO OPEN
34-CVSI3034AVCO	1.009E-007	3	CHECK VALVES RHR-5ASI-303A AND SI304A TRANS OPEN VAR
TERM			
34-CVSI3034AVLK	3.144E-005	3	CHECK VALVES RHR-5ASI-303A AND SI304A LEAK-VARIANCE
TERM			
34-CVSI3034BVCO	1.009E-007	3	CHECK VALVES RHR-5BSI-303B AND SI304B TRANS OPEN VAR
TERM			
34-CVSI3034BVLK	3.144E-005	3	CHECK VALVES RHR-5BSI-303B AND SI-304BLEAK-VARIANCE
TERM			
34-DIARHRLK-MHE	3.000E-003	3	OPERATOR FAILS TO DIAGNOSE LEAK IN RHR SYSTEM
34-DIARHRPM-MHE	6.000E-003	3	OPERATOR FAILS TO DIAGNOSE LOSS OF RHR PUMPS

Table 12
Basic Event Descriptions (continued)

34-F626--CAL-AE	4.842E-003	3	TECHNICIAN MISCALIBRATES RHR FLOW CHANNEL F626
34-F928--CAL-AE	4.842E-003	3	TECHNICIAN MISCALIBRATES RHR FLOW CHANNEL F928
34-FL---SUMP-PL	1.199E-003	4	CONTAINMENT SUMP STRAINERS PLUGGED
34-HX--RHR1A-LK	2.400E-005	4	INDEPENDENT FAILURERHR HEAT EXCHANGER A SHELL LEAK
34-HX--RHR1B-LK	2.400E-005	4	INDEPENDENT FAILURERHR HEAT EXCHANGER B SHELL LEAK
34-HX-KLKCCF12	5.640E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-HE-KHSCCF12
34-ISOL-DRN-MHE	7.090E-002	3	OPERATOR FAILS TO ISOLATE RCS DRAIN PATH
34-MV-KFCCCF12	1.980E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KFCCCF12
34-MV-KFOCCF1-4	9.730E-007	3	GLOBAL FAILURE OF 34-MV-KFOCCF1-4
34-MV-KFOCCF12	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF12
34-MV-KFOCCF123	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF123
34-MV-KFOCCF124	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF124
34-MV-KFOCCF13	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF13
34-MV-KFOCCF134	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF134
34-MV-KFOCCF14	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF14
34-MV-KFOCCF23	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF23
34-MV-KFOCCF234	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF234
34-MV-KFOCCF24	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF24
34-MV-KFOCCF34	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KFOCCF34
34-MV-KOCCCF12	2.820E-008	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV-KOCCCF12
34-MV-RHR1A--CO	1.778E-004	2	INDEPENDENT FAILUREMOV RHR-1A TRANSFERS OPEN
34-MV-RHR1A--FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-1A FAILS TOOPEN
34-MV-RHR1B--CO	1.778E-004	2	INDEPENDENT FAILUREMOV RHR-1B TRANSFERS OPEN
34-MV-RHR1B--FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-1B FAILS TOOPEN
34-MV-RHR2A--CO	1.778E-004	2	INDEPENDENT FAILUREMOV RHR-2A TRANSFERS OPEN
34-MV-RHR2A--FH	2.690E-004	3	MOV RHR-2A FAILS TOHOLD ON DEMAND
34-MV-RHR2A--FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-2A FAILS TOOPEN
34-MV-RHR2B--CO	1.778E-004	2	INDEPENDENT FAILUREMOV RHR-2B TRANSFERS OPEN
34-MV-RHR2B--FH	2.690E-004	3	MOV RHR-2B FAILS TOHOLD ON DEMAND
34-MV-RHR2B--FO	6.968E-004	3	INDEPENDENT FAILUREMOV RHR-2B FAILS TOOPEN
34-MV-SI302A-FC	1.905E-003	3	INDEPENDENT FAILUREMOV SI-302A FAILS TO CLOSE
34-MV-SI302A-OC	1.200E-006	4	INDEPENDENT FAILUREMOV SI-302A TRANSFERS CLOSED
34-MV-SI302B-FC	1.905E-003	3	INDEPENDENT FAILUREMOV SI-302B FAILS TO CLOSE
34-MV-SI302B-FO	6.968E-004	3	MOV SI-302B FAILS TO OPEN
34-MV-SI302B-OC	1.200E-006	4	INDEPENDENT FAILUREMOV SI-302B TRANSFERS CLOSED
34-MV-SI350A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SI-350A FAILS TO OPEN
34-MV-SI350B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SI-350B FAILS TO OPEN
34-MV-SI351A-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SI-351A FAILS TO OPEN
34-MV-SI351B-FO	6.968E-004	3	INDEPENDENT FAILUREMOV SI-351B FAILS TO OPEN
34-MV3KFOCCF1-4	9.730E-007	3	GLOBAL FAILURE OF 34-MV3KFOCCF1-4
34-MV3KFOCCF12	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF12
34-MV3KFOCCF123	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF123
34-MV3KFOCCF124	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF124
34-MV3KFOCCF13	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF13
34-MV3KFOCCF134	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF134
34-MV3KFOCCF14	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF14
34-MV3KFOCCF23	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF23
34-MV3KFOCCF234	3.750E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF234
34-MV3KFOCCF24	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF24
34-MV3KFOCCF34	4.110E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-MV3KFOCCF34
34-MVD-RHR11-CO	1.778E-004	2	MOV RHR-11 TRANSFERS OPEN
34-MVD-RHR11-FH	2.690E-004	3	MOV RHR-11 FAILS TOHOLD ON DEMAND
34-MVD-RHR11-FO	6.968E-004	3	MOV RHR-11 FAILS TOOPEN
34-MVIKOCCCF12	2.820E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)SI-300A/B TRN CLSD
34-MVRHR12A-VCO	1.927E-007	3	MOVS RHR-1A AND RHR-2A TRANSFERS OPEN-VARIANCE TERM
34-MVRHR12B-VCO	1.927E-007	3	MOVS RHR-1B AND RHR-2B TRANSFERS OPEN-VARIANCE TERM

Table 12
Basic Event Descriptions (continued)

34-MVSI300A--OC	1.200E-006	4	INDEPENDENT FAILUREMOV SI-300A TRANSFERS CLOSED
34-MVSI300B--FO	6.968E-004	3	MOV SI-300B FAILS TO OPEN
34-MVSI300B--OC	1.200E-006	4	INDEPENDENT FAILUREMOV SI-300B TRANSFERS CLOSED
34-PM--RHR1A-PR	5.399E-004	4	INDEPENDENT FAILURERESIDUAL HEAT REMOVAL PUMP A FTR
34-PM--RHR1A-PS	9.509E-004	3	INDEPENDENT FAILURERESIDUAL HEAT REMOVAL PUMP A FTS
34-PM--RHR1A-TM	2.060E-003	3	RHR PUMP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
34-PM--RHR1B-PR	5.399E-004	4	INDEPENDENT FAILURERESIDUAL HEAT REMOVAL PUMP B FTR
34-PM--RHR1B-PS	9.509E-004	3	INDEPENDENT FAILURERESIDUAL HEAT REMOVAL PUMP B FTS
34-PM--RHR1B-TM	3.220E-003	3	RHR PUMP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
34-PM-KPRCCF12	5.510E-005	4	DOUBLE COMMON CAUSE FAILURE (CCF)34-PM-KPRCCF12
34-PM-KPSCCF12	1.130E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)34-PM-KPSCCF12
34-RHRELOS---HE	2.563E-003	3	LATE RECOVERY AFTEREARLY COGNITIVE OR TIME DEP. FAILURE
34-RHRINJRI-MHE	5.010E-001	3	OPERATOR FAILS TO ALIGN RHR FOR REFILL (REDUCD INV)
34-RHRLRCR-B-HE	5.175E-001	3	FAILURE TO RECOVER LONG TERM COOLING BEFORE BOILING
34-RHRLRCR-D-HE	2.053E-002	3	FAILURE TO RECOVER LONG TERM COOLING BEFORE CORE DAMAGE
34-RHRRCVR-B-HE	5.175E-001	3	OPERATOR FAILS TO RECOVER RHR COOLING
34-RHRRCVR-D-HE	2.053E-002	3	OPERATOR FAILS TO RECOVER FROM LOSS OF RHRE BEFORE CD
34-RV--SI312-FO	3.000E-004	3	RELIEF VALVE SI-312FAILS TO OPEN
34-RV-RHR33--FC	3.000E-003	3	RELIEF VALVE RHR-33FAILS TO CLOSE
34-RV-RHR33--FO	3.000E-004	3	RELIEF VALVE RHR-33FAILS TO OPEN
34-RV-RHR33-1FC	3.000E-003	3	RELIEF VALVE RHR-33-1 FAILS TO CLOSE
34-RV-RHR33-1FO	3.000E-004	3	RELIEF VALVE RHR-33-1 FAILS TO OPEN
34-RWSTGRAV-MHE	4.205E-001	3	OPERATOR FAILS TO ESTABLISH RWST GRAVITY DRN REFILL
34-XV-RHR-7A-FC	1.000E-004	3	MANUAL VALVE RHR-7AFAILS TO CLOSE
34-XV-RHR100AFC	1.000E-004	3	MANUAL VALVE RHR-100A FAILS TO CLOSE
34-XV-RHR201-FO	1.000E-004	3	MANUAL VALVE RHR-201 FAILS TO OPEN
34-XV-RHR202-FO	1.000E-004	3	MANUAL VALVE RHR-202 FAILS TO OPEN
34-XV-RHR210-FC	1.000E-004	3	MANUAL VALVE RHR-210 FAILS TO CLOSE
34-XV-RHR4A--FC	1.000E-004	3	MANUAL VALVE RHR-4AFAILS TO CLOSE
34-XV-RHR4B--FC	1.000E-004	3	MANUAL VALVE RHR-4BFAILS TO CLOSE
34-XV-RHR80A-FC	1.000E-004	3	MANUAL VALVE RHR-80A FAILS TO CLOSE
34-XV-RHR9A--FC	1.000E-004	3	MANUAL VALVE RHR-9AFAILS TO CLOSE
35--CH2------HE	1.162E-001	3	OPERATOR FAILS TO ESTABLISH CHARGING FLOW DURING SBO
35--CH2-----DHE	2.074E-001	3	OPERATOR FAILS TO ESTABLISH CHARGING FLOW-SBO (DEP)
35--CHG-STBY-HE	1.991E-003	3	OPERATOR FAILS TO START STANDBY CHARGING PUMP
35--CHG-STBYSHE	1.000E+000	3	OPERATOR FAILS TO START STBY CHARGINGPUMP (SEISMIC)
35--LTDN-RES-HE	4.520E-002	3	OPERATOR FAILS TO RESTORE LETDOWN AFTER LOSP
35--LTS------HE	1.121E-002	3	OPERATOR FAILS TO MAINTAIN LONG TERM SHUTDOWN
35-AV-CVC11--FC	4.758E-004	3	AOV CVC-11 FAILS TOCLOSE
35-AV-CVC15--FO	2.168E-003	3	AOV CVC-15 FAILS TOOPEN
35-AV-CVC403-OC	1.032E-005	4	AOV CVC-403 TRANSFERS CLOSED
35-AV-CVC406-CO	1.032E-005	4	AOV CVC-406 TRANSFERS OPEN, DIVERTING FLOW
35-AV-CVC408-CO	1.032E-005	4	AOV CVC-408 TRANSFERS OPEN, DIVERTING FLOW
35-AV-CVC7---CO	1.032E-005	4	AOV CVC-7 TRANSFERSOPEN
35-AV-CVC7---OC	1.032E-005	4	AOV CVC-7 TRANSFERSCLOSED
35-AV-KFOCCF12	1.050E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)LD-4A/4B FTO
35-AV-KOCCCF12	2.420E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)LD-4A/4B TRAN CLOS
35-AV-LD10---OC	1.032E-005	4	AOV LD-10 TRANSFERSCLOSED
35-AV-LD14---OC	1.032E-005	4	AOV LD-14 TRANSFERSCLOSED
35-AV-LD27---OC	1.032E-005	4	AOV LD-27 TRANSFERSCLOSED
35-AV-LD4A---FO	2.168E-003	3	INDEPENDENT FAILUREAOV LD-4A FAILS TO OPEN
35-AV-LD4A---OC	1.032E-005	4	INDEPENDENT FAILUREAOV LD-4A TRANSFERSCLOSED
35-AV-LD4B---FO	2.168E-003	3	INDEPENDENT FAILUREAOV LD-4B FAILS TO OPEN
35-AV-LD4B---OC	1.032E-005	4	INDEPENDENT FAILUREAOV LD-4B TRANSFERSCLOSED

Table 12
Basic Event Descriptions (continued)

35-AV-LD6----OC	1.032E-005	4	AOV LD-6 TRANSFERS CLOSED
35-AV-MU1022-FO	2.168E-003	3	AOV MU-1022 FAILS TO OPEN
35-AVCKCOCCF12	5.170E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)CVC-712A/B TRN OPEN
35-AVCVC712A-CO	1.032E-005	4	INDEPENDENT FAILUREAOV CVC-712A TRANSFERS OPEN
35-AVCVC712B-CO	1.032E-005	4	INDEPENDENT FAILUREAOV CVC-712B TRANSFERS OPEN
35-CHG-DSP---HE	2.564E-002	3	OPERATOR FAILS TO ESTABLISH CHARGING FROM DSP
35-CV-CVC16--FO	5.000E-005	3	CHECK VALVE CVC-16 FAILS TO OPEN
35-CV-CVC411-FO	5.000E-005	3	CHECK VALVE CVC-411FAILS TO OPEN
35-CV-MU1023-FO	5.000E-005	3	CHECK VALVE MU-1023FAILS TO OPEN
35-CVCVC704A-FC	9.999E-004	3	CHECK VALVE CVC-704A FAILS TO CLOSE
35-CVCVC704A-FO	5.000E-005	3	CHECK VALVE CVC-704A FAILS TO OPEN
35-CVCVC704B-FC	9.999E-004	3	CHECK VALVE CVC-704B FAILS TO CLOSE
35-CVCVC704B-FO	5.000E-005	3	CHECK VALVE CVC-704B FAILS TO OPEN
35-HX--LTDN--LK	2.400E-005	4	LETDOWN HEAT EXCHANGER SHELL LEAK
35-MV-CVC301-FO	6.968E-004	3	MOV CVC-301 FAILS TO OPEN
35-MV-CVC440-FO	6.968E-004	3	MOV CVC-440 FAILS TO OPEN
35-PC-CHGP1A-OP	7.197E-005	4	INDEPENDENT FAILURECHG PUMP A SPEED CONTROLLER FAILURE
35-PC-CHGP1B-OP	7.197E-005	4	INDEPENDENT FAILURECHG PUMP B SPEED CONTROLLER FAILURE
35-PC-CHGP1C-OP	7.197E-005	4	INDEPENDENT FAILURECHG PUMP C SPEED CONTROLLER FAILURE
35-PC-KOPCCF12	4.360E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PC-KOPCCF12
35-PC-KOPCCF123	9.290E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)35-PC-KOPCCF123
35-PC-KOPCCF13	4.360E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PC-KOPCCF13
35-PC-KOPCCF23	4.360E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PC-KOPCCF23
35-PM-CHGP1A-PR	2.102E-004	4	INDEPENDENT FAILURECHARGING PUMP A FAILS TO RUN
35-PM-CHGP1A-PS	5.753E-004	3	INDEPENDENT FAILURECHARGING PUMP A FAILS TO START
35-PM-CHGP1A-TM	7.650E-003	3	CHARGING PUMP A UNAVAILABLE DUE TO TEST OR MAINTENANCE
35-PM-CHGP1B-PR	2.102E-004	4	INDEPENDENT FAILURECHARGING PUMP B FAILS TO RUN
35-PM-CHGP1B-PS	5.753E-004	3	INDEPENDENT FAILURECHARGING PUMP B FAILS TO START
35-PM-CHGP1B-TM	1.040E-002	3	CHARGING PUMP B UNAVAILABLE DUE TO TEST OR MAINTENANCE
35-PM-CHGP1C-PR	2.995E-004	4	INDEPENDENT FAILURECHARGING PUMP C FAILS TO RUN
35-PM-CHGP1C-PS	9.374E-003	3	INDEPENDENT FAILURECHARGING PUMP C FAILS TO START
35-PM-CHGP1C-TM	1.180E-002	3	CHARGING PUMP C UNAVAILABLE DUE TO TEST OR MAINTENANCE
35-PM-KPRCCF12	2.610E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM-KPRCCF12
35-PM-KPRCCF123	1.250E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)35-PM-KPRCCF123
35-PM-KPRCCF13	2.610E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM-KPRCCF13
35-PM-KPRCCF23	2.610E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM-KPRCCF23
35-PM-KPSCCF12	1.540E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM-KPSCCF12
35-PM-KPSCCF123	5.420E-005	3	TRIPLE COMMON CAUSE FAILURE (CCF)35-PM-KPSCCF123
35-PM-KPSCCF13	1.540E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM-KPSCCF13
35-PM-KPSCCF23	1.540E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM-KPSCCF23
35-PM1KPRCCF12	5.630E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM1KPRCCF12
35-PM1KPSCCF12	1.670E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)35-PM1KPSCCF12
35-PMBATP1A--PR	8.159E-004	4	INDEPENDENT FAILUREBORIC ACID TRANSFERPUMP A FAILS TO RUN
35-PMBATP1A--PS	1.400E-003	3	INDEPENDENT FAILUREBORIC ACID TRANSFERPUMP A FTS
35-PMBATP1B--PR	8.159E-004	4	INDEPENDENT FAILUREBORIC ACID TRANSFERPUMP B FAILS TO RUN
35-PMBATP1B--PS	1.400E-003	3	INDEPENDENT FAILUREBORIC ACID TRANSFERPUMP B FTS
35-RV-LD5----FO	3.000E-004	3	RELIEF VALVE LD-5 FAILS TO OPEN
35-SV-33109--FO	4.999E-004	3	SOV 33109 FAILS TO OPEN

Table 12
Basic Event Descriptions (continued)

35-SV-33739--FO	4.999E-004	3	SOV 33739 FAILS TO OPEN
35-TK----BAT-RP	6.482E-007	4	BORIC ACID TANK RUPTURE
35-TL--LT112-FA	2.400E-005	4	LEVEL TRANSMITTER LT-112 FAILS
35-TL--LT141-FA	2.400E-005	4	LEVEL TRANSMITTER LT-141 FAILS
35-VC-CVC7---OP	7.197E-005	4	CONTROLLER FOR AOV CVC-7 FAILURE
35-VC-CVC7DSPOP	7.197E-005	4	DSP CONTROLLER FOR AOV CVC-7 FAILURE
35-VC-RMUC---OP	7.197E-005	4	REACTOR MAKEUP CONTROLLER FAILURE
35-XV-CVC410-FO	1.000E-004	3	MANUAL VALVE CVC-410 FAILS TO OPEN
35-XV-CVC412-FO	1.000E-004	3	MANUAL VALVE CVC-412 FAILS TO OPEN
35-XV-CVC443-AE	7.991E-004	3	OPERATOR FAILS TO OPEN MANUAL VALVE CVC-443 AFTER TEST
36--CLOSE-BV-HE	6.812E-003	3	OPERATOR FAILS TO CLOSE BLOCK VALVE
36--LHS-DEP--HE	1.000E-006	3	OPERATOR ERRORS LEAD TO LOSS OF HEAT SINK
36--LHS-DIAG-HE	1.761E-003	3	OPERATOR FAILS TO DIAGNOSE LOSS OF HEAT SINK
36--LHS-DIAGDHE	2.460E-003	3	OPERATOR FAILS TO DIAGNOSE LOSS OF HEAT SINK (DEPEND)
36--LHS-DIAGSHE	1.000E+000	3	OPERATOR FAILS TO DIAGNOSE LOSS OF HEAT SINK (SEISMIC)
36--OBF------HE	2.451E-002	3	OPERATOR FAILS TO ESTABLISH BLEED ANDFEED
36--OBF-----MHE	3.512E-002	3	OPERATOR FAILS TO ESTABLISH BLEED ANDFEED (SHUTDOWN)
36--OBF-----SHE	1.000E+000	3	OPERATOR FAILS TO ESTABLISH BLEED ANDFEED (SEISMIC)
36--SGTRDIAG-HE	1.123E-003	3	OPERATOR FAILS TO DIAGNOSE SGTR
36--SLO-DEP--HE	1.000E-006	3	OPERATOR ERRORS LEAD TO LOSS OF RECIRC IN SLO
36-AV-KFOCCF12	3.150E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)36-AV-KFOCCF12
36-AV-LD2----FO	2.168E-003	3	AOV LD-2 FAILS TO OPEN
36-AV-LD2----OC	1.032E-005	4	AOV LD-2 TRANSFERS CLOSED
36-AV-LD3----FO	2.168E-003	3	AOV LD-3 FAILS TO OPEN
36-AV-LD3----OC	1.032E-005	4	AOV LD-3 TRANSFERS CLOSED
36-AV-PR2A---FC	2.458E-003	3	AOV PR-2A FAILS TO CLOSE
36-AV-PR2A---FO	2.458E-003	3	INDEPENDENT FAILUREAOV PR-2A FAILS TO OPEN
36-AV-PR2B---FC	2.458E-003	3	AOV PR-2B FAILS TO CLOSE
36-AV-PR2B---FO	2.458E-003	3	INDEPENDENT FAILUREAOV PR-2B FAILS TO OPEN
36-AVS-PS1A--FO	2.168E-003	3	INDEPENDENT FAILUREAOV PS-1A FAILS TO OPEN
36-AVS-PS1B--FO	2.168E-003	3	INDEPENDENT FAILUREAOV PS-1B FAILS TO OPEN
36-AVSKFOCCF12	2.780E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)36-AVSKFOCCF12
36-CV-MU1011-FC	9.999E-004	3	CHECK VALVE MU-1011FAILS TO CLOSE
36-DC--PQ429-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-429 FAILS
36-DC--PQ430-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-430 FAILS
36-DC--PQ431-FA	9.999E-006	4	INDEPENDENT FAILURELOOP POWER SUPPLY PQ-431 FAILS
36-DC-KFACCF12	6.050E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-429,430
36-DC-KFACCF123	1.290E-007	4	TRIPLE COMMON CAUSE FAILURE (CCF)PQ-429,430,431
36-DC-KFACCF13	6.050E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-429,431
36-DC-KFACCF23	6.050E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)PQ-430,431
36-HX-RCPATB-LK	8.721E-003	4	REACTOR COOLANT PUMP A THERMAL BARRIER RUPTURES
36-HX-RCPBTB-LK	8.721E-003	4	REACTOR COOLANT PUMP B THERMAL BARRIER RUPTURES
36-MV-KFOCCF12	1.210E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)36-MV-KFOCCF12
36-MV-PR1A---AE	7.991E-004	3	OPERATOR FAILS TO OPEN MOV PR-1A AFTER TEST
36-MV-PR1A---FC	3.330E-003	3	MOV PR-1A FAILS TO CLOSE
36-MV-PR1A---FO	3.331E-003	3	INDEPENDENT FAILUREMOV PR-1A FAILS TO OPEN
36-MV-PR1B---AE	7.991E-004	3	OPERATOR FAILS TO OPEN MOV PR-1B AFTER TEST
36-MV-PR1B---FC	3.330E-003	3	MOV PR-1A FAILS TO CLOSE
36-MV-PR1B---FO	3.331E-003	3	INDEPENDENT FAILUREMOV PR-1B FAILS TO OPEN
36-SUBCLGCAL-AE	4.533E-003	3	TECHNICIAN MISCALIBRATES RCS SUBCOOLING
36-SV-33113--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33113 FAILS TO OPEN
36-SV-33114--FO	4.999E-004	3	INDEPENDENT FAILURESOV 33114 FAILS TO OPEN
36-SV-33731--FO	4.999E-004	3	SOV 33731 FAILS TO OPEN
36-SV-KFOCCF12	2.350E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)36-SV-KFOCCF12

Table 12
Basic Event Descriptions (continued)

36-T450A-CAL-AE	2.397E-003	3	TECHNICIAN MISCALIBRATES RCS HOT LEG TEMP T450
36-T450B-CAL-AE	2.397E-003	3	TECHNICIAN MISCALIBRATES RCS COLD LEG TEMP T450
36-TP--PT419-AE	1.208E-003	3	TECHNICIAN MISCALIBRATES PRESSINSTRUMENT PT-419
36-TP--PT420-AE	1.208E-003	3	TECHNICIAN MISCALIBRATES PRESSINSTRUMENT PT-420
36-TP--PT429-FA	2.999E-006	4	INDEPENDENT FAILUREPRES TRANSMITTER PT-429 FAILS
36-TP--PT430-FA	2.999E-006	4	INDEPENDENT FAILUREPRES TRANSMITTER PT-430 FAILS
36-TP--PT431-FA	2.999E-006	4	INDEPENDENT FAILUREPRES TRANSMITTER PT-431 FAILS
36-TP-KFACCF12	1.820E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)PT-429,430
36-TP-KFACCF123	3.870E-008	4	TRIPLE COMMON CAUSE FAILURE (CCF)PT-429,430,431
36-TP-KFACCF13	1.820E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)PT-429,431
36-TP-KFACCF23	1.820E-008	4	DOUBLE COMMON CAUSE FAILURE (CCF)PT-430,431
36-UV-PR3A---FC	3.000E-003	3	SAFETY VALVE PR-3A FAILS TO CLOSE
36-UV-PR3A---FO	3.000E-004	3	SAFETY VALVE PR-3A FAILS TO OPEN
36-UV-PR3B---FC	3.000E-003	3	SAFETY VALVE PR-3B FAILS TO CLOSE
36-UV-PR3B---FO	3.000E-004	3	SAFETY VALVE PR-3B FAILS TO OPEN
38--DOOR-EDC-HE	7.200E-003	3	OPERATOR FAILS TO OPEN BATTERY ROOM DOORS FOR VNTLTN
38--DOOR-EDCSHE	1.000E+000	3	OPERATOR FAILS TO OPEN BATTERY ROOM DOORS FOR VENT
(S)			
38-BC-BRA108-OP	2.229E-005	4	INDEPENDENT FAILURE125VDC BATTERY CHARGER BRA-108
38-BC-BRB108-OP	2.229E-005	4	INDEPENDENT FAILURE125VDC BATTERY CHARGER BRB-108
38-BC-BRC108-OP	2.229E-005	4	INDEPENDENT FAILURE125VDC BATTERY CHARGER BRC-108
38-BC-BRD108-OP	2.229E-005	4	INDEPENDENT FAILURE125VDC BATTERY CHARGER BRD-108
38-BCAKOPCCF12	5.550E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)38-BCAKOPCCF12
38-BCCKOPCCF12	5.550E-007	4	DOUBLE COMMON CAUSE FAILURE (CCF)38-BCCKOPCCF12
38-BS-BRA102-SG	2.400E-006	4	125VDC BUS BRA-102 FAILURE
38-BS-BRA104-SG	2.400E-006	4	125VDC BUS BRA-104 FAILURE
38-BS-BRB102-SG	2.400E-006	4	125VDC BUS BRB-102 FAILURE
38-BS-BRB104-SG	2.400E-006	4	125VDC BUS BRB-104 FAILURE
38-BS-BRC102-SG	2.400E-006	4	125VDC BUS BRC-102 FAILURE
38-BS-BRC103-SG	2.400E-006	4	125VDC BUS BRC-103 FAILURE
38-BS-BRD102-SG	2.400E-006	4	125VDC BUS BRD-102 FAILURE
38-BS-BRD103-SG	2.400E-006	4	125VDC BUS BRD-103 FAILURE
38-BY-BRA101-OP	9.957E-005	4	INDEPENDENT FAILURE125VDC BATTERY BRA-101 FAILURE
38-BY-BRB101-OP	9.957E-005	4	INDEPENDENT FAILURE125VDC BATTERY BRB-101 FAILURE
38-BY-BRC101-OP	9.957E-005	4	INDEPENDENT FAILURE125VDC BATTERY BRC-101 FAILURE
38-BY-BRD101-OP	9.957E-005	4	INDEPENDENT FAILURE125VDC BATTERY BRD-101 FAILURE
38-BYAKOPCCF12	1.230E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)38-BYAKOPCCF12
38-BYCKOPCCF12	1.940E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)38-BYCKOPCCF12
38-CBA101----CO	7.512E-006	4	BKR FROM BATTERY BRA-101 TO BUS BRA-102 TRANS OPEN
38-CBA102-04-CO	7.512E-006	4	BKR FROM BUS BRA-102 TO BUS BRA-104 TRANS OPEN
38-CBA102-05-CO	7.512E-006	4	BKR FROM CHARGER BRA-108 TO BUS BRA-102 TRANS OPEN
38-CBA104-01-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 1 TRANSFERSOPEN
38-CBA104-02-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 2 TRANSFERSOPEN
38-CBA104-04-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 4 TRANSFERSOPEN
38-CBA104-06-CO	7.512E-006	4	BREAKER BRA-106 CIRCUIT 6 TRANSFERSOPEN
38-CBA104-07-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 7 TRANSFERSOPEN
38-CBA104-08-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 8 TRANSFERSOPEN
38-CBA104-09-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 9 TRANSFERSOPEN
38-CBA104-12-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 12 TRANSFERS OPEN
38-CBA104-13-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 13 TRANSFERS OPEN
38-CBA104-14-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 14 TRANSFERS OPEN
38-CBA104-15-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 15 TRANSFERS OPEN
38-CBA104-21-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 21 TRANSFERS OPEN
38-CBA104-23-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 23 TRANSFERS OPEN
38-CBA104-28-CO	7.512E-006	4	BREAKER BRA-104 CIRCUIT 28 TRANSFERS OPEN
38-CBB101----CO	7.512E-006	4	BKR FROM BATTERY BRB-101 TO BUS BRB-102 TRANS OPEN

Table 12
Basic Event Descriptions (continued)

38-CBB102-04-CO	7.512E-006	4	BKR FROM BUS BRB-102 TO BUS BRB-104 TRANS OPEN
38-CBB102-05-CO	7.512E-006	4	BKR FROM CHARGEY BRB-108 TO BUS BRB-102 TRANS OPEN
38-CBB104-01-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 1 TRANSFERSOPEN
38-CBB104-02-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 2 TRANSFERSOPEN
38-CBB104-04-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 4 TRANSFERSOPEN
38-CBB104-06-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 6 TRANSFERSOPEN
38-CBB104-12-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 12 TRANSFERS OPEN
38-CBB104-21-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 21 TRANSFERS OPEN
38-CBB104-23-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 23 TRANSFERS OPEN
38-CBB104-28-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 28 TRANSFERS OPEN
38-CBB104-32-CO	7.512E-006	4	BREAKER BRB-104 CIRCUIT 32 TRANSFERS OPEN
38-CBC101----CO	7.512E-006	4	BKR FROM BATTERY BRC-101 TO BUS BRC-102 TRANS OPEN
38-CBC102-04-CO	7.512E-006	4	BKR FROM BUS BRC-102 TO BUS BRC-103 TRANS OPEN
38-CBC102-08-CO	7.512E-006	4	BKR FROM CHARGER BRC-108 TO BUS BRC-102 TRANS OPEN
38-CBC103-05-CO	7.512E-006	4	BREAKER BRC-103 CIRCUIT 5 TRANSFERSOPEN
38-CBC103-06-CO	7.512E-006	4	BREAKER BRC-103 CIRCUIT 6 TRANSFERSOPEN
38-CBC103-07-CO	7.512E-006	4	BREAKER BRC-103 CIRCUIT 7 TRANSFERSOPEN
38-CBC103-08-CO	7.512E-006	4	BREAKER BRC-103 CIRCUIT 8 TRANSFERSOPEN
38-CBC103-10-CO	7.512E-006	4	BREAKER BRC-103 CIRCUIT 10 TRANSFERS OPEN
38-CBD101----CO	7.512E-006	4	BKR FROM BATTERY BRD-101 TO BUS BRD-102 TRANS OPEN
38-CBD102-04-CO	7.512E-006	4	BKR FROM BUS BRD-102 TO BUS BRD-103 TRANS OPEN
38-CBD102-08-CO	7.512E-006	4	BKR FROM CHARGER BR-108 TO BUS BRD-102 TRANS OPEN
38-CBD103-03-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 3 TRANSFERSOPEN
38-CBD103-05-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 5 TRANSFERSOPEN
38-CBD103-06-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 6 TRANSFERSOPEN
38-CBD103-07-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 7 TRANSFERSOPEN
38-CBD103-08-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 8 TRANSFERSOPEN
38-CBD103-10-CO	7.512E-006	4	BREAKER BRD-104 CIRCUIT 10 TRANSFERS OPEN
38-CBD103-15-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 15 TRANSFERS OPEN
38-CBD103-27-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 27 TRANSFERS OPEN
38-CBD103-29-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 29 TRANSFERS OPEN
38-CBD103-31-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 31 TRANSFERS OPEN
38-CBD103-32-CO	7.512E-006	4	BREAKER BRD-103 CIRCUIT 32 TRANSFERS OPEN
38-CBD115-12-CO	7.512E-006	4	BREAKER BRD-115 CIRCUIT 12 TRANSFERS OPEN
38-CBD115-23-CO	7.512E-006	4	BREAKER BRD-115 CIRCUIT 23 TRANSFERS OPEN
38IBS-BRA105-SG	2.400E-006	4	BUS BRA-105 FAILURE
38IBS-BRA113-SG	2.400E-006	4	BUS BRA-113 FAILURE
38IBS-BRA114-SG	2.400E-006	4	BUS BRA-114 FAILURE
38IBS-BRA127-SG	2.400E-006	4	BUS BRA-127 FAILURE
38IBS-BRB105-SG	2.400E-006	4	BUS BRB-105 FAILURE
38IBS-BRB113-SG	2.400E-006	4	BUS BRB-113 FAILURE
38IBS-BRB114-SG	2.400E-006	4	BUS BRB-114 FAILURE
38IBS-BRB127-SG	2.400E-006	4	BUS BRB-127 FAILURE
38IBS-BRD115-SG	2.400E-006	4	BUS BRD-115 FAILURE
38ICBA105----CO	7.512E-006	4	BREAKER FROM BRA-106 TO BRA-105 TRANSFERS OPEN
38ICBA105-03-CO	7.512E-006	4	BREAKER BRA-105 CIRCUIT 3 TRANSFERSOPEN
38ICBA105-10-CO	7.512E-006	4	BREAKER BRA-105 CIRCUIT 10 TRANSFERS OPEN
38ICBA105-18-CO	7.512E-006	4	BREAKER BRA-105 CIRCUIT 18 TRANSFERS OPEN
38ICBA105-5A-CO	7.512E-006	4	BREAKER BRA-105 CIRCUIT 5A TRANSFERS OPEN
38ICBA113----CO	7.512E-006	4	BREAKER FROM BRA-111 TO BRA-113 TRANSFERS OPEN
38ICBA114----CO	7.512E-006	4	BREAKER FROM BRA-112 TO BRA-114 TRANSFERS OPEN
38ICBA126----CO	7.512E-006	4	BREAKER FROM BRA-126 TO BRA-127 TRANSFERS OPEN
38ICBA127----CO	7.512E-006	4	BREAKER FROM BRA-106 TO BRA-127 TRANSFERS OPEN
38ICBA127-13-CO	7.512E-006	4	BREAKER BRA-127 CIRCUIT 13 TRANSFERS OPEN
38ICBB105----CO	7.512E-006	4	BREAKER FROM BRB-106 TO BRB-105 TRANSFERS OPEN
38ICBB105-04-CO	7.512E-006	4	BREAKER BRB-105 CIRCUIT 4 TRANSFERSOPEN

Table 12
Basic Event Descriptions (continued)

38ICBB105-06-CO	7.512E-006	4	BREAKER BRB-105 CIRCUIT 6 TRANSFERSOPEN
38ICBB105-14-CO	7.512E-006	4	BREAKER BRB-105 CIRCUIT 14 TRANSFERS OPEN
38ICBB105-23-CO	7.512E-006	4	BREAKER BRB-105 CIRCUIT 23 TRANSFERS OPEN
38ICBB113----CO	7.512E-006	4	BREAKER FROM BRB-111 TO BRB-113 TRANSFERS OPEN
38ICBB114----CO	7.512E-006	4	BREAKER FROM BRB-112 TO BRB-114 TRANSFERS OPEN
38ICBB126----CO	7.512E-006	4	BREAKER FROM BRB-126 TO BRB-127 TRANSFERS OPEN
38ICBB127----CO	7.512E-006	4	BREAKER FROM BRB-106 TO BRB-127 TRANSFERS OPEN
38ICBB127-23-CO	7.512E-006	4	BREAKER BRB-127 CIRCUIT 23 TRANSFERS OPEN
38ICBB127-33-CO	7.512E-006	4	BREAKER BRB-127 CIRCUIT 33 TRANSFERS OPEN
38ICBD115-14-CO	7.512E-006	4	BREAKER BRD-115 CIRCUIT 14 TRANSFERS OPEN
38IIV-BRA111-OP	2.192E-004	4	INDEPENDENT FAILUREINVERTER BRA-111 FAILURE
38IIV-BRA112-OP	2.192E-004	4	INDEPENDENT FAILUREINVERTER BRA-112 FAILURE
38IIV-BRB111-OP	2.192E-004	4	INDEPENDENT FAILUREINVERTER BRB-111 FAILURE
38IIV-BRB112-OP	2.192E-004	4	INDEPENDENT FAILUREINVERTER BRB-112 FAILURE
38IIV-BRD109-OP	2.192E-004	4	INVERTER BRD-109 FAILURE
38IIV-KOPCCF1-4	2.040E-006	3	GLOBAL FAILURE OF 38IIV-KOPCCF1-4
38IIV-KOPCCF12	7.770E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF12
38IIV-KOPCCF123	3.690E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF123
38IIV-KOPCCF124	3.690E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF124
38IIV-KOPCCF13	7.770E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF13
38IIV-KOPCCF134	3.690E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF134
38IIV-KOPCCF14	7.770E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF14
38IIV-KOPCCF23	7.770E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF23
38IIV-KOPCCF234	3.690E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF234
38IIV-KOPCCF24	7.770E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF24
38IIV-KOPCCF34	7.770E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)38IIV-KOPCCF34
38ISA-BRA107-FC	1.000E-003	3	INDEPENDENT FAILUREAUTO SWITCH BRA-107FAILS TO TRANSFER
38ISA-BRB107-FC	1.000E-003	3	INDEPENDENT FAILUREAUTO SWITCH BRB-107FAILS TO TRANSFER
38ISA-KFCCCF12	4.700E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)38ISA-KFCCCF12
38ISA-SSA111-FC	1.000E-003	3	INVERTER BRA-111 STATIC SWITCH FAILSTO TRANSFER
38ISA-SSA112-FC	1.000E-003	3	INVERTER BRA-112 STATIC SWITCH FAILSTO TRANSFER
38ISA-SSB111-FC	1.000E-003	3	INVERTER BRB-111 STATIC SWITCH FAILSTO TRANSFER
38ISA-SSB112-FC	1.000E-003	3	INVERTER BRB-112 STATIC SWITCH FAILSTO TRANSFER
38ISA-SSD109-FC	1.000E-003	3	INVERTER BRD-109 STATIC SWITCH FAILSTO TRANSFER
38ITR-BRA106-SG	2.400E-005	4	INSTRUMENT BUS TRANSFORMER BRA-106FAILURE
38ITR-BRB106-SG	2.400E-005	4	INSTRUMENT BUS TRANSFORMER BRB-106FAILURE
39-BS-BUS1---SG	2.400E-006	4	BUS 1 FAILURE
39-BS-BUS2---SG	2.400E-006	4	BUS 2 FAILURE
39-BS-BUS3---SG	2.400E-006	4	BUS 3 FAILURE
39-BS-BUS4---SG	2.400E-006	4	BUS 4 FAILURE
39-BS-BUS5---SG	2.400E-006	4	BUS 5 FAILURE
39-BS-BUS6---SG	2.400E-006	4	BUS 6 FAILURE
39-CB--1-303-CO	7.829E-006	4	BREAKER 1-303 TRANSFERS OPEN
39-CB--1-309-CO	7.829E-006	4	BREAKER 1-309 TRANSFERS OPEN
39-CB--1-405-CO	7.829E-006	4	BREAKER 1-405 TRANSFERS OPEN
39-CB--1-406-CO	7.829E-006	4	BREAKER 1-406 TRANSFERS OPEN
39-CB--1-409-CO	7.829E-006	4	BREAKER 1-409 TRANSFERS OPEN
39-CB--1-505-CO	7.829E-006	4	BREAKER 1-505 TRANSFERS OPEN
39-CB--1-607-CO	7.829E-006	4	BREAKER 1-607 TRANSFERS OPEN
39-CB-1-101--FC	4.999E-004	3	BREAKER 1-101 FAILSTO CLOSE
39-CB-1-104--CO	7.829E-006	4	BREAKER 1-104 TRANSFERS OPEN
39-CB-1-104--FC	4.999E-004	3	BREAKER 1-104 FAILSTO CLOSE
39-CB-1-201--FC	4.999E-004	3	BREAKER 1-201 FAILSTO CLOSE
39-CB-1-204--CO	7.829E-006	4	BREAKER 1-204 TRANSFERS OPEN

Table 12
Basic Event Descriptions (continued)

39-CB-1-204--FC	4.999E-004	3	BREAKER 1-204 FAILSTO CLOSE
39-CB-1-301--CO	7.829E-006	4	BREAKER 1-301 TRANSFERS OPEN
39-CB-1-301--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-301 FAIL TO CLOSE
39-CB-1-306--FO	4.999E-004	3	BREAKER 1-306 FAILSTO OPEN
39-CB-1-307--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-307 FAILSTO CLOSE
39-CB-1-401--CO	7.829E-006	4	BREAKER 1-401 TRANSFERS OPEN
39-CB-1-401--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-401 FAILSTO CLOSE
39-CB-1-403--FO	4.999E-004	3	BREAKER 1-403 FAILSTO OPEN
39-CB-1-407--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-407 FAILSTO CLOSE
39-CB-1-501--CO	7.829E-006	4	BREAKER 1-501 TRANSFERS OPEN
39-CB-1-501--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-501 FAIL TO CLOSE
39-CB-1-501--FO	4.999E-004	3	BREAKER 1-501 FAILSTO OPEN
39-CB-1-502--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-502 FAILSTO OPEN
39-CB-1-503--CO	7.829E-006	4	BREAKER 1-503 TRANSFERS OPEN
39-CB-1-503--FC	4.999E-004	3	BREAKER 1-503 FAILSTO CLOSE
39-CB-1-503--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-503 FAILSTO OPEN
39-CB-1-504--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-504 FAILSTO OPEN
39-CB-1-506--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-506 FAILSTO OPEN
39-CB-1-508--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-508 FAILSTO OPEN
39-CB-1-511--CO	7.829E-006	4	BREAKER 1-511 TRANSFERS OPEN
39-CB-1-511--FC	4.999E-004	3	BREAKER 1-511 FAILSTO CLOSE
39-CB-1-511--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-511 FAILSTO OPEN
39-CB-1-601--CO	7.829E-006	4	BREAKER 1-601 TRANSFERS OPEN
39-CB-1-601--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-601 FAILSTO CLOSE
39-CB-1-601--FO	4.999E-004	3	BREAKER 1-601 FAILSTO OPEN
39-CB-1-604--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-604 FAILSTO OPEN
39-CB-1-605--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-605 FAILSTO OPEN
39-CB-1-606--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-606 FAILSTO OPEN
39-CB-1-608--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-608 FAILSTO OPEN
39-CB-1-610--CO	7.829E-006	4	BREAKER 1-610 TRANSFERS OPEN
39-CB-1-610--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-610 FAIL TO CLOSE
39-CB-1-610--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-610 FAILSTO OPEN
39-CB-1-611--CO	7.829E-006	4	BREAKER 1-611 TRANSFERS OPEN
39-CB-1-611--FC	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-611 FAIL TO CLOSE
39-CB-1-611--FO	4.999E-004	3	INDEPENDENT FAILUREBREAKER 1-611 FAILSTO OPEN
39-CB-KFCCCF12	3.710E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)BKRS 307, 407 FTO
39-CB-KFOCCF1-8	1.398E-004	3	COMMON CAUSE FAILURE OF 4160 V BKRS TO OPEN
39-CB3KFCCCF12	3.710E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)BKRS 301, 401 FTO
39-CN---86B5-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 86/B5 CONTACTS XFER OPEN
39-CN---86B6-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 86/B6 CONTACTS XFER OPEN
39-CN-52A166-RC	2.999E-004	3	RELAY 52A/1-606 CONTACTS FAIL
39-CN-KCOCCF1-4	3.050E-005	3	GLOBAL FAILURE OF 39-CN-KCOCCF1-4
39-CN-KCOCCF12	1.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF12
39-CN-KCOCCF123	5.520E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF123
39-CN-KCOCCF124	5.520E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF124
39-CN-KCOCCF13	1.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF13
39-CN-KCOCCF134	5.520E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF134
39-CN-KCOCCF14	1.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF14
39-CN-KCOCCF23	1.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF23
39-CN-KCOCCF234	5.520E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF234
39-CN-KCOCCF24	1.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF24
39-CN-KCOCCF34	1.160E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KCOCCF34
39-CN-KRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 39-CN-KRCCCF1-4
39-CN-KRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF12
39-CN-KRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF123
39-CN-KRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF124

Table 12
Basic Event Descriptions (continued)

39-CN-KRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF13
39-CN-KRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF134
39-CN-KRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF14
39-CN-KRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF23
39-CN-KRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF234
39-CN-KRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF24
39-CN-KRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KRCCCF34
39-CN-KROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-CN-KROCCF12
39-CN50452A1-CO	3.284E-003	4	INDEPENDENT FAILUREBREAKER 1-504 52A-1CONTACTS XFER OPEN
39-CN50452A1-RC	2.999E-004	3	INDEPENDENT FAILUREBREAKER 1-504 52A-1CONTACTS FAIL
39-CN50452A2-CO	3.284E-003	4	INDEPENDENT FAILUREBREAKER 1-504 52A-2CONTACTS XFER OPEN
39-CN50452A2-RC	2.999E-004	3	INDEPENDENT FAILUREBREAKER 1-504 52A-2CONTACTS FAIL
39-CN60452A1-CO	3.284E-003	4	INDEPENDENT FAILUREBREAKER 1-604 52A-1CONTACTS XFER OPEN
39-CN60452A1-RC	2.999E-004	3	INDEPENDENT FAILUREBREAKER 1-604 52A-1CONTACTS FAIL
39-CN60452A2-CO	3.284E-003	4	INDEPENDENT FAILUREBREAKER 1-604 52A-2CONTACTS XFER OPEN
39-CN60452A2-RC	2.999E-004	3	INDEPENDENT FAILUREBREAKER 1-604 52A-2CONTACTS FAIL
39-RE-52A166-RF	1.859E-004	4	RELAY 52A/1-606 FAILS TO OPERATE
39-SW--46684-CO	3.719E-004	4	INDEPENDENT FAILURESWITCH 46684 CONTACTS XFER OPEN
39-SW--46685-CO	3.719E-004	4	INDEPENDENT FAILURESWITCH 46685 CONTACTS XFER OPEN
39-SW-KCOCCF12	8.740E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)39-SW-KCOCCF12
39-TR-MAT----SG	2.400E-005	4	MAIN AUXILIARY TRANSFORMER FAILURE
39-TR-RAT----SG	2.400E-005	4	RESERVE AUX TRANSFORMER FAILURE
39-TR-TAT----SG	2.400E-005	4	TERTIARY AUX TRANSFORMER FAILURE
40---MCC5262-HE	1.360E-001	3	OPERATOR FAILS TO SWITCH MCC-5262 TO BUS 62
40--ORP------HE	7.690E-003	3	OPERATOR FAILS TO DEENERGIZE BUSES 33 AND 43
40-BS-BUS32--SG	2.400E-006	4	BUS 32 FAILURE
40-BS-BUS35--SG	2.400E-006	4	BUS 35 FAILURE
40-BS-BUS42--SG	2.400E-006	4	BUS 42 FAILURE
40-BS-BUS45--SG	2.400E-006	4	BUS 45 FAILURE
40-BS-BUS46--SG	2.400E-006	4	BUS 46 FAILURE
40-BS-BUS51--SG	2.400E-006	4	BUS 51 FAILURE
40-BS-BUS52--SG	2.400E-006	4	BUS 52 FAILURE
40-BS-BUS61--SG	2.400E-006	4	BUS 61 FAILURE
40-BS-BUS62--SG	2.400E-006	4	BUS 62 FAILURE
40-BS-MCC32D-SG	2.400E-006	4	MCC-32D FAILURE
40-BS-MCC32G-SG	2.400E-006	4	MCC-32G FAILURE
40-BS-MCC35C-SG	2.400E-006	4	MCC-35C FAILURE
40-BS-MCC35E-SG	2.400E-006	4	MCC-35E FAILURE
40-BS-MCC42B-SG	2.400E-006	4	MCC-42B FAILURE
40-BS-MCC42D-SG	2.400E-006	4	MCC-42D FAILURE
40-BS-MCC42G-SG	2.400E-006	4	MCC-42G FAILURE
40-BS-MCC45B-SG	2.400E-006	4	MCC-45B FAILURE
40-BS-MCC45C-SG	2.400E-006	4	MCC-45C FAILURE
40-BS-MCC45E-SG	2.400E-006	4	MCC-45E FAILURE
40-BS-MCC46B-SG	2.400E-006	4	MCC-46B FAILURE
40-BS-MCC46D-SG	2.400E-006	4	MCC-46D FAILURE
40-BS-MCC5262SG	2.400E-006	4	MCC-5262 FAILURE
40-BS-MCC52A-SG	2.400E-006	4	MCC-52A FAILURE
40-BS-MCC52B-SG	2.400E-006	4	MCC-52B FAILURE
40-BS-MCC52C-SG	2.400E-006	4	MCC-52C FAILURE
40-BS-MCC52D-SG	2.400E-006	4	MCC-52D FAILURE
40-BS-MCC52E-SG	2.400E-006	4	MCC-52E FAILURE

Table 12
Basic Event Descriptions (continued)

40-BS-MCC52F-SG	2.400E-006	4	MCC-52F FAILURE
40-BS-MCC62A-SG	2.400E-006	4	MCC-62A FAILURE
40-BS-MCC62B-SG	2.400E-006	4	MCC-62B FAILURE
40-BS-MCC62C-SG	2.400E-006	4	MCC-62C FAILURE
40-BS-MCC62D-SG	2.400E-006	4	MCC-62D FAILURE
40-BS-MCC62E-SG	2.400E-006	4	MCC 62E FAILURE
40-BS-MCC62H-SG	2.400E-006	4	MCC-62H FAILURE
40-BS-MCC62J-SG	2.400E-006	4	MCC-62J FAILURE
40-CB--13201-CO	7.512E-006	4	BREAKER 13201 TRANSFERS OPEN
40-CB--13206-CO	7.512E-006	4	BREAKER 13206 TRANSFERS OPEN
40-CB--13207-CO	7.512E-006	4	BREAKER 13207 TRANSFERS OPEN
40-CB--13242-FC	4.999E-004	3	BREAKER 13242 FAILSTO CLOSE
40-CB--13301-FO	4.999E-004	3	BREAKER 13301 FAILSTO OPEN
40-CB--13501-CO	7.512E-006	4	BREAKER 13501 TRANSFERS OPEN
40-CB--13505-CO	7.512E-006	4	BREAKER 13505 TRANSFERS OPEN
40-CB--13506-CO	7.512E-006	4	BREAKER 13506 TRANSFERS OPEN
40-CB--13507-CO	7.512E-006	4	BREAKER 13507 TRANSFERS OPEN
40-CB--13545-FC	4.999E-004	3	BREAKER 13545 FAILSTO CLOSE
40-CB--14201-CO	7.512E-006	4	BREAKER 14201 TRANSFERS OPEN
40-CB--14202-CO	7.512E-006	4	BREAKER 14202 TRANSFERS OPEN
40-CB--14207-CO	7.512E-006	4	BREAKER 14207 TRANSFERS OPEN
40-CB--14301-FO	4.999E-004	3	BREAKER 14301 FAILSTO OPEN
40-CB--14501-CO	7.512E-006	4	BREAKER 14502 TRANSFERS OPEN
40-CB--14503-CO	7.512E-006	4	BREAKER 14503 TRANSFERS OPEN
40-CB--14504-CO	7.512E-006	4	BREAKER 14504 TRANSFERS OPEN
40-CB--14505-CO	7.512E-006	4	BREAKER 14505 TRANSFERS OPEN
40-CB--14601-CO	7.512E-006	4	BREAKER 14601 TRANSFERS OPEN
40-CB--14601-FO	4.999E-004	3	BREAKER 14601 FAILSTO OPEN
40-CB--14603-CO	7.512E-006	4	BREAKER 14603 TRANSFERS OPEN
40-CB--14604-FC	4.999E-004	3	BREAKER 14604 FAILSTO CLOSE
40-CB--14605-CO	7.512E-006	4	BREAKER 14605 TRANSFERS OPEN
40-CB--14607-FC	4.999E-004	3	BREAKER 14607 FAILSTO CLOSE
40-CB--15101-CO	7.512E-006	4	BREAKER 15101 TRANSFERS OPEN
40-CB--15101-FO	5.000E-004	3	BREAKER 15101 FAIL TO OPEN
40-CB--15111-CO	7.510E-006	4	BREAKER 15111 TRANSFERS OPEN
40-CB--15111-FC	5.000E-004	3	BREAKER 15111 FAIL TO CLOSE
40-CB--15201-CO	7.512E-006	4	BREAKER 15201 TRANSFERS OPEN
40-CB--15203-CO	7.512E-006	4	BREAKER 15203 TRANSFERS OPEN
40-CB--15203-FC	4.999E-004	3	BREAKER 15203 FAILSTO CLOSE
40-CB--15204-CO	7.512E-006	4	BREAKER 15204 TRANSFERS OPEN
40-CB--15205-CO	7.512E-006	4	BREAKER 15205 TRANSFERS OPEN
40-CB--15206-CO	7.512E-006	4	BREAKER 15206 TRANSFERS OPEN
40-CB--15208-CO	7.512E-006	4	BREAKER 15208 TRANSFERS OPEN
40-CB--15209-CO	7.512E-006	4	BREAKER 15209 TRANSFERS OPEN
40-CB--15210-FC	4.999E-004	3	BREAKER 15210 FAILSTO CLOSE
40-CB--15211-CO	7.510E-006	4	BREAKER 15211 TRANSFERS OPEN
40-CB--16101-CO	7.512E-006	4	BREAKER 16101 TRANSFERS OPEN
40-CB--16111-CO	7.510E-006	4	BREAKER 16111 TRANSFERS OPEN
40-CB--16111-FC	5.000E-004	3	BREAKER 16111 FAILSTO CLOSE
40-CB--16201-CO	7.512E-006	4	BREAKER 16201 TRANSFERS OPEN
40-CB--16204-CO	7.512E-006	4	BREAKER 16204 TRANSFERS OPEN
40-CB--16206-CO	7.512E-006	4	BREAKER 16206 TRANSFERS OPEN
40-CB--16208-CO	7.512E-006	4	BREAKER 16208 TRANSFERS OPEN
40-CB--16209-CO	7.512E-006	4	BREAKER 16209 TRANSFERS OPEN
40-CB--16211-CO	7.510E-006	4	BREAKER 16211 TRANSFERS OPEN
40-CB--16212-CO	7.512E-006	4	BREAKER 16212 TRANSFERS OPEN

Table 12
Basic Event Descriptions (continued)

40-CB-46B4ABRCO	7.512E-006	4	BREAKER FROM MCC-46B TO BRC-108 TRANSFERS OPEN
40-CB-52C/A2-CO	7.512E-006	4	BREAKER FROM MCC-52C TO BRA-108 TRANSFERS OPEN
40-CB-52C/B3-CO	7.512E-006	4	BREAKER FROM MCC-52C TO BRA-111 TRANSFERS OPEN
40-CB-52C/B4-CO	7.512E-006	4	BREAKER FROM MCC-52C TO BRA-106 TRANSFERS OPEN
40-CB-52C/B5-CO	7.512E-006	4	BREAKER FROM MCC-52C TO BRA-112 TRANSFERS OPEN
40-CB-52E/E5-CO	7.512E-006	4	BREAKER FROM MCC-52E TO BRA-106 TRANSFERS OPEN
40-CB-62C/A2-CO	7.512E-006	4	BREAKER FROM MCC-62C TO BRB-111 TRANSFERS OPEN
40-CB-62C/A3-CO	7.512E-006	4	BREAKER FROM MCC-62C TO BRB-112 TRANSFERS OPEN
40-CB-62C/A4-CO	7.512E-006	4	BREAKER FROM MCC-62C TO BRB-108 TRANSFERS OPEN
40-CB-62C/A7-CO	7.512E-006	4	BREAKER FROM MCC-62C TO BRD-108 TRANSFERS OPEN
40-CB-62C/B4-CO	7.512E-006	4	BREAKER FROM MCC-62C TO BRB-106 TRANSFERS OPEN
40-CB-62C/B6-CO	7.512E-006	4	BREAKER FROM MCC-62C TO BRD-109 TRANSFERS OPEN
40-CB-62E/A2-CO	7.512E-006	4	BREAKER FROM MCC-62E TO BRB-106 TRANSFERS OPEN
40-RE-KOPCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 40-RE-KOPCCF1-4
40-RE-KOPCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF12
40-RE-KOPCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF123
40-RE-KOPCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF124
40-RE-KOPCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF13
40-RE-KOPCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF134
40-RE-KOPCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF14
40-RE-KOPCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF23
40-RE-KOPCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF234
40-RE-KOPCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF24
40-RE-KOPCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)40-RE-KOPCCF34
40-RE-UV32---OP	2.999E-004	3	INDEPENDENT FAILUREBUS 32 UNDERVOLTAGERELAYS FAIL
40-RE-UV35---OP	2.999E-004	3	INDEPENDENT FAILUREBUS 35 UNDERVOLTAGERELAYS FAIL
40-RE-UV42---OP	2.999E-004	3	INDEPENDENT FAILUREBUS 42 UNDERVOLTAGERELAYS FAIL
40-RE-UV45---OP	2.999E-004	3	INDEPENDENT FAILUREBUS 45 UNDERVOLTAGERELAYS FAIL
40-TR--1-32--SG	9.845E-006	4	TRANSFORMER 1-32 FAILURE
40-TR--1-35--SG	9.845E-006	4	TRANSFORMER 1-35 FAILURE
40-TR--1-42--SG	9.845E-006	4	TRANSFORMER 1-42 FAILURE
40-TR--1-45--SG	9.845E-006	4	TRANSFORMER 1-45 FAILURE
40-TR--1-46--SG	9.845E-006	4	TRANSFORMER 1-46 FAILURE
40-TR--1-51--SG	9.845E-006	4	TRANSFORMER 1-51 FAILURE
40-TR--1-52--SG	9.845E-006	4	TRANSFORMER 1-52 FAILURE
40-TR--1-61--SG	9.845E-006	4	TRANSFORMER 1-61 FAILURE
40-TR--1-62--SG	9.845E-006	4	TRANSFORMER 1-62 FAILURE
40-XCONN-BUS-HE	4.725E-002	3	OPERATOR FAILS TO CROSS-CONNECT BUSES51 AND 61
42-CN---BSB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY BS/B5 CONTACTS FAIL
42-CN---BSB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY BS/B6 CONTACTS FAIL
42-CN---SIB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SI/B5 CONTACTS FAIL
42-CN---SIB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SI/B5 CONTACTS FAIL
42-CN--27AB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27A/B5 CONTACTS FAIL
42-CN--27AB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27A/B6 CONTACTS FAIL
42-CN--27CB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27C/B5 CONTACTS FAIL
42-CN--27CB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27C/B6 CONTACTS FAIL
42-CN--27XB5-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 27X/B5 CONTACTS XFER OPEN
42-CN--27XB6-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 27X/B6 CONTACTS XFER OPEN
42-CN--52ZB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52Z/B5 CONTACTS FAIL
42-CN--52ZB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52Z/B6 CONTACTS FAIL
42-CN--83XB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 83X/B5 CONTACTS FAIL
42-CN--83XB5-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83X/B5 CONTACTS XFER OPEN
42-CN--83XB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 83X/B6 CONTACTS FAIL
42-CN--83XB6-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83X/B6 CONTACTS XFER OPEN
42-CN--BLSB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY BLS/B5 CONTACTS FAIL
42-CN--BLSB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY BLS/B6 CONTACTS FAIL

Table 12
Basic Event Descriptions (continued)

42-CN--BLXB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY BLX/B5 CONTACTS FAIL
42-CN--BLXB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY BLX/B6 CONTACTS FAIL
42-CN--S1XB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S1X/B5 CONTACTS FAIL
42-CN--S1XB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S1X/B6 CONTACTS FAIL
42-CN--S2XB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S2X/B5 CONTACTS FAIL
42-CN--S2XB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S2X/B6 CONTACTS FAIL
42-CN--TDB15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-B1/B5 CONTACTS FAIL
42-CN--TDB16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-B1/B6 CONTACTS FAIL
42-CN--VR157-RO	1.859E-004	4	INDEPENDENT FAILURERELAY VR15-7 CNTCTS TRANS OPEN
42-CN--VR167-RO	1.859E-004	4	INDEPENDENT FAILURERELAY VR16-7 CNTCTS TRANS OPEN
42-CN-27AR15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27A/RAT1-5 CONTACTS FAIL
42-CN-27AR16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27A/RAT1-6 CONTACTS FAIL
42-CN-27AT15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27A/TAT1-5 CONTACTS FAIL
42-CN-27AT16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27A/TAT1-6 CONTACTS FAIL
42-CN-27AXB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AX/B5 CONTACTS FAIL
42-CN-27AXB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AX/B6 CONTACTS FAIL
42-CN-27AYB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AY/B5 CONTACTS FAIL
42-CN-27AYB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AY/B6 CONTACTS FAIL
42-CN-27AZB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AZ/B5 CONTACTS FAIL
42-CN-27AZB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AZ/B6 CONTACTS FAIL
42-CN-27CR15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27C/RAT1-5 CONTACTS FAIL
42-CN-27CR16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27C/RAT1-6 CONTACTS FAIL
42-CN-27CT15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27C/TAT1-5 CONTACTS FAIL
42-CN-27CT16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27C/TAT1-6 CONTACTS FAIL
42-CN-27CXB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CX/B5 CONTACTS FAIL
42-CN-27CXB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CX/B6 CONTACTS FAIL
42-CN-27CYB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CY/B5 CONTACTS FAIL
42-CN-27CYB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CY/B6 CONTACTS FAIL
42-CN-27CZB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CZ/B5 CONTACTS FAIL
42-CN-27CZB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CZ/B6 CONTACTS FAIL
42-CN-27XR15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27X/R1-5 CONTACTS FAIL
42-CN-27XR16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27X/R1-6 CONTACTS FAIL
42-CN-27XT15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27X/TAT1-5 CONTACTS FAIL
42-CN-27XT16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27X/TAT1-6 CONTACTS FAIL
42-CN-52B501-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-501 CONTACTS FAIL
42-CN-52B503-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-503 CONTACTS FAIL
42-CN-52B509-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-509 CONTACTS FAIL
42-CN-52B510-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-510 CONTACTS FAIL
42-CN-52B511-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-511 CONTACTS FAIL
42-CN-52B601-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-601 CONTACTS FAIL
42-CN-52B602-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-602 CONTACTS FAIL
42-CN-52B603-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-603 CONTACTS FAIL
42-CN-52B610-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-610 CONTACTS FAIL
42-CN-52B611-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52SB/1-611 CONTACTS FAIL
42-CN-52C509-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52CY/1-509 CONTACTS FAIL
42-CN-52C603-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 52CT/1-603 CONTACTS FAIL
42-CN-7AZXB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AZX/B5 CONTACTS FAIL
42-CN-7AZXB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27AZX/B6 CONTACTS FAIL
42-CN-7CZAB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CAZX/B5 CONTACTS FAIL
42-CN-7CZAB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CAZX/B6 CONTACTS FAIL
42-CN-7CZXB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CZX/B5 CONTACTS FAIL
42-CN-7CZXB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 27CZX/B6 CONTACTS FAIL
42-CN-83BXB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 83BX1/B5 CONTACTS FAIL
42-CN-83BXB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 83BX1/B6 CONTACTS FAIL
42-CN-83T8A5-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX8A/B5 CONTACTS XFER OPEN
42-CN-83T8A6-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX8A/B6 CONTACTS XFER OPEN

Table 12
Basic Event Descriptions (continued)

42-CN-83TX65-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX6/B5 CONTACTS XFER OPEN
42-CN-83TX66-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX6/B6 CONTACTS XFER OPEN
42-CN-83TX75-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX7/B5 CONTACTS XFER OPEN
42-CN-83TX76-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX7/B6 CONTACTS XFER OPEN
42-CN-83TX85-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX8/B5 CONTACTS XFER OPEN
42-CN-83TX86-RO	1.859E-004	4	INDEPENDENT FAILURERELAY 83TX8/B6 CONTACTS XFER OPEN
42-CN-9B1X15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S9B1X1/B5 CONTACTS FAIL
42-CN-9B1X16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S9B1X1/B6 CONTACTS FAIL
42-CN-9B1X25-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S9B1X2/B5 CONTACTS FAIL
42-CN-9B1X26-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S9B1X2/B6 CONTACTS FAIL
42-CN-9BX2A5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S9B1X2A/B5 CONTACTS FAIL
42-CN-9BX2A6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S9B1X2A/B6 CONTACTS FAIL
42-CN-ILS1B5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SILS1/B5 CONTACTS FAIL
42-CN-ILS1B6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SILS1/B6 CONTACTS FAIL
42-CN-ILS2B5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SILS2/B5 CONTACTS FAIL
42-CN-ILS2B6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SILS2/B6 CONTACTS FAIL
42-CN-KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN-KRCCCF12
42-CN-KROCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN-KROCCF12
42-CN-S3X1B5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S3X1/B5 CONTACTS FAIL
42-CN-S3X1B6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S3X1/B6 CONTACTS FAIL
42-CN-S3X2B5-RC	2.999E-004	3	RELAY S3X1/B5 SECOND CONTACT SET FAILS
42-CN-S3X2B6-RC	2.999E-004	3	RELAY S3X1/B6 SECOND CONTACT SET FAILS
42-CN-S5X1B5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S5X1/B5 CONACTS FAIL
42-CN-S5X1B6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S5X1/B6 CONTACTS FAIL
42-CN-S6BOX5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S6BOX/B5 CONTACTS FAIL
42-CN-S6BOX6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S6BOX/B6 CONTACTS FAIL
42-CN-S7BOX5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S7BOX/B5 CONTACTS FAIL
42-CN-S7BOX6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S7BOX/B6 CONTACTS FAIL
42-CN-S8B1X5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S8B1X/B5 CONTACTS FAIL
42-CN-S8B1X6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY S8B1X/B6 CONTACTS FAIL
42-CN-SISEQ5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SISEQ/B5 CONTACTS FAIL
42-CN-SISEQ6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SISEQ/B6 CONTACTS FAIL
42-CN-TDB1X5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-B1X/B5 CONTACTS FAIL
42-CN-TDB1X6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-B1X/B6 CONTACTS FAIL
42-CN-TDBSB5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-BLS/B5 CONTACTS FAIL
42-CN-TDBSB6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-BLS/B6 CONTACTS FAIL
42-CN-TDR9X5-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S9X/B5 CONTACTS FAIL
42-CN-TDR9X6-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S9X/B6 CONTACTS FAIL
42-CN-TDRS15-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S1/B5 CONTACTS FAIL
42-CN-TDRS16-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S1/B6 CONTACTS FAIL
42-CN-TDRS25-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S2/B5 CONTACTS FAIL
42-CN-TDRS26-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S2/B6 CONTACTS FAIL
42-CN-TDRS35-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S3/B5 CONTACTS FAIL
42-CN-TDRS36-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S3/B6 CONTACTS FAIL
42-CN-TDRS55-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S5/B5 CONTACTS FAIL
42-CN-TDRS56-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S5/B6 CONTACTS FAIL
42-CN-TDRS75-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S7/B5 CONTACTS FAIL
42-CN-TDRS76-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S7/B6 CONTACTS FAIL
42-CN-TDRS95-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S9/B5 CONTACTS FAIL
42-CN-TDRS96-RC	2.999E-004	3	INDEPENDENT FAILURERELAY TDR-S9/B6 CONTACTS FAIL
42-CN-TS27A51RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/A/27A/R1-51ST CNTCT SET TR OP
42-CN-TS27A52RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/A/27A/R1-52ND CNTCT SET TR OP
42-CN-TS27A61RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/A/27A/R1-61ST CNTCT SET TR OP

Table 12
Basic Event Descriptions (continued)

42-CN-TS27A62RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/A/27A/R1-62ND CNTCT SET TR OP
42-CN-TS27C51RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/G/27C/R1-51ST CNTCT SET TR OP
42-CN-TS27C52RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/G/27C/R1-52ND CNTCT SET TR OP
42-CN-TS27C61RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/G/27C/R1-61ST CNTCT SET TR OP
42-CN-TS27C62RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/G/27C/R1-62ND CNTCT SET TR OP
42-CN-TSD7A51RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/D/27A/T1-51ST CNTCT SET TR OP
42-CN-TSD7A52RO	1.869E-004	4	INDEPENDENT FAILURERELAY TS/D/27A/T1-52ND CNTCT SET TR OP
42-CN-TSD7A61RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/D/27A/T1-61ST CNTCT SET TR OP
42-CN-TSD7A62RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/D/27A/T1-62ND CNTCT SET TR OP
42-CN-TSH7C51RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/H/27C/T1-51ST CNTCT SET TR OP
42-CN-TSH7C52RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/H/27C/T1-52ND CNTCT SET TR OP
42-CN-TSH7C61RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/H/27C/T1-61ST CNTCT SET TR OP
42-CN-TSH7C62RO	1.859E-004	4	INDEPENDENT FAILURERELAY TS/H/27C/T1-62ND CNTCT SET TR OP
42-CN-VR1511-RO	1.859E-004	4	INDEPENDENT FAILURERELAY VR15-11 CNTCTS TRANS OPEN
42-CN-VR1611-RO	1.859E-004	4	INDEPENDENT FAILURERELAY VR16-11 CNTCTS TRANS OPEN
42-CN/KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)SILS1/B5/B5 FTC
42-CN0KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN0KRCCCF12
42-CN0KROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN0KROCCF12
42-CN1KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN1KRCCCF12
42-CN1KROCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 42-CN1KROCCF1-4
42-CN1KROCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF12
42-CN1KROCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF123
42-CN1KROCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF124
42-CN1KROCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF13
42-CN1KROCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF134
42-CN1KROCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF14
42-CN1KROCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF23
42-CN1KROCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF234
42-CN1KROCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF24
42-CN1KROCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN1KROCCF34
42-CN2KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN2KRCCCF12
42-CN2KROCCF1-16	2.877E-005	3	GLOBAL FAILURE OF RAT/TAT UNAV CNTCTS
42-CN3KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN3KRCCCF12
42-CN3KROCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN3KROCCF12
42-CN4KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN4KRCCCF12
42-CN5KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN5KRCCCF12
42-CN6KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN6KRCCCF12
42-CN7KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN7KRCCCF12
42-CN8KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN8KRCCCF12
42-CN8KROCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN8KROCCF12
42-CN9KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CN9KRCCCF12
42-CNAKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNAKRCCCF12
42-CNBKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNBKRCCCF12

Table 12
Basic Event Descriptions (continued)

42-CNCKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNCKRCCCF12
42-CNDKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNDKRCCCF12
42-CNEKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNEKRCCCF12
42-CNFKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNFKRCCCF12
42-CNGKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNGKRCCCF12
42-CNHKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNHKRCCCF12
42-CNIKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNIKRCCCF12
42-CNJKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNJKRCCCF12
42-CNKKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNKKRCCCF12
42-CNLKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNLKRCCCF12
42-CNMKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 42-CNMKRCCCF1-4
42-CNMKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF12
42-CNMKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF123
42-CNMKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF124
42-CNMKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF13
42-CNMKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF134
42-CNMKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF14
42-CNMKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF23
42-CNMKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF234
42-CNMKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF24
42-CNMKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNMKRCCCF34
42-CNNKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 42-CNNKRCCCF1-4
42-CNNKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF12
42-CNNKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF123
42-CNNKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF124
42-CNNKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF13
42-CNNKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF134
42-CNNKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF14
42-CNNKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF23
42-CNNKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF234
42-CNNKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF24
42-CNNKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNNKRCCCF34
42-CNPKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 42-CNPKRCCCF1-4
42-CNPKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF12
42-CNPKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF123
42-CNPKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF124
42-CNPKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF13
42-CNPKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF134
42-CNPKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF14
42-CNPKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF23
42-CNPKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF234
42-CNPKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF24
42-CNPKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNPKRCCCF34
42-CNQKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNQKRCCCF12
42-CNRKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNRKRCCCF12
42-CNSKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNSKRCCCF12
42-CNTKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNTKRCCCF12
42-CNTKROCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNTKROCCF12
42-CNUKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNUKRCCCF12
42-CNVKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNVKRCCCF12
42-CNWKRCCCF1-12	3.691E-006	3	GLOBAL FAILURE OF UV RELAYS (CNTCTS)
42-CNWKRCCCFA	1.917E-006	3	COMMON CAUSE FAILURE OF BUS 5 UVRELAYS (CONTACTS)
42-CNWKRCCCFB	1.917E-006	3	COMMON CAUSE FAILURE OF BUS 6 UVRELAYS (CONTACTS)
42-CNXKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNXKRCCCF12
42-CNXKROCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)42-CNXKROCCF12
42-CNYKRCCCF1-10	3.691E-006	3	GLOBAL FAILURE OF AUX RELAYS (CNTCTS)

Table 12
Basic Event Descriptions (continued)

42-CNYKRCCCFA	1.514E-006	3	COMMON CAUSE FLR OF BUS 5 AUX RELAYS (CONTACTS)
42-CNYKRCCCFB	1.514E-006	3	COMMON CAUSE FLR OF BUS 6 AUX RELAYS (CONTACTS)
42-CNZKRCCCF1-10	3.139E-005	3	GLOBAL FAILURE OF BREAKER TRIP CNTCTS
42-RE---BSB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY BS/B5 FAILS TO OPERATE
42-RE---BSB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY BS/B6 FAILS TO OPERATE
42-RE---SIB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SI/B5 FAILS TO OPERATE
42-RE---SIB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SI/B5 FAILS TO OPERATE
42-RE--27AB5-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27A/B5 MECHANICALLY BOUND
42-RE--27AB6-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27A/B6 MECHANICALLY BOUND
42-RE--27CB5-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27C/B5 MECHANICALLY BOUND
42-RE--27CB6-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27C/B6 MECHANICALLY BOUND
42-RE--52ZB5-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52Z/B5 MECHANICALLY BOUND
42-RE--52ZB6-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52Z/B6 MECHANICALLY BOUND
42-RE--83XB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 83X/B5 FAILS TO OPERATE
42-RE--83XB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 83X/B6 FAILS TO OPERATE
42-RE--BLSB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY BLS/B5 FAILS TO OPERATE
42-RE--BLSB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY BLS/B6 FAILS TO OPERATE
42-RE--BLXB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY BLX/B5 FAILS TO OPERATE
42-RE--BLXB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY BLX/B6 FAILS TO OPERATE
42-RE--S1XB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S1X/B5 FAILS TO OPERATE
42-RE--S1XB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S1X/B6 FAILS TO OPERATE
42-RE--S2XB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S2X/B5 FAILS TO OPERATE
42-RE--S2XB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S2X/B6 FAILS TO OPERATE
42-RE--TDB15-RF	1.859E-004	4	INDEPENDENT FAILURERELAY TDR-B1/B5 FAILS TO OPERATE
42-RE--TDB16-RF	1.859E-004	4	INDEPENDENT FAILURERELAY TDR-B1/B6 FAILS TO OPERATE
42-RE-27AR15-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27A/RAT1-5 MECHANICALLY BOUND
42-RE-27AR16-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27A/RAT1-6 MECHANICALLY BOUND
42-RE-27AT15-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27A/TAT1-5 MECHANICALLY BOUND
42-RE-27AT16-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27A/TAT1-6 MECHANICALLY BOUND
42-RE-27AXB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27AX/B5 FAILSTO OPERATE
42-RE-27AXB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27AX/B6 FAILSTO OPERATE
42-RE-27AYB5-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27AY/B5 MECHANICALLY BOUND
42-RE-27AYB6-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27AY/B6 MECHANICALLY BOUND
42-RE-27AZB5-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27AZ/B5 MECHANICALLY BOUND
42-RE-27AZB6-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27AZ/B6 MECHANICALLY BOUND
42-RE-27CR15-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27C/RAT1-5 MECHANICALLY BOUND
42-RE-27CR16-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27C/RAT1-6 MECHANICALLY BOUND
42-RE-27CT15-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27C/TAT1-5 MECHANICALLY BOUND
42-RE-27CT16-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27C/TAT1-6 MECHANICALLY BOUND
42-RE-27CXB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27CX/B5 FAILSTO OPERATE
42-RE-27CXB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27CX/B6 FAILSTO OPERATE
42-RE-27CYB5-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27CY/B5 MECHANICALLY BOUND
42-RE-27CYB6-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27CY/B6 MECHANICALLY BOUND
42-RE-27CZB5-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27CZ/B5 MECHANICALLY BOUND
42-RE-27CZB6-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 27CZ/B6 MECHANICALLY BOUND
42-RE-27XR15-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27X/R1-5 FAILS TO OPERATE
42-RE-27XR16-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27X/R1-6 FAILS TO OPERATE
42-RE-27XT15-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27X/TAT1-5 FAILS TO OPERATE

Table 12
Basic Event Descriptions (continued)

42-RE-27XT16-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27X/TAT1-6 FAILS TO OPERATE
42-RE-52B501-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-501 MECHANICALLY BOUND
42-RE-52B503-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-503 MECHANICALLY BOUND
42-RE-52B509-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-509 MECHANICALLY BOUND
42-RE-52B510-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-510 MECHANICALLY BOUND
42-RE-52B511-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-511 MECHANICALLY BOUND
42-RE-52B601-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-601 MECHANICALLY BOUND
42-RE-52B602-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-602 MECHANICALLY BOUND
42-RE-52B603-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-603 MECHANICALLY BOUND
42-RE-52B610-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-610 MECHANICALLY BOUND
42-RE-52B611-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52SB/1-611 MECHANICALLY BOUND
42-RE-52C509-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52CY/1-509 MECHANICALLY BOUND
42-RE-52C603-RB	1.859E-004	4	INDEPENDENT FAILURERELAY 52CT/1-603 MECHANICALLY BOUND
42-RE-7AZXB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27AZX/B5 FAILS TO OPERATE
42-RE-7AZXB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27AZX/B6 FAILS TO OPERATE
42-RE-7CZAB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27CAZX/B5 FAILS TO OPERATE
42-RE-7CZAB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27CAZX/B6 FAILS TO OPERATE
42-RE-7CZXB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27CZX/B5 FAILS TO OPERATE
42-RE-7CZXB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 27CZX/B6 FAILS TO OPERATE
42-RE-83BXB5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 83BX1/B5 FAILS TO OPERATE
42-RE-83BXB6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY 83BX1/B6 FAILS TO OPERATE
42-RE-9B1X15-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S9B1X1/B5 FAILS TO OPERATE
42-RE-9B1X16-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S9B1X1/B6 FAILS TO OPERATE
42-RE-9B1X25-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S9B1X2/B5 FAILS TO OPERATE
42-RE-9B1X26-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S9B1X2/B6 FAILS TO OPERATE
42-RE-9BX2A5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S9B1X2A/B5 FAILS TO OPERATE
42-RE-9BX2A6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S9B1X2A/B6 FAILS TO OPERATE
42-RE-ILS1B5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SILS1/B5 FAILS TO OPERATE
42-RE-ILS2B5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SILS2/B5 FAILS TO OPERATE
42-RE-ILS2B6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SILS2/B6 FAILS TO OPERATE
42-RE-KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE-KRFCCF12
42-RE-S3X1B5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S3X1/B5 FAILSTO OPERATE
42-RE-S3X1B6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S3X1/B6 FAILSTO OPERATE
42-RE-S5X1B5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S5X1/B5 FAILSTO OPERATE
42-RE-S5X1B6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S5X1/B6 FAILSTO OPERATE
42-RE-S6BOX5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S6BOX/B5 FAILS TO OPERATE
42-RE-S6BOX6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S6BOX/B6 FAILS TO OPERATE
42-RE-S7BOX5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S7BOX/B5 FAILS TO OPERATE
42-RE-S7BOX6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S7BOX/B6 FAILS TO OPERATE
42-RE-S8B1X5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S8B1X/B5 FAILS TO OPERATE
42-RE-S8B1X6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY S8B1X/B6 FAILS TO OPERATE
42-RE-SISEQ5-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SISEQ/B5 FAILS TO OPERATE
42-RE-SISEQ6-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SISEQ/B6 FAILS TO OPERATE
42-RE-TDB1X5-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-B1X/B5 FAILS TO OPERATE

Table 12
Basic Event Descriptions (continued)

42-RE-TDB1X6-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-B1X/B6 FAILS TO OPERATE
42-RE-TDBSB5-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-BLS/B5 FAILS TO OPERATE
42-RE-TDBSB6-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-BLS/B6 FAILS TO OPERATE
42-RE-TDR9X5-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S9X/B5 FAILS TO OPERATE
42-RE-TDR9X6-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S9X/B6 FAILS TO OPERATE
42-RE-TDRS15-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S1/B5 FAILS TO OPERATE
42-RE-TDRS16-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S1/B6 FAILS TO OPERATE
42-RE-TDRS25-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S2/B5 FAILS TO OPERATE
42-RE-TDRS26-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S2/B6 FAILS TO OPERATE
42-RE-TDRS35-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S3/B5 FAILS TO OPERATE
42-RE-TDRS36-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S3/B6 FAILS TO OPERATE
42-RE-TDRS55-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S5/B5 FAILS TO OPERATE
42-RE-TDRS56-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S5/B6 FAILS TO OPERATE
42-RE-TDRS75-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S7/B5 FAILS TO OPERATE
42-RE-TDRS76-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S7/B6 FAILS TO OPERATE
42-RE-TDRS95-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S9/B5 FAILS TO OPERATE
42-RE-TDRS96-RF	1.116E-004	4	INDEPENDENT FAILURERELAY TDR-S9/B6 FAILS TO OPERATE
42-RE0KRBCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE0KRBCCF12
42-RE0KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE0KRFCCF12
42-RE1KRBCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 42-RE1KRBCCF1-4
42-RE1KRBCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF12
42-RE1KRBCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF123
42-RE1KRBCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF124
42-RE1KRBCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF13
42-RE1KRBCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF134
42-RE1KRBCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF14
42-RE1KRBCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF23
42-RE1KRBCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF234
42-RE1KRBCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF24
42-RE1KRBCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE1KRBCCF34
42-RE1KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE1KRFCCF12
42-RE2KRBCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 42-RE2KRBCCF1-4
42-RE2KRBCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF12
42-RE2KRBCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF123
42-RE2KRBCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF124
42-RE2KRBCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF13
42-RE2KRBCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF134
42-RE2KRBCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF14
42-RE2KRBCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF23
42-RE2KRBCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF234
42-RE2KRBCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF24
42-RE2KRBCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE2KRBCCF34
42-RE2KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE2KRFCCF12
42-RE3KRBCCF1-12	1.147E-006	3	GLOBAL FAILURE OF UV RELAYS (BOUND)
42-RE3KRBCCFA	5.955E-007	3	COMMON CAUSE FAILURE OF BUS 5 UVRELAYS (BOUND)
42-RE3KRBCCFB	5.955E-007	3	COMMON CAUSE FAILURE OF BUS 6 UVRELAYS (BOUND)
42-RE3KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE3KRFCCF12
42-RE4KRBCCF1-10	9.750E-006	3	GLOBAL FAILURE OF BREAKER TRIP RELAYS
42-RE4KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE4KRFCCF12
42-RE5KRBCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE5KRBCCF12
42-RE5KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE5KRFCCF12
42-RE6KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE6KRFCCF12
42-RE7KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE7KRFCCF12
42-RE8KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE8KRFCCF12
42-RE9KRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RE9KRFCCF12
42-REAKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REAKRFCCF12

Table 12
Basic Event Descriptions (continued)

42-REBKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REBKRFCCF12
42-RECKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RECKRFCCF12
42-REDKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REDKRFCCF12
42-REEKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REEKRFCCF12
42-REFKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REFKRFCCF12
42-REGKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REGKRFCCF12
42-REHKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REHKRFCCF12
42-REIKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REIKRFCCF12
42-REJKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REJKRFCCF12
42-REKKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REKKRFCCF12
42-RELKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RELKRFCCF12
42-REMKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REMKRFCCF12
42-RENKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RENKRFCCF12
42-REPKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REPKRFCCF12
42-REQKRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 42-REQKRFCCF1-4
42-REQKRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF12
42-REQKRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF123
42-REQKRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF124
42-REQKRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF13
42-REQKRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF134
42-REQKRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF14
42-REQKRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF23
42-REQKRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF234
42-REQKRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF24
42-REQKRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-REQKRFCCF34
42-RERKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RERKRFCCF12
42-RESKRFCCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)42-RESKRFCCF12
42-RETKRFCCF1-10	1.147E-006	3	GLOBAL FAILURE OF AUX RELAYS (FTO)
42-RETKRFCCFA	4.703E-007	3	COMMON CAUSE FLR OF BUS 5 AUX RELAYS (FAIL TO OP)
42-RETKRFCCFB	4.703E-007	3	COMMON CAUSE FLR OF BUS 6 AUX RELAYS (FAIL TO OP)
42-REUKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)SILS1/B5/B6 FTO
43-TR-MAIN---SG	2.400E-005	4	MAIN TRANSFORMER FAILURE
45-RM----R13-AE	9.683E-005	3	TECHNICIAN MISCALIBRATES RMS CHANNEL R-13
45-RM----R14-AE	9.683E-005	3	TECHNICIAN MISCALIBRATES RMS CHANNEL R-14
47--ORT------HE	9.919E-003	3	OPERATOR FAILS TO TRIP REACTOR MANUALLY
47-AD--LC461-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR LC-461B FAILS
47-AD--LC462-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR LC-462A FAILS
47-AD--LC463-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR LC-463C FAILS
47-AD--LC471-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR LC-471B FAILS
47-AD--LC472-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR LC-472A FAILS
47-AD--LC473-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR LC-473C FAILS
47-AD--PC429-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-429A FAILS
47-AD--PC430-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-430A FAILS
47-AD--PC431-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-431A FAILS
47-AD-KFACCF12	5.960E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-AD-KFACCF12
47-AD-KFACCF123	1.610E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-AD-KFACCF123
47-AD-KFACCF13	5.960E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-AD-KFACCF13
47-AD-KFACCF23	5.960E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-AD-KFACCF23
47-ADAKFACC12345	5.141E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACC12345
47-ADAKFACC12346	5.141E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACC12346
47-ADAKFACC12356	5.141E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACC12356
47-ADAKFACC12456	5.141E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACC12456
47-ADAKFACC13456	5.141E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACC13456
47-ADAKFACC23456	5.141E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACC23456
47-ADAKFACCF1-6	6.880E-007	3	GLOBAL FAILURE OF 47-ADAKFACCF1-6
47-ADAKFACCF12	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF12

Table 12
Basic Event Descriptions (continued)

47-ADAKFACCF123	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF123
47-ADAKFACCF1234	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1234
47-ADAKFACCF1235	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1235
47-ADAKFACCF1236	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1236
47-ADAKFACCF124	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF124
47-ADAKFACCF1245	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1245
47-ADAKFACCF1246	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1246
47-ADAKFACCF125	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF125
47-ADAKFACCF1256	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1256
47-ADAKFACCF126	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF126
47-ADAKFACCF13	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF13
47-ADAKFACCF134	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF134
47-ADAKFACCF1345	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1345
47-ADAKFACCF1346	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1346
47-ADAKFACCF135	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF135
47-ADAKFACCF1356	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1356
47-ADAKFACCF136	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF136
47-ADAKFACCF14	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF14
47-ADAKFACCF145	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF145
47-ADAKFACCF1456	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF1456
47-ADAKFACCF146	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF146
47-ADAKFACCF15	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF15
47-ADAKFACCF156	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF156
47-ADAKFACCF16	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF16
47-ADAKFACCF23	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF23
47-ADAKFACCF234	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF234
47-ADAKFACCF2345	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF2345
47-ADAKFACCF2346	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF2346
47-ADAKFACCF235	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF235
47-ADAKFACCF2356	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF2356
47-ADAKFACCF236	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF236
47-ADAKFACCF24	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF24
47-ADAKFACCF245	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF245
47-ADAKFACCF2456	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF2456
47-ADAKFACCF246	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF246
47-ADAKFACCF25	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF25
47-ADAKFACCF256	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF256
47-ADAKFACCF26	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF26
47-ADAKFACCF34	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF34
47-ADAKFACCF345	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF345
47-ADAKFACCF3456	3.303E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF3456
47-ADAKFACCF346	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF346
47-ADAKFACCF35	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF35
47-ADAKFACCF356	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF356
47-ADAKFACCF36	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF36
47-ADAKFACCF45	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF45
47-ADAKFACCF456	5.703E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF456
47-ADAKFACCF46	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF46
47-ADAKFACCF56	1.643E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-ADAKFACCF56
47-CN--RT1XA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT1-XA CONTACTS FAIL
47-CN--RT1XB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT1-XB CONTACTS FAIL
47-CN--RT2XA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT2-XA CONTACTS FAIL
47-CN--RT2XB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT2-XB CONTACTS FAIL
47-CN--RT3XA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT3-XA CONTACTS FAIL
47-CN--RT3XB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT3-XB CONTACTS FAIL
47-CN--RT4XA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT4-XA CONTACTS FAIL

Table 12
Basic Event Descriptions (continued)

47-CN--RT4XB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY RT4-XB CONTACTS FAIL
47-CN-46004A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46004-XA CONTACTS FAIL
47-CN-46004A2RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46004-XA SEC CONTACT SET
47-CN-46004B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46004-XB CONTACTS FAIL
47-CN-46004B2RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46004-XB SEC CONTACT SET
47-CN-46285A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46285-XA CONTACTS FAIL
47-CN-46285A2RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46285-XA SEC CONTACT SET
47-CN-46285B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46285-XB CONTACTS FAIL
47-CN-46285B2RC	2.999E-004	3	INDEPENDENT FAILURERELAY 46285-XB SEC CONTACT SET
47-CN-AFP1XA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY AFP1/XA CONTACTS FAIL
47-CN-AFP1XB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY AFP1/XB CONTACTS FAIL
47-CN-AFP2XA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY AFP2/XA CONTACTS FAIL
47-CN-AFP2XB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY AFP2/XB CONTACTS FAIL
47-CN-AMSCXA-RC	2.999E-004	3	RELAY AMSAC/XA CONTACTS FAIL
47-CN-AMSCXA2RC	2.999E-004	3	RELAY AMSAC/XA SECOND CONTACT SET FAILS
47-CN-AMSCXA3RC	2.999E-004	3	RELAY AMSAC/XA THIRD CONTACT SET FAILS
47-CN-AMSCXB-RC	2.999E-004	3	RELAY AMSAC/XB CONTACTS FAIL
47-CN-AMSCXB2RC	2.999E-004	3	RELAY AMSAC/XB SECOND CONTACT SET FAILS
47-CN-LC461B2RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-461B-XA SEC CONTACT SET
47-CN-LC461B3RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-461B-XB SEC CONTACT SET
47-CN-LC461BARC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-461B-XA CONTACTS FAIL
47-CN-LC461BBRC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-461B-XB CONTACTS FAIL
47-CN-LC462A2RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-462A-XA SEC CONTACT SET
47-CN-LC462A3RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-462A-XB SEC CONTACT SET
47-CN-LC462AARC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-462A-XA CONTACTS FAIL
47-CN-LC462ABRC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-462A-XB CONTACTS FAIL
47-CN-LC463CARC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-463C-XA CONTACTS FAIL
47-CN-LC463CBRC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-463C-XB CONTACTS FAIL
47-CN-LC471B2RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-471B-XA SEC CONTACT SET
47-CN-LC471B3RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-471B-XB SEC CONTACT SET
47-CN-LC471BARC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-471B-XA CONTACTS FAIL
47-CN-LC471BBRC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-471B-XB CONTACTS FAIL
47-CN-LC472A2RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-472A-XA SEC CONTACT SET
47-CN-LC472A3RC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-472A-XB SEC CONTACT SET
47-CN-LC472AARC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-472A-XA CONTACTS FAIL
47-CN-LC472ABRC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-472A-XB CONTACTS FAIL
47-CN-LC473CARC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-473C-XA CONTACTS FAIL
47-CN-LC473CBRC	2.999E-004	3	INDEPENDENT FAILURERELAY LC-473C-XB CONTACTS FAIL
47-CN-PC429A2RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429A-XA SEC CONTACT SET
47-CN-PC429A3RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429A-XB SEC CONTACT SET
47-CN-PC429AARC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429A-XA CONTACTS FAIL
47-CN-PC429ABRC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429A-XB CONTACTS FAIL
47-CN-PC430A2RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-430A-XA SEC CONTACT SET
47-CN-PC430A3RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-430A-XB SEC CONTACT SET
47-CN-PC430AARC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-430A-XA CONTACTS FAIL
47-CN-PC430ABRC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-430A-XB CONTACTS FAIL
47-CN-PC431AARC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-431A-XA CONTACTS FAIL
47-CN-PC431ABRC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-431A-XB CONTACTS FAIL
47-CN1KRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 47-CN1KRCCCF1-4
47-CN1KRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF12
47-CN1KRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF123
47-CN1KRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF124
47-CN1KRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF13
47-CN1KRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF134
47-CN1KRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF14
47-CN1KRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF23

Table 12
Basic Event Descriptions (continued)

47-CN1KRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF234
47-CN1KRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF24
47-CN1KRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN1KRCCCF34
47-CN3KRCCCF1-30	3.691E-006	3	GLOBAL COMMON CAUSE FAILURE (CCF)RELAY CONTACTS FAIL
47-CN8KRCC12345	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12345
47-CN8KRCC12346	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12346
47-CN8KRCC12347	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12347
47-CN8KRCC12348	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12348
47-CN8KRCC12356	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12356
47-CN8KRCC12357	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12357
47-CN8KRCC12358	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12358
47-CN8KRCC12367	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12367
47-CN8KRCC12368	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12368
47-CN8KRCC12378	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12378
47-CN8KRCC12456	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12456
47-CN8KRCC12457	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12457
47-CN8KRCC12458	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12458
47-CN8KRCC12467	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12467
47-CN8KRCC12468	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12468
47-CN8KRCC12478	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12478
47-CN8KRCC12567	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12567
47-CN8KRCC12568	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12568
47-CN8KRCC12578	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12578
47-CN8KRCC12678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC12678
47-CN8KRCC13456	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13456
47-CN8KRCC13457	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13457
47-CN8KRCC13458	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13458
47-CN8KRCC13467	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13467
47-CN8KRCC13468	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13468
47-CN8KRCC13478	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13478
47-CN8KRCC13567	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13567
47-CN8KRCC13568	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13568
47-CN8KRCC13578	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13578
47-CN8KRCC13678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC13678
47-CN8KRCC14567	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC14567
47-CN8KRCC14568	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC14568
47-CN8KRCC14578	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC14578
47-CN8KRCC15678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC15678
47-CN8KRCC23456	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23456
47-CN8KRCC23457	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23457
47-CN8KRCC23458	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23458
47-CN8KRCC23467	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23467
47-CN8KRCC23468	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23468
47-CN8KRCC23478	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23478
47-CN8KRCC23567	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23567
47-CN8KRCC23568	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23568
47-CN8KRCC23578	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23578
47-CN8KRCC23678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC23678
47-CN8KRCC24567	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC24567
47-CN8KRCC24568	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC24568
47-CN8KRCC24578	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC24578
47-CN8KRCC24678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC24678
47-CN8KRCC25678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC25678
47-CN8KRCC34567	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC34567
47-CN8KRCC34568	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC34568
47-CN8KRCC34578	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC34578

Table 12
Basic Event Descriptions (continued)

47-CN8KRCC34678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC34678
47-CN8KRCC35678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC35678
47-CN8KRCC45678	3.940E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCC45678
47-CN8KRCCC1234	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1234
47-CN8KRCCC1235	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1235
47-CN8KRCCC1236	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1236
47-CN8KRCCC1237	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1237
47-CN8KRCCC1238	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1238
47-CN8KRCCC1245	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1245
47-CN8KRCCC1246	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1246
47-CN8KRCCC1247	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1247
47-CN8KRCCC1248	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1248
47-CN8KRCCC1256	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1256
47-CN8KRCCC1257	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1257
47-CN8KRCCC1258	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1258
47-CN8KRCCC1267	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1267
47-CN8KRCCC1268	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1268
47-CN8KRCCC1278	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1278
47-CN8KRCCC1345	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1345
47-CN8KRCCC1346	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1346
47-CN8KRCCC1347	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1347
47-CN8KRCCC1348	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1348
47-CN8KRCCC1356	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1356
47-CN8KRCCC1357	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1357
47-CN8KRCCC1358	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1358
47-CN8KRCCC1367	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1367
47-CN8KRCCC1368	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1368
47-CN8KRCCC1378	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1378
47-CN8KRCCC1456	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1456
47-CN8KRCCC1457	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1457
47-CN8KRCCC1458	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1458
47-CN8KRCCC1467	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1467
47-CN8KRCCC1468	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1468
47-CN8KRCCC1478	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1478
47-CN8KRCCC1567	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1567
47-CN8KRCCC1568	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1568
47-CN8KRCCC1578	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1578
47-CN8KRCCC1678	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC1678
47-CN8KRCCC2345	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2345
47-CN8KRCCC2346	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2346
47-CN8KRCCC2347	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2347
47-CN8KRCCC2348	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2348
47-CN8KRCCC2356	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2356
47-CN8KRCCC2357	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2357
47-CN8KRCCC2358	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2358
47-CN8KRCCC2367	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2367
47-CN8KRCCC2368	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2368
47-CN8KRCCC2376	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2376
47-CN8KRCCC2378	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2378
47-CN8KRCCC2456	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2456
47-CN8KRCCC2457	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2457
47-CN8KRCCC2458	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2458
47-CN8KRCCC2467	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2467
47-CN8KRCCC2468	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2468
47-CN8KRCCC2478	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2478
47-CN8KRCCC2567	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2567

Table 12
Basic Event Descriptions (continued)

47-CN8KRCCC2568	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2568
47-CN8KRCCC2578	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2578
47-CN8KRCCC2678	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC2678
47-CN8KRCCC3456	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3456
47-CN8KRCCC3457	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3457
47-CN8KRCCC3458	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3458
47-CN8KRCCC3467	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3467
47-CN8KRCCC3468	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3468
47-CN8KRCCC3478	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3478
47-CN8KRCCC3567	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3567
47-CN8KRCCC3568	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3568
47-CN8KRCCC3578	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3578
47-CN8KRCCC3678	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC3678
47-CN8KRCCC4567	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC4567
47-CN8KRCCC4568	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC4568
47-CN8KRCCC4578	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC4578
47-CN8KRCCC4678	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC4678
47-CN8KRCCC5678	5.064E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCC5678
47-CN8KRCCCF1-8	3.691E-006	3	GLOBAL FAILURE SIX OR MORE 47-CN8KRCCCF1-8
47-CN8KRCCCF12	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF12
47-CN8KRCCCF123	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF123
47-CN8KRCCCF124	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF124
47-CN8KRCCCF125	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF125
47-CN8KRCCCF126	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF126
47-CN8KRCCCF127	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF127
47-CN8KRCCCF128	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF128
47-CN8KRCCCF13	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF13
47-CN8KRCCCF134	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF134
47-CN8KRCCCF135	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF135
47-CN8KRCCCF136	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF136
47-CN8KRCCCF137	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF137
47-CN8KRCCCF138	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF138
47-CN8KRCCCF14	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF14
47-CN8KRCCCF145	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF145
47-CN8KRCCCF146	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF146
47-CN8KRCCCF147	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF147
47-CN8KRCCCF148	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF148
47-CN8KRCCCF15	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF15
47-CN8KRCCCF156	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF156
47-CN8KRCCCF157	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF157
47-CN8KRCCCF158	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF158
47-CN8KRCCCF16	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF16
47-CN8KRCCCF167	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF167
47-CN8KRCCCF168	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF168
47-CN8KRCCCF17	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF17
47-CN8KRCCCF178	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF178
47-CN8KRCCCF18	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF18
47-CN8KRCCCF23	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF23
47-CN8KRCCCF234	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF234
47-CN8KRCCCF235	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF235
47-CN8KRCCCF236	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF236
47-CN8KRCCCF237	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF237
47-CN8KRCCCF238	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF238
47-CN8KRCCCF24	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF24
47-CN8KRCCCF245	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF245
47-CN8KRCCCF246	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF246

Table 12
Basic Event Descriptions (continued)

47-CN8KRCCCF247	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF247
47-CN8KRCCCF248	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF248
47-CN8KRCCCF25	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF25
47-CN8KRCCCF256	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF256
47-CN8KRCCCF257	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF257
47-CN8KRCCCF258	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF258
47-CN8KRCCCF26	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF26
47-CN8KRCCCF267	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF267
47-CN8KRCCCF268	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF268
47-CN8KRCCCF27	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF27
47-CN8KRCCCF278	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF278
47-CN8KRCCCF28	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF28
47-CN8KRCCCF34	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF34
47-CN8KRCCCF345	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF345
47-CN8KRCCCF346	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF346
47-CN8KRCCCF347	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF347
47-CN8KRCCCF348	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF348
47-CN8KRCCCF35	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF35
47-CN8KRCCCF356	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF356
47-CN8KRCCCF357	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF357
47-CN8KRCCCF358	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF358
47-CN8KRCCCF36	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF36
47-CN8KRCCCF367	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF367
47-CN8KRCCCF368	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF368
47-CN8KRCCCF37	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF37
47-CN8KRCCCF378	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF378
47-CN8KRCCCF38	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF38
47-CN8KRCCCF45	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF45
47-CN8KRCCCF456	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF456
47-CN8KRCCCF457	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF457
47-CN8KRCCCF458	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF458
47-CN8KRCCCF46	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF46
47-CN8KRCCCF467	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF467
47-CN8KRCCCF468	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF468
47-CN8KRCCCF47	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF47
47-CN8KRCCCF478	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF478
47-CN8KRCCCF48	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF48
47-CN8KRCCCF56	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF56
47-CN8KRCCCF567	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF567
47-CN8KRCCCF568	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF568
47-CN8KRCCCF57	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF57
47-CN8KRCCCF578	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF578
47-CN8KRCCCF58	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF58
47-CN8KRCCCF67	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF67
47-CN8KRCCCF678	1.457E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF678
47-CN8KRCCCF68	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF68
47-CN8KRCCCF78	6.296E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-CN8KRCCCF78
47-CNRKRCCCF1-8	5.762E-006	3	GLOBAL FAILURE OF RX TRP RLYS (CNTCS)
47-CNRKRCCCFA (CNTCS)	7.171E-006	3	COMMON CAUSE FLR OF TRAIN A REACTOR TRIP RELAYS
47-CNRKRCCCFB (CNTCS)	7.171E-006	3	COMMON CAUSE FLR OF TRAIN B REACTOR TRIP RELAYS
47-RE--RT1XA-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT1-XA MECH BOUND
47-RE--RT1XB-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT1-XB MECH BOUND
47-RE--RT2XA-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT2-XA MECH BOUND
47-RE--RT2XB-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT2-XB MECH BOUND

Table 12
Basic Event Descriptions (continued)

47-RE--RT3XA-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT3-XA MECH BOUND
47-RE--RT3XB-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT3-XB MECH BOUND
47-RE--RT4XA-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT4-XA MECH BOUND
47-RE--RT4XB-RB	1.859E-004	4	INDEPENDENT FAILURERELAY RT4-XB MECH BOUND
47-RE-46004A-RF	2.187E-003	4	INDEPENDENT FAILURERELAY 46004-XA FAILS TO OPERATE
47-RE-46004B-RF	2.187E-003	4	INDEPENDENT FAILURERELAY 46004-XB FAILS TO OPERATE
47-RE-46285A-RF	2.187E-003	4	INDEPENDENT FAILURERELAY 46285-XA FAILS TO OPERATE
47-RE-46285B-RF	2.187E-003	4	INDEPENDENT FAILURERELAY 46285-XB FAILS TO OPERATE
47-RE-AFP1XA-RF	1.859E-004	4	INDEPENDENT FAILURERELAY AFP1/XA FAILSTO OPERATE
47-RE-AFP1XB-RF	1.859E-004	4	INDEPENDENT FAILURERELAY AFP1/XB FAILSTO OPERATE
47-RE-AFP2XA-RF	1.859E-004	4	INDEPENDENT FAILURERELAY AFP2/XA FAILSTO OPERATE
47-RE-AFP2XB-RF	1.859E-004	4	INDEPENDENT FAILURERELAY AFP2/XB FAILSTO OPERATE
47-RE-AMSCXA-RF	5.597E-004	4	RELAY AMSAC/XA FAILS TO OPERATE
47-RE-AMSCXB-RF	5.597E-004	4	RELAY AMSAC/XB FAILS TO OPERATE
47-RE-KRFCCF1-4	2.040E-005	3	GLOBAL FAILURE OF 47-RE-KRFCCF1-4
47-RE-KRFCCF12	7.770E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF12
47-RE-KRFCCF123	3.690E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF123
47-RE-KRFCCF124	3.690E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF124
47-RE-KRFCCF13	7.770E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF13
47-RE-KRFCCF134	3.690E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF134
47-RE-KRFCCF14	7.770E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF14
47-RE-KRFCCF23	7.770E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF23
47-RE-KRFCCF234	3.690E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF234
47-RE-KRFCCF24	7.770E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF24
47-RE-KRFCCF34	7.770E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-RE-KRFCCF34
47-RE-LC461BARB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-461B-XA MECH BOUND
47-RE-LC461BBRB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-461B-XB MECH BOUND
47-RE-LC462AARB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-462A-XA MECH BOUND
47-RE-LC462ABRB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-462A-XB MECH BOUND
47-RE-LC463CARB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-463C-XA MECH BOUND
47-RE-LC463CBRB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-463C-XB MECH BOUND
47-RE-LC471BARB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-471B-XA MECH BOUND
47-RE-LC471BBRB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-471B-XB MECH BOUND
47-RE-LC472AARB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-472A-XA MECH BOUND
47-RE-LC472ABRB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-472A-XB MECH BOUND
47-RE-LC473CARB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-473C-XA MECH BOUND
47-RE-LC473CBRB	1.859E-004	4	INDEPENDENT FAILURERELAY LC-473C-XB MECH BOUND
47-RE-PC429AARB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-429A-XA MECH BOUND
47-RE-PC429ABRB	1.859E-004	4	INDEPENDANT FAILUR RELAY PC-429A-XB MECH BOUND
47-RE-PC430AARB	1.859E-004	4	INDEPENDANT FAILUR RELAY PC-430A-XA MECH BOUND
47-RE-PC430ABRB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-430A-XB MECH BOUND
47-RE-PC431AARB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-431A-XA MECH BOUND
47-RE-PC431ABRB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-431A-XB MECH BOUND
47-RE3KRBCCF1-18	1.147E-006	3	GLOBAL COMMON CAUSE FAILURE (CCF)RELAY MECH. FAILURE
47-REAKRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 47-REAKRFCCF1-4
47-REAKRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF12
47-REAKRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF123
47-REAKRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF124
47-REAKRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF13
47-REAKRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF134
47-REAKRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF14
47-REAKRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF23
47-REAKRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF234
47-REAKRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF24
47-REAKRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-REAKRFCCF34
47-RERKRBCCF1-8	1.790E-006	3	GLOBAL FAILURE OF RX TRP RLYS (BOUND)

Table 12
Basic Event Descriptions (continued)

47-RERKRBCCFA (BOUND)	2.288E-006	3	COMMON CAUSE FLR OF TRAIN A REACTOR TRIP RELAYS
47-RERKRBCCFB (BOUND)	2.288E-006	3	COMMON CAUSE FLR OF TRAIN B REACTOR TRIP RELAYS
47-SD----PLC-FA	2.999E-007	4	AMSAC PROCESSOR MINI-PLC-2/16 FAILS
47-SD--OO-05-FA	3.353E-003	4	AMSAC AC ISOLATED OUTPUT CARD OO-05 FAILS
47-SD-AMSCPS-FA	1.114E-002	4	AMSAC RACK POWER SUPPLY 1771-P3 FAILS
47-SD-INP121-FA	2.999E-006	4	AMSAC ISOLATED ANALOG INPUT CARD MODULE 2 121 FAILS
47-SD-INP130-FA	2.999E-006	4	AMSAC ISOLATED ANALOG INPUT CARD MODULE 3 130 FAILS
47-SD-PLCCPS-FA	9.999E-006	4	AMSAC PROCESSOR INTEGRAL POWER SUPPLY FAILS
47-SW--46004-CO	4.370E-003	4	INDEPENDENT FAILURESWITCH 46004 CONTACTS XFER OPEN
47-SW--46285-CO	4.370E-003	4	INDEPENDENT FAILURESWITCH 46285 CONTACTS XFER OPEN
47-SW-ABLOCK-CO	1.119E-003	4	AMSAC BLOCK SWITCH CONTACTS TRANSFER OPEN
47-SW-KCOCCF12	1.030E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)47-SW-KCOCCF12
47-SY-RPSTRA-TM	4.870E-003	3	RPS TRAIN A UNAVAILABLE DUE TO TEST OR MAINTENANCE
47-SY-RPSTRB-TM	4.160E-003	3	RPS TRAIN B UNAVAILABLE DUE TO TEST OR MAINTENANCE
49-CB----BYA-FO	9.639E-004	3	BREAKER BYA FAILS TO OPEN
49-CB----BYB-FO	9.639E-004	3	BREAKER BYB FAILS TO OPEN
49-CB----RTA-FO	1.132E-003	3	INDEPENDENT FAILUREBREAKER RTA FAILS TO OPEN
49-CB----RTB-FO	1.132E-003	3	INDEPENDENT FAILUREBREAKER RTB FAILS TO OPEN
49-CB-KFOCCF12	1.740E-004	3	DOUBLE COMMON CAUSE FAILURE (CCF)49-CB-KFOCCF12
49-CN52X3302-RC	2.999E-004	3	RELAY 52AX/13302 CONTACTS FAIL
49-CN52X4302-RC	2.999E-004	3	RELAY 52AX/14302 CONTACTS FAIL
49-RE52X3302-RF	5.597E-004	4	RELAY 52AX/13302 FAILS TO ACTUATE
49-RE52X4302-RF	5.597E-004	4	RELAY 52AX/14302 FAILS TO ACTUATE
49-ROD-MECH--FA	1.800E-006	3	CONTROL RODS FAIL TO DROP INTO THE CORE
51-CV-NG214--FO	5.000E-005	3	CHECK VALVE NG-214 FAILS TO OPEN
51-CV-NG224--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE NG-224 FAILS TO OPEN
51-CV-NG234--FO	5.000E-005	3	INDEPENDENT FAILURECHECK VALVE NG-234 FAILS TO OPEN
51-CV-NG244--FO	5.000E-005	3	CHECK VALVE NG-244 FAILS TO OPEN
51-CV2KFOCCF12	1.080E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)51-CV2KFOCCF12
51-GB-CHP1A--LK	9.598E-004	4	CHARGING PUMP A SPEED CONT NITROGENCYLINDER LEAKS
51-GB-CVC-7--LK	9.598E-004	4	CVC-7 NITROGEN CYLINDER LEAKS
51-GB-KLKCCF12	2.260E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)51-GB-KLKCCF12
51-GB-SD3A---LK	9.598E-004	4	INDEPENDENT FAILURESD-3A NITROGEN CYLINDER LEAKS
51-GB-SD3B---LK	9.598E-004	4	INDEPENDENT FAILURESD-3B NITROGEN CYLINDER LEAKS
51-XV-NG62---FO	1.000E-004	3	MANUAL VALVE NG-62 FAILS TO OPEN
55-AD--PC429-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-429C FAILS
55-AD--PC430-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-430E FAILS
55-AD--PC431-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-431G FAILS
55-AD--PC945-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-945-BFAILS
55-AD--PC946-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-946-BFAILS
55-AD--PC947-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-947-BFAILS
55-AD--PC948-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-948-BFAILS
55-AD--PC949-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-949-BFAILS
55-AD--PC950-FA	1.116E-004	4	INDEPENDENT FAILURECOMPARATOR PC-950-BFAILS
55-AD-KFACCF12	6.780E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-AD-KFACCF12
55-AD-KFACCF123	1.440E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-AD-KFACCF123
55-AD-KFACCF13	6.780E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-AD-KFACCF13
55-AD-KFACCF23	6.780E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-AD-KFACCF23
55-AD5KFACCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-AD5KFACCF12
55-AD7KFACCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-AD7KFACCF12
55-AD9KFACCF12	2.630E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-AD9KFACCF12
55-CN-----VA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY VA CONTACTS FAIL
55-CN-----VB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY VB CONTACTS FAIL
55-CN----CIA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CIA CONTACTS FAIL

Table 12
Basic Event Descriptions (continued)

55-CN----CIB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CIB CONTACTS FAIL
55-CN----CSA-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CSA CONTACTS FAIL
55-CN----CSB-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CSB CONTACTS FAIL
55-CN---CIRA-RO	1.859E-004	4	INDEPENDENT FAILURERELAY CIRA CONTACTS2, 6 TRANSFER OPEN
55-CN---CIRB-RO	1.859E-004	4	INDEPENDENT FAILURERELAY CIRB CONTACTS2, 6 TRANSFER OPEN
55-CN---CPRA-RO	1.859E-004	4	INDEPENDENT FAILURERELAY CPRA CONTACTS3, 7 TRANSFER OPEN
55-CN---CPRB-RO	1.859E-004	4	INDEPENDENT FAILURERELAY CPRB CONTACTS3, 7 TRANSFER OPEN
55-CN---CSRA-RO	1.859E-004	4	INDEPENDENT FAILURERELAY CSRA CONTACTS2, 6 TRANSFER OPEN
55-CN---CSRB-RO	1.859E-004	4	INDEPENDENT FAILURERELAY CSRB CONTACTS2, 6 TRANSFER OPEN
55-CN---SIRA-RO	1.859E-004	4	INDEPENDENT FAILURERE SIR-A CONTACTS 2, 6 TRANSFER OPEN
55-CN---SIRB-RO	1.859E-004	4	INDEPENDENT FAILURERE SIR-B CONTACTS 2, 6 TRANSFER OPEN
55-CN---TRA2-RO	1.859E-004	4	INDEPENDENT FAILURERELAY TRA2 CONTACTS3, 7 TRANSFER OPEN
55-CN---TRB2-RO	1.859E-004	4	INDEPENDENT FAILURERELAY TRB2 CONTACTS3, 7 TRANSFER OPEN
55-CN---V11X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY V11X CONTACTSFAIL
55-CN---V21X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY V21X CONTACTSFAIL
55-CN--CI13X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CI13X CONTACTS FAIL
55-CN--CI20X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CI20X CONTACTS FAIL
55-CN--CP10X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CP10X CONTACTS FAIL
55-CN--CP20X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CP20X CONTACTS FAIL
55-CN--CS10X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CONTACTS FAIL
55-CN--CS20X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY CONTACTS FAIL
55-CN--F10X1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY F10X-1 CONTACTS FAIL
55-CN--F20X1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY F20X-1 CONTACTS FAIL
55-CN--F30X1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY F30X-1 CONTACTS FAIL
55-CN--F40X1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY F40X-1 CONTACTS FAIL
55-CN--SI14X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SI14X CONTACTS FAIL
55-CN--SI15X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SI15X CONTACTS FAIL
55-CN--SI24X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SI24X CONTACTS FAIL
55-CN--SI25X-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SI25X CONTACTS FAIL
55-CN--SIAA1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SIA-A1 CONTACTS FAIL
55-CN--SIAA2-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SIA-A2 CONTACTS FAIL
55-CN--SIAB1-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SIA-B1 CONTACTS FAIL
55-CN--SIAB2-RC	2.999E-004	3	INDEPENDENT FAILURERELAY SIA-B2 CONTACTS FAIL
55-CN--SIBAX-RO	1.859E-004	4	INDEPENDENT FAILURERE SIB-AX CONTACTS 3, 7 TRANSFER OPEN
55-CN--SIBBX-RO	1.859E-004	4	INDEPENDENT FAILURERE SIB-BX CONTACTS 3, 7 TRANSFER OPEN
55-CN-KRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 55-CN-KRCCCF1-4
55-CN-KRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF12
55-CN-KRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF123
55-CN-KRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF124
55-CN-KRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF13
55-CN-KRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF134
55-CN-KRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF14
55-CN-KRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF23
55-CN-KRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF234

Table 12
Basic Event Descriptions (continued)

55-CN-KRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF24
55-CN-KRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN-KRCCCF34
55-CN-PBRCIA-RO	1.859E-004	4	INDEPENDENT FAILUREPUSHBUTTON PB/RCIA CONTACTS XFER OPEN
55-CN-PBRCIB-RO	1.859E-004	4	INDEPENDENT FAILUREPUSHBUTTON PB/RCIB CONTACTS XFER OPEN
55-CN-PBRCSA-RO	1.859E-004	4	INDEPENDENT FAILUREPUSHBUTTON PB/RCSA CONTACTS XFER OPEN
55-CN-PBRCSB-RO	1.859E-004	4	INDEPENDENT FAILUREPUSHBUTTON PB/RCSB CONTACTS XFER OPEN
55-CN-PC429C2RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429C-XA SEC CONTACT SET
55-CN-PC429C3RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429C-XB SEC CONTACT SET
55-CN-PC429CARC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429C-XA CONTACTS FAIL
55-CN-PC429CBRC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-429C-XB CONTACTS FAIL
55-CN-PC430EARC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-430E-XA CONTACTS FAIL
55-CN-PC430EBRC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-430E-XB CONTACTS FAIL
55-CN-PC431G2RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-431G-XA SEC CONTACT SET
55-CN-PC431G3RC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-431G-XB SEC CONTACT SET
55-CN-PC431GARC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-431G-XA CONTACTS FAIL
55-CN-PC431GBRC	2.999E-004	3	INDEPENDENT FAILURERELAY PC-431G-XB CONTACTS FAIL
55-CN-PT945A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-945-XA CONTACTS FAIL
55-CN-PT945B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-945-XB CONTACTS FAIL
55-CN-PT946A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-946-XA CONTACTS FAIL
55-CN-PT946B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-946-XB CONTACTS FAIL
55-CN-PT947A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-947-XA CONTACTS FAIL
55-CN-PT947B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-947-XB CONTACTS FAIL
55-CN-PT948A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-948-XA CONTACTS FAIL
55-CN-PT948B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-948-XB CONTACTS FAIL
55-CN-PT949A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-949-XA CONTACTS FAIL
55-CN-PT949B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-949-XB CONTACTS FAIL
55-CN-PT950A-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-950-XA CONTACTS FAIL
55-CN-PT950B-RC	2.999E-004	3	INDEPENDENT FAILURERELAY PT-950-XB CONTACTS FAIL
55-CN-S14X09-RO	1.859E-004	4	INDEPENDENT FAILURERELAY SI14X CONTACT9 TRANSFERS OPEN
55-CN-S14X13-RO	1.859E-004	4	INDEPENDENT FAILURERELAY SI14X CONTACT13 TRANSFERS OPEN
55-CN-S24X09-RO	1.859E-004	4	INDEPENDENT FAILURERELAY SI24X CONTACT9 TRANSFERS OPEN
55-CN-S24X13-RO	1.859E-004	4	INDEPENDENT FAILURERELAY SI24X CONTACT13 TRANSFERS OPEN
55-CN1KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN1KRCCCF12
55-CN1KROCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 55-CN1KROCCF1-4
55-CN1KROCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF12
55-CN1KROCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF123
55-CN1KROCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF124
55-CN1KROCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF13
55-CN1KROCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF134
55-CN1KROCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF14
55-CN1KROCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF23
55-CN1KROCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF234
55-CN1KROCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF24
55-CN1KROCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN1KROCCF34
55-CN2KROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN2KROCCF12
55-CN3KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)CI13X,CI20X CNT FL
55-CN4KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN4KRCCCF12
55-CN5KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN5KRCCCF12

Table 12
Basic Event Descriptions (continued)

55-CN7KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN7KRCCCF12
55-CN8KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN8KRCCCF12
55-CN9KRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CN9KRCCCF12
55-CNAKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNAKRCCCF12
55-CNAKROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNAKROCCF12
55-CNBKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNBKRCCCF12
55-CNBKROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNBKROCCF12
55-CNCKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNCKRCCCF12
55-CNCKROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNCKROCCF12
55-CNDKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNDKRCCCF12
55-CNDKROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNDKROCCF12
55-CNEKROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNEKROCCF12
55-CNFKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 55-CNFKRCCCF1-4
55-CNFKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF12
55-CNFKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF123
55-CNFKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF124
55-CNFKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF13
55-CNFKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF134
55-CNFKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF14
55-CNFKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF23
55-CNFKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF234
55-CNFKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF24
55-CNFKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNFKRCCCF34
55-CNFKROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNFKROCCF12
55-CNGKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNGKRCCCF12
55-CNHKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNHKRCCCF12
55-CNJKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 55-CNJKRCCCF1-4
55-CNJKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF12
55-CNJKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF123
55-CNJKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF124
55-CNJKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF13
55-CNJKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF134
55-CNJKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF14
55-CNJKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF23
55-CNJKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF234
55-CNJKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF24
55-CNJKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNJKRCCCF34
55-CNKKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 55-CNKKRCCCF1-4
55-CNKKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF12
55-CNKKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF123
55-CNKKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF124
55-CNKKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF13
55-CNKKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF134
55-CNKKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF14
55-CNKKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF23
55-CNKKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF234
55-CNKKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF24
55-CNKKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNKKRCCCF34
55-CNLKRCCCF1-4	5.580E-006	3	GLOBAL FAILURE OF 55-CNLKRCCCF1-4
55-CNLKRCCCF12	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF12
55-CNLKRCCCF123	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF123
55-CNLKRCCCF124	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF124
55-CNLKRCCCF13	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF13
55-CNLKRCCCF134	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF134
55-CNLKRCCCF14	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF14
55-CNLKRCCCF23	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF23

Table 12
Basic Event Descriptions (continued)

55-CNLKRCCCF234	1.010E-006	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF234
55-CNLKRCCCF24	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF24
55-CNLKRCCCF34	2.130E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNLKRCCCF34
55-CNPKROCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNPKROCCF12
55-CNVKRCCCF12	1.410E-005	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-CNVKRCCCF12
55-RE-----VA-RF	1.859E-004	4	INDEPENDENT FAILURERELAY VA FAILS TO OPERATE
55-RE-----VB-RF	1.859E-004	4	INDEPENDENT FAILURERELAY VB FAILS TO OPERATE
55-RE----CIA-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CIA FAILS TO OPERATE
55-RE----CIB-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CIB FAILS TO OPERATE
55-RE----CSA-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CSA FAILS TO OPERATE
55-RE----CSB-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CSB FAILS TO OPERATE
55-RE---V11X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY V11X FAILS FAILS TO OPERATE
55-RE---V21X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY V21X FAILS TOOPERATE
55-RE--CI13X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CI13X FAILS TO OPERATE
55-RE--CI20X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CI20X FAILS TO OPERATE
55-RE--CP10X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CP10X FAILS TO OPERATE
55-RE--CP20X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CP20X FAILS TO OPERATE
55-RE--CS10X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CS10X FAILS TO OPERATE
55-RE--CS20X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY CS20X FAILS TO OPERATE
55-RE--F10X1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY F10X-1 FAILS TO OPERATE
55-RE--F20X1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY F20X-1 FAILS TO OPERATE
55-RE--F30X1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY F30X-1 FAILS TO OPERATE
55-RE--F40X1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY F40X-1 FAILS TO OPERATE
55-RE--SI14X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SI14X FAILS TO OPERATE
55-RE--SI15X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SI15X FAILS TO OPERATE
55-RE--SI24X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SI24X FAILS TO OPERATE
55-RE--SI25X-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SI25X FAILS TO OPERATE
55-RE--SIAA1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SIA-A1 FAILS TO OPERATE
55-RE--SIAA2-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SIA-A2 FAILS TO OPERATE
55-RE--SIAB1-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SIA-B1 FAILS TO OPERATE
55-RE--SIAB2-RF	1.859E-004	4	INDEPENDENT FAILURERELAY SIA-B2 FAILS TO OPERATE
55-RE-KRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 55-RE-KRFCCF1-4
55-RE-KRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF12
55-RE-KRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF123
55-RE-KRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF124
55-RE-KRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF13
55-RE-KRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF134
55-RE-KRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF14
55-RE-KRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF23
55-RE-KRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF234
55-RE-KRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF24
55-RE-KRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RE-KRFCCF34
55-RE-PC429CARB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-429C-XA MECH BOUND
55-RE-PC429CBRB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-429C-XB MECH BOUND
55-RE-PC430EARB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-430E-XA MECH BOUND
55-RE-PC430EBRB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-430E-XB MECH BOUND
55-RE-PC431GARB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-431G-XA MECH BOUND
55-RE-PC431GBRB	1.859E-004	4	INDEPENDENT FAILURERELAY PC-431G-XB MECH BOUND
55-RE-PT945A-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-945-XA FAILS TO OPERATE
55-RE-PT945B-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-945-XB FAILS TO OPERATE
55-RE-PT946A-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-946-XA FAILS TO OPERATE
55-RE-PT946B-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-946-XB FAILS TO OPERATE
55-RE-PT947A-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-947-XA FAILS TO OPERATE
55-RE-PT947B-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-947-XB FAILS TO OPERATE
55-RE-PT948A-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-948-XA FAILS TO OPERATE
55-RE-PT948B-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-948-XB FAILS TO OPERATE

Table 12
Basic Event Descriptions (continued)

55-RE-PT949A-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-949-XA FAILS TO OPERATE
55-RE-PT949B-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-949-XB FAILS TO OPERATE
55-RE-PT950A-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-950-XA FAILS TO OPERATE
55-RE-PT950B-RF	1.859E-004	4	INDEPENDENT FAILURERELAY PT-950-XB FAILS TO OPERATE
55-REAKFACC12345	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACC12345
55-REAKFACC12346	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACC12346
55-REAKFACC12356	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACC12356
55-REAKFACC12456	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACC12456
55-REAKFACC13456	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACC13456
55-REAKFACC23456	8.569E-008	3	QUINTUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACC23456
55-REAKFACCF1-6	1.147E-006	3	GLOBAL FAILURE OF 55-REAKFACCF1-6
55-REAKFACCF12	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF12
55-REAKFACCF123	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF123
55-REAKFACCF1234	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1234
55-REAKFACCF1235	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1235
55-REAKFACCF1236	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1236
55-REAKFACCF124	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF124
55-REAKFACCF1245	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1245
55-REAKFACCF1246	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1246
55-REAKFACCF125	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF125
55-REAKFACCF1256	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1256
55-REAKFACCF126	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF126
55-REAKFACCF13	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF13
55-REAKFACCF134	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF134
55-REAKFACCF1345	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1345
55-REAKFACCF1346	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1346
55-REAKFACCF135	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF135
55-REAKFACCF1356	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1356
55-REAKFACCF136	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF136
55-REAKFACCF14	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF14
55-REAKFACCF145	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF145
55-REAKFACCF1456	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF1456
55-REAKFACCF146	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF146
55-REAKFACCF15	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF15
55-REAKFACCF156	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF156
55-REAKFACCF16	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF16
55-REAKFACCF23	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF23
55-REAKFACCF234	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF234
55-REAKFACCF2345	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF2345
55-REAKFACCF2346	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF2346
55-REAKFACCF235	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF235
55-REAKFACCF2356	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF2356
55-REAKFACCF236	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF236
55-REAKFACCF24	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF24
55-REAKFACCF245	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF245
55-REAKFACCF2456	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF2456
55-REAKFACCF246	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF246
55-REAKFACCF25	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF25
55-REAKFACCF256	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF256
55-REAKFACCF26	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF26
55-REAKFACCF34	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF34
55-REAKFACCF345	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF345
55-REAKFACCF3456	5.505E-008	3	QUADRUPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF3456
55-REAKFACCF346	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF346
55-REAKFACCF35	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF35
55-REAKFACCF356	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF356

Table 12
Basic Event Descriptions (continued)

55-REAKFACCF36	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF36
55-REAKFACCF45	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF45
55-REAKFACCF456	9.506E-008	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF456
55-REAKFACCF46	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF46
55-REAKFACCF56	2.738E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKFACCF56
55-REAKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REAKRFCCF12
55-REBKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REBKRFCCF12
55-RECKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RECKRFCCF12
55-REDKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REDKRFCCF12
55-REEKRFCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)55-REEKRFCCF12
55-REFKRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 55-REFKRFCCF1-4
55-REFKRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF12
55-REFKRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF123
55-REFKRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF124
55-REFKRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF13
55-REFKRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF134
55-REFKRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF14
55-REFKRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF23
55-REFKRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF234
55-REFKRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF24
55-REFKRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REFKRFCCF34
55-REGKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REGKRFCCF12
55-REHKRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 55-REHKRFCCF1-4
55-REHKRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF12
55-REHKRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF123
55-REHKRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF124
55-REHKRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF13
55-REHKRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF134
55-REHKRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF14
55-REHKRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF23
55-REHKRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF234
55-REHKRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF24
55-REHKRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REHKRFCCF34
55-REIKRFCCF12	4.370E-006	4	DOUBLE COMMON CAUSE FAILURE (CCF)RLYS CI13X, 20X FL
55-REJKRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 55-REJKRFCCF1-4
55-REJKRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF12
55-REJKRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF123
55-REJKRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF124
55-REJKRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF13
55-REJKRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF134
55-REJKRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF14
55-REJKRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF23
55-REJKRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF234
55-REJKRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF24
55-REJKRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REJKRFCCF34
55-REKKRFCCF1-4	1.730E-006	3	GLOBAL FAILURE OF 55-REKKRFCCF1-4
55-REKKRFCCF12	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF12
55-REKKRFCCF123	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF123
55-REKKRFCCF124	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF124
55-REKKRFCCF13	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF13
55-REKKRFCCF134	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF134
55-REKKRFCCF14	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF14
55-REKKRFCCF23	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF23
55-REKKRFCCF234	3.130E-007	3	TRIPLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF234
55-REKKRFCCF24	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF24
55-REKKRFCCF34	6.600E-007	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REKKRFCCF34

Table 12
Basic Event Descriptions (continued)

55-RESKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-RESKRFCCF12
55-REVKRFCCF12	4.370E-006	3	DOUBLE COMMON CAUSE FAILURE (CCF)55-REVKRFCCF12
55-SY---ESF1-SF	4.865E-003	3	TRAIN A CONTAINMENTPRESSURE SIGNAL FAILS
55-SY---ESF3-SF	4.865E-003	3	TRAIN B CONTAINMENTPRESSURE SIGNAL FAILS
55-SY--FWISO-FA	1.415E-004	3	FEEDWATER ISOLATIONSIGNAL FAILS
55-SY-ESFTRA-TM	3.410E-003	3	ESFAS TRAIN A UNAVAILABLE DUE TO TEST OR MAINTENANCE
55-SY-ESFTRB-TM	3.110E-003	3	ESFAS TRAIN B UNAVAILABLE DUE TO TEST OR MAINTENANCE
56-CI-CAT-A--SF	1.200E-004	3	ISOLATION FAILURE OF CATEGORY A PENETRATIONS
56-CI-CAT-B--HE	1.200E-002	3	OPERATOR FAILS TO ISOLATE CATEGORY B PENETRATIONS
56-CI-CAT-B-SHE	1.000E+000	3	OPERATOR FAILS TO ISOLATE CATEGORY B PENETRATIONS
(SEIS)			
56-LCTMT-HI--AE	9.999E-005	3	TECHNICIAN MISCALIBRATES CNT HIGH RANGE LEVEL HI
56-LCTMT-LOW-AE	9.999E-005	3	TECHNICIAN MISCALIBRATES CNT HIGH RANGE LEVEL LO
59-OSPRCVR-B-HE	1.880E-002	3	FAILURE TO RECOVER OSP BEFORE BOILING
59-OSPRCVR-D-HE	4.415E-002	3	FAILURE TO RECOVER OSP BEFORE CORE DAMAGE
67-DM-TCV200-OC	1.288E-006	4	DAMPER TCV-200 TRANSFERS CLOSED
67-DM-TCV210-OC	1.288E-006	4	DAMPER TCV-210 TRANSFERS CLOSED
86-INSTRFCRF-HE	1.800E-002	3	FAIL TO CONTROL AFW
86-INSTRRCRF-HE	1.800E-002	3	FAIL TO CONTROL AFW
8HR/2HR-FAILS	2.300E-001	3	FAILURE TO RECOVER OSP WITHIN 8 HRS GIVEN 2HR-FAILS
8HR/2HR-SUCCESS	7.700E-001	3	OSP IS RECOVRD WITHIN 8 HOURS GIVEN 2HR-FAILS
AC-0159	4.115E-001	3	OFFSITE POWER NOT RECOVERED WITHIN 1 HOUR, 59 MINUTES
AC-0159-SUC	5.885E-001	3	OFFSITE POWER RECOVERED WITHIN 1 HOURS, 59 MINUTES
AC-0221	3.547E-001	3	OFFSITE POWER NOT RECOVERED WITHIN 2 HOURS, 21
MINUTES			
AC-0221-SUC	6.453E-001	3	OFFSITE POWER RECOVERED WITHIN 2 HOURS, 21 MINUTES
AC-0241	3.427E-001	3	OFFSITE POWER NOT RECOVERED WITHIN 2 HOURS, 41
MINUTES			
AC-0241-SUC	6.573E-001	3	OFFSITE POWER RECOVERED WITHIN 2 HOURS, 41 MINUTES
AC-0356	3.045E-001	3	OFFSITE POWER NOT RECOVERED WITHIN 3 HOURS, 56
MINUTES			
AC-0715	1.761E-001	3	OFFSITE POWER NOT RECOVERED WITHIN 7 HOURS, 15
MINUTES			
AC-0715-SUC	8.239E-001	3	OFFSITE POWER RECOVERED WITHIN 7 HOURS, 15 MINUTES
AC-1632	7.958E-002	3	OFFSITE POWER RECOVERED WITHIN 16HOURS, 32 MINUTES
AC-1632-SUC	9.204E-001	3	OFFSITE POWER RECOVERED WITHIN 16HOURS, 32 MINUTES
BOIL	1.000E+000	3	BOIL FLAG
BR-PIPE	5.000E-003	3	LOW PRESSURE RESIDUAL HEAT REMOVAL PIPE FAILS
CD	1.000E+000	3	CORE DAMAGE FLAG
CX06-ISOL-A	5.000E-001	3	Fail to Isolate Before Failure of any Buses CW Mod
CX06-ISOL-B	5.000E-001	3	Fail to Isolate Before Failure of AFWP CW Mod
CX06-ISOL-C	5.000E-001	3	FAIL TO ISOLATE BEFORE FAILURE OF BUS 6 CW MOD
CX06-ISOL-D	5.000E-001	3	FAIL TO ISOLATE BEFORE 18 INCHES ON TDAFP CW MOD
CX06-ISOL-E	5.000E-001	3	
CY06-ISOL-A	5.000E-001	3	
CY06-ISOL-B	5.000E-001	3	
CY06-ISOL-C	5.000E-001	3	
CY06-ISOL-D	5.000E-001	3	
CY06-ISOL-E	5.000E-001	3	
DUMMY	0.000E+000	3	DUMMY TO PREVENT DOUBLE COUNTING OF HUMAN ERRORS
FAILBATRMCLG-HE	7.900E-002	3	Fail to Establish Battery Room Cooling
FAULT-A	5.000E-001	3	STEAM GENERATOR A IS FAULTED
FAULT-B	5.000E-001	3	STEAM GENERATOR B IS FAULTED
FI06-ISOL-A	5.000E-001	3	Fail to Isolate Before Failure of any Buses FP Large
FI06-ISOL-B	5.000E-001	3	Fail to Isolate Before Failure of AFWP FP Large
FI06-ISOL-C	5.000E-001	3	Fail to Start MDAFPFP Large

Table 12
Basic Event Descriptions (continued)

FI06-ISOL-D	5.000E-001	3	FAIL TO ISOLATE BEFORE FAILURE OF MDAFP
FL-ATWS	1.000E+000	6	ATWS FLAG
FL-BUS5-FAIL	1.000E+000	6	BUS 5 FAILS
FL-BUS6-FAIL	1.000E+000	6	BUS 6 FAILS
FL-CRRV-NEED	1.000E+000	6	CONTROL ROOM AND RELAY ROOM VENT NEEDED FOR CFCUS
FL-DGA-FAIL	1.000E+000	6	DIESEL GENERATOR A FAILS
FL-DGB-FAIL	1.000E+000	6	DIESEL GENERATOR B FAILS
FL-EPS-RECOV	1.000E+000	6	OFFSITE POWER HAS BEEN RECOVERED
FL-EPS-SUCC	1.000E+000	6	EPS SUCCESS
FL-GDRN-FLD	1.000E+000	6	RWST GRAV DRN FAILED BY PLANT CONDITIONS
FL-HPI-A	1.000E+000	6	HIGH PRESSURE INJECTION TRAIN A FAILS
FL-HPI-B	1.000E+000	6	HIGH PRESSURE INJECTION TRAIN B FAILS
FL-HPI-SUCC	1.000E+000	6	HIGH PRESSURE INJECTION IS SUCCESSFUL
FL-LATE	1.000E+000	6	LATE SEQUENCES POWER RECOVERY APPLIES
FL-OSP-INIT	1.000E+000	6	OFFSITE POWER LOST DUE TO THE INITIATOR
FL-RECOV	1.000E+000	6	LOSS OF OFFSITE POWER IS RECOVERED
FL-RHR-A	1.000E+000	6	FAILURE OF RHR TRAIN A IN SI AND COOLDOWN MODE
FL-RHR-B	1.000E+000	6	FAILURE OF RHR TRAIN B IN SI AND COOLDOWN MODE
FL-SIACF-PWR	1.000E+000	6	POWER TO AIR COMPRESSOR F FAILS
FL-SIACG-PWR	1.000E+000	6	POWER TO AIR COMPRESSOR G FAILS
FL-SLO-LERF	1.000E+000	6	SMALL LOCA LEADING TO LERF
FL-SWA-FAIL	1.000E+000	6	SERVICE WATER TRAINA FAILS
FL-SWB-FAIL	1.000E+000	6	SERVICE WATER TRAINB FAILS
FLB-A-CNTMNT	8.887E-003	3	BREAK IN FEEDWATER LINE A IN CONTAINMENT
FLB-A-ISOL	1.995E-001	3	BREAK IN FEEDWATER LINE A UPSTREAM OF FW-7A
FLB-A-UNISOL	7.716E-002	3	BREAK IN FEEDWATER LINE A BETWEEN FW-7A AND FW-13A
FLB-B-CNTMNT	5.888E-003	3	BREAK IN FEEDWATER LINE B IN CONTAINMENT
FLB-B-ISOL	3.183E-002	3	BREAK IN FEEDWATER LINE B UPSTREAM OF FW-7B
FLB-B-UNISOL	7.645E-002	3	BREAK IN FEEDWATER LINE B BETWEEN FW-7B AND FW-13B
IE-CI06B	3.730E-005	3	LARGE CIRC WTR LINE BREAK IN TURB BLDG BASEMENT
IE-CX06B	2.920E-005	3	MEDIUM CIRC WTR LINE BREAK IN TURB BLDG BASEMENT
IE-CY06B	7.340E-005	3	SMALL CIRC WTR LINE BREAK IN TURB BLDG BASEMENT
IE-FI02B	0.000E+000	3	LARGE FIRE PROT PIPE BREAK IN DG 1A ROOM
IE-FI04B	0.000E+000	3	LARGE FIRE PROT PIPE BREAK IN CARDOX ROOM
IE-FI06B	7.080E-005	3	LARGE FIRE PROTECT LINE BREAK IN TURB BLDG BASEMENT
IE-FIR1	0.000E+000	3	FIRE NEAR MCC-62J OCCURS
IE-FIR10	0.000E+000	3	FIRE IN BUS 5 SWITCHES IN ECCA OCCURS
IE-FIR11	0.000E+000	3	FIRE IN BUS 6 SWITCHES IN ECCA OCCURS
IE-FIR12	0.000E+000	3	FIRE IN SG PORV SWITCHES IN MCCA OCCURS
IE-FIR13	0.000E+000	3	FIRE IN PRZR PORV SWITCHES IN MCCC OCCURS
IE-FIR14	0.000E+000	3	FIRE IN DIESEL GENERATOR ROOM A OCCURS
IE-FIR2	0.000E+000	3	FIRE IN CABLE SPREADING ROOM OCCURS
IE-FIR3	0.000E+000	3	FIRE IN BUS 1 AND 2ROOM OCCURS
IE-FIR4	0.000E+000	3	FIRE IN DIESEL GENERATOR ROOM B OCCURS
IE-FIR5	0.000E+000	3	FIRE IN RELAY ROOM OCCURS
IE-FIR6	0.000E+000	3	AUXILIARY FEEDWATERPUMP A OIL FIRE OCCURS
IE-FIR7	0.000E+000	3	AUXILIARY FEEDWATERPUMP B OIL FIRE OCCURS
IE-FIR8	0.000E+000	3	FIRE NEAR BUSES 51 AND 52 OCCURS
IE-FIR9	0.000E+000	3	FIRE DUE TO GAS BOTTLES ON FAN FLOOR OCCURS
IE-FLD1	0.000E+000	3	FLOOD FROM CW LINESIN TURBINE BUILDINGOCCURS
IE-FLD10	0.000E+000	3	FLOOD FROM SW HDR IN SCREENHOUSE OCCURS
IE-FLD2	0.000E+000	3	FLOOD FROM SERVICE WATER LINES IN AUX BLDG N BSMNT OCCURS
IE-FLD2A	0.000E+000	3	UNISOLABLE FLOOD FROM SI LINES IN ABN BSMNT OCCURS
IE-FLD2B	0.000E+000	3	ISOLABLE FLOOD FROM SI LINES IN ABN BSMNT OCCURS
IE-FLD3	0.000E+000	3	FLOOD FROM SW LINESIN DG ROOM A OCCURS

Table 12
Basic Event Descriptions (continued)

IE-FLD4	0.000E+000	3	FLOOD FROM SW LINE IN DG ROOM B OCCURS
IE-FLD5	0.000E+000	3	FLOOD FROM CONDENSATE LINE IN AFW PMP B RM OCCURS
IE-FLD5A	0.000E+000	3	FLOOD FROM SERVICE WATER LINES IN AFW PUMP B RM OCCURS
IE-FLD6	0.000E+000	3	FLOOD FROM SW LINE IN CRDM EQUIPMENT ROOM OCCURS
IE-FLD7	0.000E+000	3	FLOOD FROM SW HEADER IN BUS 51/52ROOM OCCURS
IE-FLD8	0.000E+000	3	FLOOD FROM SERVICE WATER LINES IN SI PUMP AREA OCCURS
IE-FLD8A	0.000E+000	3	UNISOLABLE FLOOD FROM SI LINES IN SIPUMP AREA OCCURS
IE-FLD8B	0.000E+000	3	ISOLABLE FLOOD FROMSI LINES IN SI PUMP AREA OCCURS
IE-FLD9	0.000E+000	3	FLOOD FROM SW LINE IN SG BLOWDOWN AREA OCCURS
IE-FPA-1PUMP	0.000E+000	3	LOSS OF TRN-A FPC COMPONENTS, SHUTDOWN INIT.
IE-FPA-BUS	0.000E+000	3	LOSS OF TRN-A ELECTRICAL SUPPORT SYSTEMS TO FPC
IE-FPB-1PUMP	0.000E+000	3	LOSS OF TRN-B FPC COMPONENTS, SHUTDOWN INIT.
IE-FPB-BUS	0.000E+000	3	LOSS OF TRN-B ELECTRICAL SUPPORT SYSTEMS TO FPC
IE-FPC-HX	0.000E+000	3	INITIATOR FAILING FPC HX FLOW TO FPC HX
IE-FPC-PUMPS	0.000E+000	3	INITIATOR FAILING BOTH FPC PUMPS
IE-ISL	0.000E+000	3	INTERFACING SYSTEM LOSS OF COOLANT ACCIDENT OCCURS
IE-LLO	0.000E+000	3	LARGE BREAK LOSS OFCOOLANT ACCIDENT OCCURS
IE-LOSP	0.000E+000	3	LOSS OF OFFSITE POWER OCCURS
IE-MK05B	0.000E+000	3	SMALL MISCELLANEOUSPIPE BREAK NEAR BUS 51/52
IE-MK5B3	0.000E+000	3	SMALL MISCELLANEOUSPIPE BREAK NEAR MDAFP 1B
IE-MLO	0.000E+000	3	MEDIUM LOSS OF COOLANT ACCIDENT OCCURS
IE-NK5B3	0.000E+000	3	SMALL CST PIPE BREAK NEAR MDAFP 1B
IE-NK5B4	0.000E+000	3	SMALL CST PIPE BREAK NEAR TDAFP
IE-RHA-1PUMP	0.000E+000	3	LOSS OF TRN-A RHR COMPONENTS, SHUTDOWN INIT.
IE-RHA-BUS	0.000E+000	3	LOSS OF TRN-A ELECTRICAL SUPPORT SYSTEMS TO RHR
IE-RHA-HX	0.000E+000	3	LOSS OF TRN-A RHR HEAT EXCHANGER COOLING
IE-RHB-1PUMP	0.000E+000	3	LOSS OF TRN-B COMPONENTS, SHUTDOWN INIT.
IE-RHB-BUS	0.000E+000	3	LOSS OF TRN-B ELECTRICAL SUPPORT SYSTEMS TO RHR
IE-RHB-HX	0.000E+000	3	LOSS OF TRN-B RHR HEAT EXCHANGER COOLING
IE-RHR-HXS	0.000E+000	3	INITIATOR FAILING RHR HX FLOW TO BOTH HXS
IE-RHR-MIDLOOP	0.000E+000	3	FAILURE TO MAINTAINLEVEL IN MIDLOOP FAILS BOTH RHR TRNS
IE-RHR-OVERDRN	0.000E+000	3	RCS OVERDRAIN WHILEGOING TO MIDLOOP, FLR TO MAINT LVL
IE-RHR-PUMPS	0.000E+000	3	INTIATOR FAILING BOTH RHR PUMPS
IE-SC02B	0.000E+000	3	LARGE TRAIN A SW PIPE BREAK NEAR DG 1A
IE-SC22B	0.000E+000	3	LARGE TRAIN A SW BRK IN SCREENHOUSE
IE-SE05B	0.000E+000	3	SMALL TRAIN A SW PIPE BREAK NEAR BUS 51/52
IE-SE5B2	0.000E+000	3	SMALL TRAIN A SW PIPE BREAK NEAR MDAFP 1A
IE-SE5B3	0.000E+000	3	SMALL TRAIN A SW PIPE BREAK NEAR MDAFP 1B
IE-SEIS	0.000E+000	3	SEISMIC EVENT OCCURS
IE-SF02B	0.000E+000	3	LARGE TRAIN B SW PIPE BREAK NEAR DG 1A
IE-SF03B	0.000E+000	3	LARGE TRAIN B SW PIPE BREAK NEAR DG 1B
IE-SF22B	0.000E+000	3	LARGE TRAIN B SW BRK IN SCREENHOUSE
IE-SGTR	0.000E+000	3	STEAM GENERATOR TUBE RUPTURE OCCURS
IE-SH05B	0.000E+000	3	SMALL TRAIN B SW PIPE BREAK NEAR BUS 51/52
IE-SH5B2	0.000E+000	3	SMALL TRAIN B SW PIPE BREAK NEAR MDAFP 1A
IE-SH5B3	0.000E+000	3	SMALL TRAIN B SW PIPE BREAK NEAR MDAFP 1B
IE-SI04B	0.000E+000	3	LARGE SW PIPE BREAK IN CARDOX ROOM
IE-SI05B	0.000E+000	3	LARGE SW PIPE BREAK IN SAFEGUARDS ALLEY
IE-SI06B	3.220E-005	3	LARGE SERVICE WTR LINE BREAK IN TURB BLDG BASEMENT
IE-SI22B	0.000E+000	3	LARGE SW BRK IN SCREENHOUSE
IE-SK5B3	0.000E+000	3	SMALL ISOLABLE SW PIPE BREAK NEAR MDAFP 1B
IE-SK5B4	0.000E+000	3	SMALL SW BRK NEAR TDAFP
IE-SLB	0.000E+000	3	STEAM OR FEEDWATER LINE BREAK OCCURS
IE-SLO	0.000E+000	3	SMALL BREAK LOSS OF COOLANT ACCIDENTOCCURS

Table 12
Basic Event Descriptions (continued)

IE-SLOFP	0.000E+000	3	FUEL POOL SMALL LOCA INITIATING EVENT
IE-SOPORV	0.000E+000	3	STUCK OPEN PORV OCCURS
IE-TB5	0.000E+000	3	MULTIPLIER FOR LOSSOF 4160 V AC BUS 5 IE FREQUENCY
IE-TB6	0.000E+000	3	MULTIPLIER FOR LOSSOF 4160 V AC BUS 6 IE FREQUENCY
IE-TCC	0.000E+000	3	MULTIPLIER FOR LOSSOF COMPONENT COOLING IE FREQ
IE-TDA	0.000E+000	3	MULTIPLIER FOR LOSSOF 125 V DC BUS BRA-104 IE FREQ
IE-TDB	0.000E+000	3	MULTIPLIER FOR LOSSOF 125 V DC BUS BRB-104 IE FREQ
IE-TI06B	2.530E-004	3	STEAMLINE BRK IN TURB BLDG CAUSESLARGE FIRE PROT
IE-TIA	0.000E+000	3	MULTIPLIER FOR LOSSOF INSTRUMENT AIR IE FREQUENCY
IE-TMF	1.000E+000	6	LOSS OF MAIN FEEDWATER OCCURS
IE-TRA	0.000E+000	3	TRANSIENT WITH MAIN FEEDWATER AVAILABLE OCCURS
IE-TSW	0.000E+000	3	MULTIPLIER FOR LOSSOF SERVICE WATER IE FREQUENCY
IE-TX06B	1.870E-005	3	STEAMLINE BRK IN TURB BLDG CAUSESMEDIUM FIRE PROT
IE-VEF	0.000E+000	3	VESSEL FAILURE OCCURS
IE-WI06B	1.350E-004	3	LARGE FEEDWATER BREAK IN TURBINE BLDG BASEMENT
IE-WX06B	4.690E-005	3	MEDIUM FEEDWATER BREAK IN TURBINE BLDG BASEMENT
ISL-ISOLATE	5.000E-001	3	ISL IS SUCCESSFULLYISOLATED EARLY
LERF	1.000E+000	3	LERF FLAG
LL-SUCT	1.740E-002	3	LOCA LOCATION IS INTHE RHR SUCTION PIPING
LLO-CLA	2.500E-001	3	LARGE COLD LEG LOCAIN LOOP A
LLO-CLB	2.500E-001	3	LARGE COLD LEG LOCAIN LOOP B
LLO-MT-ICSA	5.263E-002	3	1 HOUR MISSION TIMEFOR ICS ACTUATION
LLO-MT-ICSB	5.263E-002	3	1 HOUR MISSION TIMEFOR ICS ACTUATION
LMLO-MT-LPI	3.750E-001	3	9 HOUR MISSION TIMEFOR LPI IN LARGE AND MEDIUM LOCA
LOCA-A	2.500E-001	3	LOCA IS IN RCS LOOP A COLD LEG
LOCA-B	2.500E-001	3	LOCA IS IN RCS LOOPB COLD LEG
LOSP-24	9.277E-005	3	LOSS OF ALL POWER FROM GRID DURING 24HOURS
MLO-CLA	1.593E-001	3	MEDIUM COLD LEG LOCA IN LOOP A
MLO-CLB	1.593E-001	3	MEDIUM COLD LEG LOCA IN LOOP B
MLO-MT-AFW	3.750E-001	3	9 HOUR MISSION TIMEFOR AFW IN AN MLO
MLO-MT-MFW	3.750E-001	3	9 HOUR MISSION TIMEFOR MFW IN MEDIUM LOCA
NULL	0.000E+000	3	SET TO 0
PORV-CHALLENGE	1.923E-002	3	PORV IS CHALLENGED BY THE INITIATOR
POS-CORE-RCS-DUR	1.000E+000	3	REDUCED FUEL INVENTORY IN RCS IN EARLY POS
POS-FUELPOOL-DUR	1.000E+000	3	FUEL IN FUEL POOL EARLY
RCP-SEAL-LOPSR	1.000E-001	3	RCP SEAL LOCA ADJUSTMENT FOR LOW PRESSURE
ROD	1.000E+000	3	SEISMIC FAILURE OF CONTROL ROD INSERTION
RST	1.000E+000	3	SEISMIC FAILURE OF REFUELING WATER STORAGE TANK
RVP	1.000E+000	3	SEISMIC FAILURE OF REACTOR VESSEL
S-AC-ACC-----FA	1.000E+000	3	SEISMIC FAILURE OF SIS ACCUMULATORS
S-AC-PORV----FA	1.000E+000	3	SEISMIC FAILURE OF PRESSURIZER PORV AIR ACCUMULATORS
S-AC-SD3AB---FA	1.000E+000	3	SEISMIC FAILURE OF SD-3A AND SD-3B AIRACCUMULATORS
S-AV-CHG-----FA	1.000E+000	3	SEISMIC FAILURE OF CHG AIR VALVES
S-AV-CI------FA	1.000E+000	3	SEISMIC FAILURE OF CI AIR VALVES
S-AV-OCD-----FA	1.000E+000	3	SEISMIC FAILURE OF MS AIR VALVES
S-AV-PORV----FA	1.000E+000	3	SEISMIC FAILURE OF PRESSURIZER PORVS
S-BC-125-----FA	1.000E+000	3	SEISMIC FAILURE OF 125VDC BATTERY CHARGERS
S-BD-ADM-----FA	1.000E+000	3	SEISMIC FAILURE OF ADMINISTRATION BUILDING
S-BD-AUX-----FA	1.000E+000	3	SEISMIC FAILURE OF AUXILIARY BUILDING
S-BD-SCREEN--FA	1.000E+000	3	SEISMIC FAILURE OF SCREENHOUSE
S-BD-TURB----FA	1.000E+000	3	SEISMIC FAILURE OF TURBINE BUILDING
S-BY-125-----FA	1.000E+000	3	SEISMIC FAILURE OF 125VDC BATTERIES
S-BY-RACKS---FA	1.000E+000	3	SEISMIC FAILURE OF 125VDC BATTERY RACKS
S-CV-ACC-----FA	1.000E+000	3	SEISMIC FAILURE OF ACC CHECK VALVES
S-CV-AFW-----FA	1.000E+000	3	SEISMIC FAILURE OF AFW CHECK VALVES
S-CV-BF------FA	1.000E+000	3	SEISMIC FAILURE OF BLEED AND FEED CHECK VALVES

Table 12
Basic Event Descriptions (continued)

S-CV-CCW-----FA	1.000E+000	3	SEISMIC FAILURE OF CCW CHECK VALVES
S-CV-CI------FA	1.000E+000	3	SEISMIC FAILURE OF CI CHECK VALVES
S-CV-HPI-----FA	1.000E+000	3	SEISMIC FAILURE OF HPI CHECK VALVES
S-CV-LPI-----FA	1.000E+000	3	SEISMIC FAILURE OF LPI CHECK VALVES
S-CV-MSI-----FA	1.000E+000	3	SEISMIC FAILURE OF MAIN STEAM ISOLATION VALVES
S-CV-SWSAB---FA	1.000E+000	3	SEISMIC FAILURE OF SWS CHECK VALVES
S-DG-DGAB----FA	1.000E+000	3	SEISMIC FAILURE OF DIESEL GENERATOR
S-DG-VALVES--FA	1.000E+000	3	SEISMIC FAILURE OF DIESEL GENERATOR MISC VALVES
S-DM-CAC-----FA	1.000E+000	3	SEISMIC FAILURE OF CAC DAMPERS
S-DP-120-----FA	1.000E+000	3	SEISMIC FAILURE OF 120V AC DISTRIBUTION PANELS
S-DP-125-----FA	1.000E+000	3	SEISMIC FAILURE OF 125VDC CONTROL PANELS
S-DP-AFW-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-CCW-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-CHG-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-CI------FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-HPI-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-HPR-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-LPR-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-MCC52A--FA	1.000E+000	3	SEISMIC FAILURE OF MCC-52A
S-DP-MCC52B--FA	1.000E+000	3	SEISMIC FAILURE OF MCC-52B
S-DP-MCC52E--FA	1.000E+000	3	SEISMIC FAILURE OF MCC-52E
S-DP-MCC62E--FA	1.000E+000	3	SEISMIC FAILURE OF MCC-62E
S-DP-MCC62H--FA	1.000E+000	3	SEISMIC FAILURE OF MCC-62H
S-DP-MCC62J--FA	1.000E+000	3	SEISMIC FAILURE OF MCC-62J
S-DP-RPS-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-DP-SWS-----FA	1.000E+000	3	SEISMIC FAILURE OF DEPENDENT MCC GROUP
S-EC-DGE-----FA	1.000E+000	3	SEISMIC FAILURE OF DIESEL GENERATOR EXCITER CABINET
S-FL-SCREEN--FA	1.000E+000	3	SEISMIC FAILURE OF SWS SCREENS
S-FN-CAC-ABCDFA	1.000E+000	3	SEISMIC FAILURE OF CAC FAN COIL UNITS
S-FN-RHRAB---FA	1.000E+000	3	SEISMIC FAILURE OF RHR PUMPS FAN COIL UNITS
S-FP-120-----FA	1.000E+000	3	SEISMIC FAILURE OF 120V AC FUSE PANELS
S-FP-125-----FA	1.000E+000	3	SEISMIC FAILURE OF 125V DC FUSE PANELS
S-HE-CCWAB---FA	1.000E+000	3	SEISMIC FAILURE OF CCW HEAT EXCHANGERS
S-HE-RHRAB---FA	1.000E+000	3	SEISMIC FAILURE OF RHR HEAT EXCHANGERS
S-IV-120-----FA	1.000E+000	3	SEISMIC FAILURE OF 120V AC INVERTERS
S-LO-COOLERS-FA	1.000E+000	3	SEISMIC FAILURE OF AFW PUMP LUBE OIL COOLERS
S-MS-AFW-----FA	1.000E+000	3	SEISMIC FAILURE OF DC MOTOR STARTERS
S-MV-AFW-----FA	1.000E+000	3	SEISMIC FAILURE OF AFW MOTOR VALVES
S-MV-CCW-----FA	1.000E+000	3	SEISMIC FAILURE OF CCW MOTOR VALVES
S-MV-CI------FA	1.000E+000	3	SEISMIC FAILURE OF CI MOTOR VALVES
S-MV-HPR-----FA	1.000E+000	3	SEISMIC FAILURE OF HPR MOTOR VALVES
S-MV-LPR-----FA	1.000E+000	3	SEISMIC FAILURE OF LPR MOTOR VALVES
S-MV-MSI-----FA	1.000E+000	3	SEISMIC FAILURE OF SLB ISOLATION MOTORVALVES
S-PD-AFWC----FA	1.000E+000	3	SIESMIC FAILURE OF TURBINE DRIVEN AFW PUMP
S-PM--SWS----FA	1.000E+000	3	SEISMIC FAILURE OF SWS PUMPS
S-PM-AFWAB---FA	1.000E+000	3	SIESMIC FAILURE OF MOTOR DRIVEN AFW PUMP
S-PM-CCWAB---FA	1.000E+000	3	SEISMIC FAILURE OF CCW PUMPS
S-PM-CVCAC---FA	1.000E+000	3	SEISMIC FAILURE OF CHARGING PUMPS A AND C
S-PM-CVCB----FA	1.000E+000	3	SEISMIC FAILURE OF CHARGING PUMP B
S-PM-RHRAB---FA	1.000E+000	3	SEISMIC FAILURE OF RHR PUMPS
S-PM-SISAB---FA	1.000E+000	3	SEISMIC FAILURE OF SIS PUMPS
S-PN-BOSEQ---FA	1.000E+000	3	SEISMIC FAILURE OF BLACKOUT SEQUENCER PANELS
S-PN-DGCP----FA	1.000E+000	3	SEISMIC FAILURE OF DIESEL GENERATOR CONTROL PANEL
S-PN-SISEQ---FA	1.000E+000	3	SEISMIC FAILURE OF SI SEQUENCER PANELS
S-PP-AFWAB---FA	1.000E+000	3	SEISMIC FAILURE OF AFW SYSTEM PIPING
S-PP-PORV----FA	1.000E+000	3	SEISMIC FAILURE OF PRESSURIZER PORV PIPING

Table 12
Basic Event Descriptions (continued)

S-PP-SWSAB---FA	1.000E+000	3	SEISMIC FAILURE OF SERVICE WATER PIPING
S-RP-DGE-----FA	1.000E+000	3	SEISMIC FAILURE OF DIESEL GENERATOR RELAY PANEL
S-RR-ESFAS---FA	1.000E+000	3	SEISMIC FAILURE OF ESFAS RELAY RACKS
S-SV-AFW-----FA	1.000E+000	3	SEISMIC FAILURE OF AFW SOLENOID VALVES
S-SV-MSI-----FA	1.000E+000	3	SEISMIC FAILURE OF SLB ISOLATION SOLENOID VALVES
S-SWGR-4160--FA	1.000E+000	3	SEISMIC FAILURE OF 4160VAC SWITCHGEAR
S-SWGR-480---FA	1.000E+000	3	SEISMIC FAILURE OF 480VAC SWITCHGEAR
S-TK-CCW-----FA	1.000E+000	3	SEISMIC FAILURE OF COMPONENT COOLING SURGE TANK
S-TK-DGFO----FA	1.000E+000	3	SEISMIC FAILURE OF FUEL OIL DAY TANKS
S-TK-RWST----FA	1.000E+000	3	SEISMIC FAILURE OF REFUELING WATER STORAGE TANK
S-TK-VCT-----FA	1.000E+000	3	SEISMIC FAILURE OF VOLUME CONTROL TANK
S-TR-480-----FA	1.000E+000	3	SEISMIC FAILURE OF 480VAC TRANSFORMERS
S-UV-CHG-----FA	1.000E+000	3	SEISMIC FAILURE OF CHG RELIEF VALVES
SBO	1.000E+000	3	FLAG FOR LOSS OF OFFSITE POWER WITH SBO
SBO-MT-AFW	1.790E-001	3	STATION BLACKOUT MISSION TIME MULT. FOR AFW
SEAL	1.000E+000	3	SEISMIC SEAL LOCA
SEICDF	9.390E-006	3	SIESMIC EVENT LEADSTO CORE DAMAGE
SGTR-MT-HPI	4.167E-002	3	MULTIPLIER FOR 1 HOUR HPI MISSION TIME IN AN SGTR
SI06-ISOL-A	5.000E-001	3	FAIL TO ISOLATE BEFORE FAILURE OF ANY BUSES SW LARGE
SI06-ISOL-B	5.000E-001	3	Fail to Isolate Before Failure of AFWP SW Large
SI06-ISOL-C	5.000E-001	3	FAIL TO ISOLATE BEFORE AFWP ALOP FAIL SW LARGE
SI06-ISOL-D	5.000E-001	3	FAIL ISOLATION BEFORE 18 INCHES ON TDAFP SW LARGE
SI06-ISOL-E	5.000E-001	3	
SL182	6.000E-001	3	MEDIUM REACTOR COOLANT PUMP SEAL LOCA (182 GPM)
SL21-CD	2.000E-001	3	RCP SEAL LOCA GREATER THAN 21 GPMNO RCS COOLDOWN
SL21-NO-CD	6.000E-001	3	RCP SEAL LOCA GREATER THAN 21 GPMNO RCS COOLDOWN
SL480	2.500E-003	3	LARGE REACTOR COOLANT PUMP SEAL LOCA (480 GPM)
SL76	8.000E-001	3	SMALL REACTOR COOLANT PUMP SEAL LOCA (21,57,76 GPM)
SLB-A-CNTMNT	5.598E-002	3	BREAK IN STEAM LINEA IN CONTAINMENT
SLB-A-ISOL	3.019E-001	3	BREAK IN STEAM LINEA IN AUX BUILDING DOWNSTREAM OF MSIV
SLB-A-UNISOL	1.685E-002	3	BREAK IN STEAM LINEA IN AUX BUILDING UPSTREAM OF MSIV
SLB-B-CNTMNT	5.896E-002	3	BREAK IN STEAM LINEB IN CONTAINMENT
SLB-B-ISOL	1.523E-001	3	BREAK IN STEAM LINEB IN AUX BUILDING DOWNSTREAM OF MSIV
SLB-B-UNISOL	1.421E-002	3	BREAK IN STEAM LINEB IN AUX BUILDING UPSTREAM OF MSIV
SLB-MT-ICSA	2.105E-001	3	4 HOUR MISSION TIMEFOR ICS ACTUATION
SLB-MT-ICSB	2.105E-001	3	4 HOUR MISSION TIMEFOR ICS ACTUATION
SLERF	5.410E-001	3	SEISMIC CONDITIONALLARGE EARLY RELEASEFREQUENCY
SLO-CLB	3.938E-002	3	SMALL COLD LEG LOCAIN LOOP B
SLO56--DIVERSION	9.700E-001	3	FRACTION OF IE- SLO56 DUE TO FLOW DIVERSIONS
SLO56-PIPERUPTUR	3.000E-002	3	FRACTION OF IE- SLO56 DUE TO PIPE/ COMPT BREAKS
SNONLERF	4.590E-001	3	SEISMIC EVENT LEADSTO CORE DAMAGE BUT NOT LERF
SPB	1.000E+000	3	SEISMIC SMALL PIPE BREAK
SSP	1.000E+000	3	SEISMIC FAILURE OF STEAM LINE
STBY-ABBFA	5.000E-001	3	AUX BLDG BSMT FAN COIL UNIT A IS IN STANDBY
STBY-ABBFB	5.000E-001	3	AUX BLDG BSMT FAN COIL UNIT B IS IN STANDBY
STBY-ABBFC	5.000E-001	3	AUX BLDG BSMT FAN COIL UNIT C IS IN STANDBY
STBY-ABBFD	5.000E-001	3	AUX BLDG BSMT FAN COIL UNIT D IS IN STANDBY
STBY-ABMFA	5.000E-001	3	AUX BLDG MEZZ FAN COIL UNIT A IS IN STANDBY
STBY-ABMFB	5.000E-001	3	AUX BLDG MEZZ FAN COIL UNIT B IS IN STANDBY
STBY-CCWPA	5.000E-001	3	COMPONENT COOLING PUMP A IS IN STANDBY
STBY-CCWPB	5.000E-001	3	COMPONENT COOLING PUMP B IS IN STANDBY
STBY-CHGPA	3.330E-001	3	CHARGING PUMP A IS IN STANDBY
STBY-CHGPB	3.330E-001	3	CHARGING PUMP B IS IN STANDBY
STBY-CHGPC	3.330E-001	3	CHARGING PUMP C IS IN STANDBY

Table 12
Basic Event Descriptions (continued)

STBY-CRACA	5.000E-001	3	CONTROL ROOM AIR CONDITIONING TRAIN A IS IN STANDBY
STBY-CRACB	5.000E-001	3	CONTROL ROOM AIR CONDITIONING TRAIN B IS IN STANDBY
STBY-CWPA	2.205E-001	3	CIRCULATING WATER PUMP A IS IN STANDBY
STBY-CWPB	2.205E-001	3	CIRCULATING WATER PUMP B IS IN STANDBY
STBY-CWPNONE	5.590E-001	3	BOTH CIRCULATING WATER PUMPS ARE RUNNING
STBY-PEWPA	5.000E-001	3	PLANT EQUIPMENT WATER PUMP A IS IN STANDBY
STBY-PEWPB	5.000E-001	3	PLANT EQUIPMENT WATER PUMP B IS IN STANDBY
STBY-RMUWPA	5.000E-001	3	REACTOR MAKEUP WATER PUMP A IS IN STANDBY
STBY-RMUWPB	5.000E-001	3	REACTOR MAKEUP WATER PUMP B IS IN STANDBY
STBY-SIACF	5.000E-001	3	AIR COMPRESSOR F ISIN STANDBY
STBY-SIACG	5.000E-001	3	AIR COMPRESSOR G ISIN STANDBY
STBY-SWPA1	2.500E-001	3	SERVICE WATER PUMP A1 IS IN STANDBY
STBY-SWPA2	2.500E-001	3	SERVICE WATER PUMP A2 IS IN STANDBY
STBY-SWPB1	2.500E-001	3	SERVICE WATER PUMP B1 IS IN STANDBY
STBY-SWPB2	2.500E-001	3	SERVICE WATER PUMP B2 IS IN STANDBY
SUCC-CHG	8.139E-001	3	CHARGING SUCCESS
SUR-ROD	1.000E+000	3	SURROGATE ELEMENT FOR ROD
SUR-SSP	1.000E+000	3	SURROGATE ELEMENT FOR SSP
SUR-SXACC	1.000E+000	3	SURROGATE ELEMENT FOR SXACC
SUR-SXACP	1.000E+000	3	SURROGATE ELEMENT FOR SXACP
SUR-SXAFW	1.000E+000	3	SURROGATE ELEMENT FOR SXAFW
SUR-SXCCW	1.000E+000	3	SURROGATE ELEMENT FOR SXCCW
SUR-SXCHG	1.000E+000	3	SURROGATE ELEMENT FOR SXCHG
SUR-SXCI	1.000E+000	3	SURROGATE ELEMENT FOR SXCI
SUR-SXDCP	1.000E+000	3	SURROGATE ELEMENT FOR SXDCP
SUR-SXESF	1.000E+000	3	SURROGATE ELEMENT FOR SXESF
SUR-SXFCH	1.000E+000	3	SURROGATE ELEMENT FOR SXFCH
SUR-SXHPI	1.000E+000	3	SURROGATE ELEMENT FOR SXHPI
SUR-SXHPR	1.000E+000	3	SURROGATE ELEMENT FOR SXHPR
SUR-SXISO	1.000E+000	3	SURROGATE ELEMENT FOR SXISO
SUR-SXLPI	1.000E+000	3	SURROGATE ELEMENT FOR SXLPI
SUR-SXLPR	1.000E+000	3	SURROGATE ELEMENT FOR SXLPR
SUR-SXOBF	1.000E+000	3	SURROGATE ELEMENT FOR SXOBF
SUR-SXOCD	1.000E+000	3	SURROGATE ELEMENT FOR SXOCD
SUR-SXSWS	1.000E+000	3	SURROGATE ELEMENT FOR SXSWS
TI06-ISOL-A	5.000E-001	3	Fail to Isolate Before Failure of any Buses STM Large
TI06-ISOL-B	5.000E-001	3	Fail to Isolate Before Failure of AFWP STM Large
TI06-ISOL-C	5.000E-001	3	Fail to Start MDAFPSTM Large
TI06-ISOL-D	5.000E-001	3	FAIL TO ISOLATE BEFORE FAILURE OF MDAFP
TRA-SSI ACTUATION	1.858E-002	3	TRANSIENT IS DUE TOSPURIOUS SAFETY INJECTION
TRAINA-FAILS	1.000E+000	3	TRAIN A OF SYSTEM FAILS - DUMMY EVENT
TRAINB-FAILS	1.000E+000	3	TRAIN B OF SYSTEM FAILS - DUMMY EVENT
TX06-ISOL-A	5.000E-001	3	Fail to Isolate Before Failure of any Buses STM Mod
TX06-ISOL-B	5.000E-001	3	Fail to Isolate Before Failure of AFWP STM Mod
TX06-ISOL-C	5.000E-001	3	Fail to Start MDAFPSTM Moderate
UET-0PORVS	1.070E-001	3	UNFAVORABLE EXPOSURE TIME FOR 0PORVS AVAILABLE
UET-1PORV	1.130E-001	3	UNFAVORABLE EXPOSURE TIME FOR 1PORV AVAILABLE
UET-2PORVS	1.620E-001	3	UNFAVORABLE EXPOSURE TIME FOR 2PORVS AVAILABLE
WI06-ISOL-A	1.000E+000	3	Fail to Isolate Before Failure of any Buses FW Large
WI06-ISOL-B	5.000E-001	3	Fail to Isolate Before Failure of AFWP FW Large
WI06-ISOL-C	5.000E-001	3	Fail to Start MDAFPFW Large
WI06-ISOL-D	5.000E-001	3	FAIL TO ISOLATE BEFORE FAILURE OF BUSES 61 AND 62
WX06-ISOL-A	5.000E-001	3	Fail to Isolate Before Failure of any Buses FW Mod
WX06-ISOL-B	5.000E-001	3	Fail to Isolate Before Failure of AFWP FW Mod
WX06-ISOL-C	5.000E-001	3	Fail to Start MDAFPFW Moderate

Table 12
Basic Event Descriptions (continued)

XCOM-AC-0159	5.885E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AC-0221	6.453E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AC-0241	6.573E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AC-0715	8.239E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AC-0725	8.266E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AC-1632	9.204E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AC-1642	9.214E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ACFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ACLLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ACMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ACSLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFATWS	9.673E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR14	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR2	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR7	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR8	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFISL	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFLOSP	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRCX064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRCX06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRCY064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRCY06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRFI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRFI06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRSI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRSI06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRTI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRTI06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRTX064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRTX06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRWI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRWI06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRWX064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFRWX06B	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSBO	9.646E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSCX064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSCX06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSCY064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSCY06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSFI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-AFSFI06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSGTR	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSLB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSLO	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSSI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSSI06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSTI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSTI06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSTX064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSTX06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSWI064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSWI06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSWX064	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFSWX06B	9.957E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTCC	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTCX064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTCX06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTCY064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTCY06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTCY06M	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTDA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTDB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTFI064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTFI06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTFI06M	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTIA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTMF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTRA	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTSI064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTSI06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTSI06M	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTSW	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTTI064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTTI06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTTI06M	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTTX064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTTX06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTWI064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTWI06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTWI06M	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTWX064	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFTWX06B	9.627E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1ACX	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1ACY	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1AFI	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1ASI	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1ATI	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1ATX	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1AWI	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1AWX	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1CXB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1CYB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1FIB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1SIB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-AFX-1TIB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1TXB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1WIB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-1WXB	9.937E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2CXB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2CY4	3.600E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2CYB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2FI4	3.600E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2FIB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2SI4	3.600E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2SIB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2TI4	3.600E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2TIB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2TXB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2WI4	3.600E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2WIB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFX-2WXB	9.820E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-ACXB	5.770E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-ACYB	5.770E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-AFIB	7.210E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-ASIB	8.560E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-ATIB	7.210E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-ATXB	9.631E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-AWIB	5.770E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-AWXB	8.560E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BCXB	8.139E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BCY4	8.139E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BCYB	8.139E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BFI4	8.772E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BFIB	8.772E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BSI4	8.772E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BSIB	8.772E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BTI4	8.772E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BTIB	8.772E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BTXB	9.838E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BWI4	8.139E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BWIB	8.139E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AFZ-BWXB	9.366E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-AMSAC	9.815E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-29	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-37	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-40	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-41	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-42	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-44	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-50	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-52	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-56	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-62	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-63	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ATWS-64	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-ATWS-65	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-66	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-67	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-69	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-70	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-71	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-72	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-73	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-74	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-75	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-76	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-77	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-78	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-79	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-80	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-81	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-82	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-83	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-84	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-85	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-86	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-87	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-88	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-89	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-90	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-91	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWS-92	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWSTOT	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-ATWSX	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-BDB	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-BR-PIPE	9.950E-001	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR1	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR10	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR11	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR14	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR2	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR3	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR4	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR5	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR6	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR7	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR8	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFIR9	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFLD1	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFLD3	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFLD4	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFLD5	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCFLD6	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCLOSP	9.994E-001	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCTB5	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCTB6	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCTDA	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCTDB	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCTIA	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCTMF	1.000E+000	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit
XCOM-CCTRA	9.999E-001	0	NUPRA	Special	EventSuccess	Branch	DataDo	NOT	Edit

Table 12
Basic Event Descriptions (continued)

XCOM-CCTSW	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CDFTOP	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR2	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR7	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHLOSP	9.981E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHSBO	8.139E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTCC	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTDA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTDB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTIA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTMF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTRA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CHTSW	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR2	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR7	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR8	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIISL	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIL	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CILLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CILOSP	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBCC	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBDA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBDB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-CISBLP	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBMF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBSW	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISBTR	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISLB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CISLO	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITCC	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITDA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITDB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITIA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITMF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITRA	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CITSW	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CIVEF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CKV	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CSSLB	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-CSSLO	9.622E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPLOSP	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTCC	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTDA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTDB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTIA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTMF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTRA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-EPTSW	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-F2SLB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-F2SLO	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR14	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR2	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR7	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR8	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCISL	9.992E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCLLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCLOSP	9.989E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSBB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSBB6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSBCC	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-FCSBDA	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSBDB	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSBLP	9.989E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSBMF	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSBTR	9.992E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSLB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCSLO	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTB6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTCC	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTDA	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTDB	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTIA	9.994E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTMF	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTRA	9.992E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCTSW	9.987E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FCVEF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR10TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR11TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR12-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR12TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR13-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR13-53	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR13TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-02	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-16	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-FIR14-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR14TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR2-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR2-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR2-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR2TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR3-23	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR3TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR4TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR5-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR5-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR5-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR5-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR5-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR5-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR5TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-02	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-16	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR6TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR7-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR7-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR7-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR7-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR7TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-02	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-FIR8-13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-16	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR8TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR9-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR9-14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR9-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR9-23	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIR9TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIRETOP	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIRETOT	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FIRLERTP	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD1-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD1-23	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD1-28	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD1TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-35	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD3TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD4TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD5-22	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD5-28	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD5-29	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD5-32	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD5TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD6-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD6-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLD6TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-FLDX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIATWS	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-HIFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR14	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR8	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIISL	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HILLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HILOSP	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HISGTR	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HISLB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HISLO	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITCC	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITDA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITDB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITIA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITMF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITRA	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HITSW	9.994E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HIVEF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPICX065	9.929E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPICX06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPICY065	9.929E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPICY06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPICY06M	9.929E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPIFI065	9.928E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPIFI06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPISI065	9.929E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPISI06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPISI06M	9.929E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPITI065	9.928E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPITI06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPITI06M	9.928E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPITX065	9.928E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPITX06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPIWI065	9.928E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPIWI06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPIWI06M	9.928E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPIWX065	9.928E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HPIWX06B	9.931E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-HRFIR14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR8	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFIR9	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFLD5	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRISL	9.756E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRLOSP	9.985E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSBB5	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSBB6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSBDA	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSBDB	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSBLP	9.985E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSBMF	9.976E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSBTR	9.755E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSLB	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRSLO	9.756E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTB5	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTB6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTDA	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTDB	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTIA	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTMF	9.976E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTRA	9.755E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-HRTSW	9.978E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I18CY06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I18SI06B	4.990E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-CI06B	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-CX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-CY06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-FI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-SI06B	4.990E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-TI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-TX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-WI06B	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I5-WX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-CX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-CY06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-FI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-SI06B	4.990E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-TI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-TX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-WI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-I6-WX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ICS	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-ATWS	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-CI06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-CX06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-CY06B	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FI06B	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-IE-FIR1	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR10	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR11	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR14	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR2	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR3	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR4	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR5	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR7	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR8	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FIR9	9.987E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FLD1	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FLD3	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FLD4	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FLD5	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-FLD6	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-ISL	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-LLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-LOSP	9.661E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-MLO	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SBO5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SBOL	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SBOX	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SGTR	9.962E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SI06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SLB	9.910E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SLO	9.959E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-SLOP	9.970E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TB5	9.991E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TB6	9.983E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TCC	9.547E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TDA	9.955E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TDB	9.955E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TI06B	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TIA	9.916E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TMF	9.028E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TRA	6.000E-004	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TSW	7.611E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-TX06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-VEF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-WI06B	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IE-WX06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IMDCX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IMDCY06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IMDFI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IMDSI06B	4.990E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IMDTI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-IMDWI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISAUX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISCNT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-37	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-48	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-ISL-52	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-65	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-69	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-73	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-75	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-76	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISL-77	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISLTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISLX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ISSGTR	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDCX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDCY06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDFI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDSI06B	4.990E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDTI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDTX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDWI06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ITDWX06B	5.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-L1FIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-L1MLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-L1SLO	9.816E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-L2FIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-L2MLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LERF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LERFX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LIFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LILLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LIMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LISLO	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LIVEF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LLO-02	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LLO-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LLOTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LLOX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-16	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-20	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-24	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-28	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-29	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSP-30	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSPTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LOSPX	9.988E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-LRFIR6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR8	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRISL	9.763E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRLLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRLOSP	9.987E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSBB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSBB6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSBDA	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSBDB	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSBLP	9.987E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSBMF	9.977E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSBTR	9.762E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRSLB	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTB6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTDA	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTDB	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTIA	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTMF	9.977E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTRA	9.762E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRTSW	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LRVEF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-LTS	9.858E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MEX	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFLD1	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFLD3	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFLD4	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFISL	9.744E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFSGTR	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFSLB	9.977E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFSLO	9.787E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTB5	9.991E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTB6	9.991E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTCC	9.990E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTDA	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTDB	9.980E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTIA	9.953E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTRA	9.911E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MFTSW	9.639E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MGO	9.798E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MLO-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MLO-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MLO-33	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-MLO-41	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MLOTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-MLOX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-O1FIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-O1SLO	9.589E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-O2FIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-O2SLO	9.443E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-O3SGTR	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-O4SGTR	9.993E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR8	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFIR9	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBISL	9.717E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBLOSP	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBSLB	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBSLO	9.717E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTB6	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTCC	9.987E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTDA	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTDB	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTIA	9.997E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTMF	9.973E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTRA	9.718E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OBTSW	9.933E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCCX06B4	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCCX06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCCY06B4	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCCY06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCCY06BM	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCFI06B4	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCFI06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCFI06BM	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCSI06B4	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCSI06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCSI06BM	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCSLB	9.992E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCTI06B4	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCTI06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCTI06BM	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCTX06B4	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCTX06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-OCV	9.880E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCWI06B4	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCWI06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCWI06BM	9.080E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCWX06B4	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OCWX06BB	9.221E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OILOSP	9.988E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OIP	9.717E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OITB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OITB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OITCC	9.986E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OITDA	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OITDB	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OITMF	9.977E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-OITRA	9.768E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORFIR12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORISL	9.631E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORMLO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORP	9.913E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBB5	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBB6	9.992E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBCC	9.947E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBDA	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBDB	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBLP	9.507E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBMF	9.897E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSBTR	8.943E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSGTR	9.996E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORSLB	9.991E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-ORT	9.899E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-PPR	8.256E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1FIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1FIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1FLD3	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1FLD4	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1FLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1LOSP	9.539E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1SLO	8.988E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TB5	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TB6	9.992E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TCC	9.949E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TDA	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TDB	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TMF	9.901E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TRA	8.985E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R1TSW	9.962E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2FIR13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2FIR3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2FLD3	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2FLD4	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2FLD5	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2FLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2LOSP	9.507E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2SLO	8.946E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2TB5	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2TB6	9.992E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-R2TCC	9.947E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2TDA	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2TDB	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2TMF	9.897E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2TRA	8.943E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-R2TSW	9.732E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPCX06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPCX06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPCY06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPCY06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPFI06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPFI06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPSI06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPSI06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPTI06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPTI06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPTX06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPTX06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPWI06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPWI06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPWX06A	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RCPWX06B	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RIF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RSL	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RTLOSP	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RVC	9.940E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RVO	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCCX06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCCY06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCFI06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCSI06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCTI06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCTX06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCWI06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RWCWX06B	9.950E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-RXT	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBAUX	9.922E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBCNT	9.988E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBO5-20	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBO5-24	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-23	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-24	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-33	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-37	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-41	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-51	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-55	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-SBOL-61	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-65	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-66	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOL-69	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SBOX	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-20	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTR-21	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTRTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SGTRX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SIDL	9.999E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SL182	8.025E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SL480	9.975E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SL76	2.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-11	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-16	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-37	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-56	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-64	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-73	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-74	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-75	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-78	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-79	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-82	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-83	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-84	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-85	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-86	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-87	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-88	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB-89	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB103	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB105	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB107	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB111	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB112	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB113	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB114	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB115	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLB116	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLBTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLBX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-SLCCX06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCCX06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCCY06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCCY06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCFI06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCFI06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCSI06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCSI06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCTI06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCTI06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCTX06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCTX06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCWI06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCWI06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCWX06B	4.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLCWX06M	8.000E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLERF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-13	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-20	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-21	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-22	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-23	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-24	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-28	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-29	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-33	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-35	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-36	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-37	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-40	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-41	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-42	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-43	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-44	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-45	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-46	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-47	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-48	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-49	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-52	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-53	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-54	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLO-55	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-SLO-56	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLOTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SLOX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SNONLERF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SOPORV	9.989E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPFLD1	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPFLD3	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPFLD4	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPFLD5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPFLD6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPLOSP	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPSLB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTB5	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTB6	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTCC	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTDA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTDB	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTIA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTMF	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTRA	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SPTSW	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SWTCC	9.995E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXACP	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXAF1	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXAF7	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXCCI	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXCCP	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXCCW	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXCH2	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXDCP	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXESF	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXHI1	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXHI2	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXHI3	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXHPR	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXISO	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXLI1	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXLI2	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXLR1	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXLR2	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXOB5	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXOBF	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXOCD	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXOCS	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXRST	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-SXSWS	0.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TACX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-TB5-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-35	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5-40	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB5TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-35	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TB6TOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TBF	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TBL	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-07	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-12	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-17	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-18	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-20	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-21	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCC-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCCTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TCCX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-35	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-36	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDA-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDATOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-TDB-35	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-36	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDB-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDBTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TDCX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIA-03	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIA-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIA-16	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIA-23	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIA-24	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIA-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIA-28	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIATOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TIAX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMF-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMF-14	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMF-15	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMF-19	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMF-23	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMF-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMF-28	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMFTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TMFX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-37	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRA-39	9.998E-001	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRATOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TRAX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-05	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-06	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-08	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-09	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-25	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-26	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-27	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-28	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-30	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-31	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-32	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-34	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-35	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-38	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSW-39	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSWTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-TSWX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit

Table 12
Basic Event Descriptions (continued)

XCOM-VEF-01	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-VEF-02	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-VEF-04	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-VEF-10	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-VEFTOT	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XCOM-VEFX	1.000E+000	0	NUPRA Special EventSuccess Branch DataDo NOT Edit
XEQN-AFRCX064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFRCY064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFRFI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFRSI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFRTI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFRTX064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFRWI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFRWX064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSCX064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSCY064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSFI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSSI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSTI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSTX064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSWI064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-AFSWX064	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-OCFI06B4	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-OCTI06B4	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-OCTX06B4	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-OCWI06B4	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XEQN-OCWX06B4	1.000E+000	0	NUPRA Special EventUnity Equation DataDo NOT Edit
XHOS-1-101-OPEN	1.000E+000	6	BREAKER 1-101 FROM RAT TO BUS 1 IS OPEN
XHOS-1-104-OPEN	0.000E+000	6	BREAKER 1-104 FROM MAT TO BUS 1 IS OPEN
XHOS-1-201-OPEN	1.000E+000	6	BREAKER 1-201 FROM RAT TO BUS 2 IS OPEN
XHOS-1-204-OPEN	0.000E+000	6	BREAKER 1-204 FROM MAT TO BUS 2 IS OPEN
XHOS-1-301-OPEN	0.000E+000	6	BREAKER 1-301 FROM MAT TO BUS 3 IS OPEN
XHOS-1-307-OPEN	1.000E+000	6	BREAKER 1-307 FROM RAT TO BUS 3 IS OPEN
XHOS-1-401-OPEN	0.000E+000	6	BREAKER 1-401 FROM MAT TO BUS 4 IS OPEN
XHOS-1-407-OPEN	1.000E+000	6	BREAKER 1-407 FROM RAT TO BUS 4 IS OPEN
XHOS-1-501-CLSE	1.000E+000	6	BREAKER 1-501 FROM TAT TO BUS 5 IS CLOSED
XHOS-1-501-OPEN	0.000E+000	6	BREAKER 1-501 FROM TAT TO BUS 5 IS OPEN
XHOS-1-503-CLSE	0.000E+000	6	BREAKER 1-503 FROM RAT TO BUS 5 IS CLOSED
XHOS-1-503-OPEN	1.000E+000	6	BREAKER 1-503 FROM RAT TO BUS 5 IS OPEN
XHOS-1-511-CLSE	0.000E+000	6	BREAKER 1-511 FROM MAT TO BUS 5 IS CLOSED
XHOS-1-511-OPEN	1.000E+000	6	BREAKER 1-511 FROM MAT TO BUS 5 IS OPEN
XHOS-1-601-CLSE	1.000E+000	6	BREAKER 1-601 FROM RAT TO BUS 6 IS CLOSED
XHOS-1-601-OPEN	0.000E+000	6	BREAKER 1-601 FROM RAT TO BUS 6 IS OPEN
XHOS-1-610-CLSE	0.000E+000	6	BREAKER 1-610 FROM MAT TO BUS 6 IS CLOSED
XHOS-1-610-OPEN	1.000E+000	6	BREAKER 1-610 FROM MAT TO BUS 6 IS OPEN
XHOS-1-611-CLSE	0.000E+000	6	BREAKER 1-611 FROM TAT TO BUS 6 IS CLOSED
XHOS-1-611-OPEN	1.000E+000	6	BREAKER 1-611 FROM TAT TO BUS 6 IS OPEN
XHOS-15101-OPEN	0.000E+000	6	BREAKER FROM BUS 5 TO BUS 51 IS OPEN
XHOS-15161-OPEN	1.000E+000	6	BREAKERS FROM BUS 51 TO BUS 61 ARE OPEN
XHOS-15201-OPEN	0.000E+000	6	BREAKER FROM BUS 5 TO BUS 52 IS OPEN
XHOS-15262-OPEN	1.000E+000	6	BREAKERS FROM BUS 52 TO BUS 62 ARE OPEN
XHOS-16101-OPEN	0.000E+000	6	BREAKER FROM BUS 6 TO BUS 61 IS OPEN
XHOS-16201-OPEN	0.000E+000	6	BREAKER FROM BUS 6 TO BUS 62 IS OPEN
XHOS-ABBFA	0.000E+000	6	AUX BLDG FAN COIL UNIT A IS IN STANDBY
XHOS-ABBFB	0.000E+000	6	AUX BLDG FAN COIL UNIT B IS IN STANDBY
XHOS-ABBFC	1.000E+000	6	AUX BLDG FAN COIL UNIT C IS IN STANDBY

Table 12
Basic Event Descriptions (continued)

XHOS-ABBFD	1.000E+000	6	AUX BLDG FAN COIL UNIT D IS IN STANDBY
XHOS-ABMFA	0.000E+000	6	AUX BLDG MEZZ FAN COIL UNIT A IS IN STANDBY
XHOS-ABMFB	1.000E+000	6	AUX BLDG MEZZ FAN COIL UNIT B IS IN STANDBY
XHOS-AFW10A-CLS	0.000E+000	6	MOV AFW-10A IS CLOSED
XHOS-AFW10B-CLS	0.000E+000	6	MOV AFW-10B IS CLOSED
XHOS-AFWPA	1.000E+000	6	AUXILIARY FEEDWATERPUMP A IS IN STANDBY
XHOS-AFWPB	1.000E+000	6	AUXILIARY FEEDWATERPUMP B IS IN STANDBY
XHOS-AFWPT	1.000E+000	6	TURBINE DRIVEN AUXILIARY FEEDWATERPUMP IS IN STANDBY
XHOS-BYA-CLOSED	0.000E+000	6	REACTOR TRIP BYPASSBREAKER A CLOSED
XHOS-BYA-OPEN	1.000E+000	6	REACTOR TRIP BYPASS BREAKER A OPEN
XHOS-BYB-CLOSED	0.000E+000	6	REACTOR TRIP BYPASSBREAKER B CLOSED
XHOS-BYB-OPEN	1.000E+000	6	REACTOR TRIP BYPASS BREAKER B OPEN
XHOS-CC6A-CLOSED	0.000E+000	6	MOV CC-6A IS CLOSED
XHOS-CC6B-CLOSED	0.000E+000	6	MOV CC-6B IS CLOSED
XHOS-CCWPA	0.000E+000	6	COMPONENT COOLING PUMP A IS IN STANDBY
XHOS-CCWPB	1.000E+000	6	COMPONENT COOLING PUMP B IS IN STANDBY
XHOS-CHGPA	0.000E+000	6	CHARGING PUMP A IS IN STANDBY
XHOS-CHGPB	1.000E+000	6	CHARGING PUMP B IS IN STANDBY
XHOS-CHGPC	0.000E+000	6	CHARGING PUMP C IS IN STANDBY
XHOS-CRACA	0.000E+000	6	CONTROL ROOM AIR CONDITIONING TRAIN A IS IN STANDBY
XHOS-CRACB	1.000E+000	6	CONTROL ROOM AIR CONDITIONING TRAIN B IS IN STANDBY
XHOS-DRAINDOWN	0.000E+000	6	DRAINDOWN ACTIVITY IN PROGRESS =1, ELSE=0
XHOS-FUEL-POOL	0.000E+000	3	HOUSE EVENT FOR SPENT FUEL POOL OPS=1, ALL OTHERS=0
XHOS-FWPA	0.000E+000	6	FEEDWATER PUMP A ISIN STANDBY
XHOS-FWPB	0.000E+000	6	FEEDWATER PUMP B ISIN STANDBY
XHOS-G1-OPEN	0.000E+000	6	BKR G-1 IS OPEN. GENERATOR IS NOT CONNECTED TO GRID
XHOS-GEN-LINK	1.000E+000	6	ISOLATED PHASE DISCONNECT LINKS INSTALLED
XHOS-LARGE-VENT	0.000E+000	3	HOUSE EVENT FOR S/DLARGE RCS VENT =1, SMALL OR NO VENT=0
XHOS-LVL-CAVITY	0.000E+000	3	HOUSE EVENT FOR CORE UNLOAD/LOAD, 1=CAV FULL, ELSE 0
XHOS-LVL-FLNGE-6	1.000E+000	3	RCS LEVEL 6 INCHES BELOW THE REACTOR PRESS VSL FLANGE=1
XHOS-LVL-MIDLOOP	0.000E+000	3	HOUSE EVENT FOR RCS LEVEL @ MIDLOOP=1, OTHER LEVELS=0
XHOS-LVL-PZR	0.000E+000	3	COLD SHUTDOWN WITH PRESSURIZER LEVEL NORMAL S/D BAND
XHOS-LVL-SOLID	0.000E+000	3	COLD SHUTDOWN WITH PRESSURIZER WATER SOLID
XHOS-MODE1-PWR	1.000E+000	3	MODE 1 (HIGH POWER)HOUSE EVENT, 1=MODE 1, ELSE 0
XHOS-MODE2-HSB	0.000E+000	3	MODE 2 (LOW POWER &STARTUP/SHUTDOWN), 1=MODE 2, ELSE 0
XHOS-MODE3-HSD	0.000E+000	3	MODE 3 (HOT SD) HOUSE EVT, 1=MODE 3, ELSE 0
XHOS-MODE4-ISL	0.000E+000	3	MODE 4 (HOT S/D, TEMP <350) HS EVT 1-MD4 LOWER, ELSE 0
XHOS-MODE4-ISU	0.000E+000	3	MODE 4 (HOT S/D, TEMP >350) HS EVT 1=MD4 UPPER, ELSE 0
XHOS-MODE5-CSD	0.000E+000	3	MODE 5 (COLD SHUTDOWN) HOUSE, 1=MODE 5, ELSE 0
XHOS-MODE6-REF	0.000E+000	3	MODE 6 (REFUELING) HOUSE EVENT, 1=MODE 6, ELSE 0
XHOS-NO-LRG-VENT	1.000E+000	3	HOUSE EVENT - FOR ALARGE RCS VENT =0, NO VENT =1
XHOS-NUPRA	1.000E+000	6	NUPRA MODEL
XHOS-PEWPA	0.000E+000	6	PLANT EQUIPMENT WATER PUMP A IS IN STANDBY
XHOS-PEWPB	1.000E+000	6	PLANT EQUIPMENT WATER PUMP B IS IN STANDBY
XHOS-PR1A-CLOSE	0.000E+000	6	PRESSURIZER PORV A BLOCK VALVE IS CLOSED
XHOS-PR1B-CLOSE	0.000E+000	6	PRESSURIZER PORV B BLOCK VALVE IS CLOSED
XHOS-RHRPA	1.000E+000	6	RHR PUMP A IS IN STANDBY
XHOS-RHRPB	1.000E+000	6	RHR PUMP B IS IN STANDBY
XHOS-RHRPWR	1.000E+000	6	RHR SYSTEM IS ALIGNED TO AT POWERMODE
XHOS-RMUWPA	0.000E+000	6	REACTOR MAKEUP WATER PUMP A IS IN STANDBY
XHOS-RMUWPB	1.000E+000	6	REACTOR MAKEUP WATER PUMP B IS IN STANDBY

Table 12
Basic Event Descriptions (continued)

XHOS-RUN-CWPA	1.000E+000	6	CIRCULATING WATER PUMP A IS RUNNING
XHOS-RUN-CWPB	0.000E+000	6	CIRCULATING WATER PUMP B IS RUNNING
XHOS-SFCP-2PUMP	0.000E+000	6	TWO SPENT FUEL COOLING PUMPS ARE REQUIRED
XHOS-SFPC-RHRHXA	0.000E+000	6	SPENT FUEL POOL COOLING IS LINED UPTO RHR HX A
XHOS-SFPC-SFPHX	1.000E+000	6	SPENT FUEL POOL COOLING IS LINED UPTO THE SFP HX
XHOS-SFPCA	0.000E+000	6	SPENT FUEL POOL COOLING PUMP A IS IN STANDBY
XHOS-SFPCB	1.000E+000	6	SPENT FUEL POOL COOLING PUMP B IS IN STANDBY
XHOS-SIACF	0.000E+000	6	AIR COMPRESSOR F ISIN STANDBY
XHOS-SIACG	1.000E+000	6	AIR COMPRESSOR G ISIN STANDBY
XHOS-SM	0.000E+000	6	SAFETY MONITOR MODEL
XHOS-SW-NOXTIE	1.000E+000	6	SERVICE WATER HEADERS ARE NOT CROSS-TIED
XHOS-SW-XTIE	0.000E+000	6	SERVICE WATER HEADERS ARE CROSS-TIED
XHOS-SWA-TBH	1.000E+000	6	SERVICE WATER TRAINA ALIGNED TO TURBINE BLDG HDR
XHOS-SWB-TBH	0.000E+000	6	SERVICE WATER TRAINB ALIGNED TO TURBINE BLDG HDR
XHOS-SWPA1	0.000E+000	6	SERVICE WATER PUMP A1 IS IN STANDBY
XHOS-SWPA2	0.000E+000	6	SERVICE WATER PUMP A2 IS IN STANDBY
XHOS-SWPB1	1.000E+000	6	SERVICE WATER PUMP B1 IS IN STANDBY
XHOS-SWPB2	1.000E+000	6	SERVICE WATER PUMP B2 IS IN STANDBY

Table 13
Basic Event Importance Measures

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WinNUPRA 3.0 Production                                   Licensed to: KEWAUNEE
Importance Analysis
EQN File: C:\DOMINION\KEWAUNEE\NEW BASE\EQNS\CDF-TBFLDMIN.EQN
BED File: C:\DOMINION\KEWAUNEE\NEW BASE\DATA\FLOOD.BED
==============================================================================
Event Name          Point Est.        F-V          RAW          RRW
==============================================================================
04-CW-TRIP-F-HE     1.000e+000  5.676e-001         1.00        2.313
IE-CI06B            3.730e-005  5.676e-001     15218.00        2.313
IE-TI06B            2.530e-004  1.481e-001       586.29        1.174
IE-WI06B            1.350e-004  1.379e-001      1022.06        1.160
06-NOINDAFWF-HE     6.400e-001  1.191e-001         1.07        1.135
05B-FRACTDP-OFF     9.000e-001  1.157e-001         1.01        1.131
05B-BYALOP-F-HE     4.400e-001  1.137e-001         1.14        1.128
08-FPSISO68F-HE     3.000e-002  9.311e-002         4.01        1.103
XCOM-AFZ-BTI4       8.772e-001  7.893e-002         1.01        1.086
IE-CX06B            2.920e-005  6.711e-002      2299.11        1.072
05B-MDPTD49F-HE     4.700e-001  6.207e-002         1.07        1.066
XEQN-AFSWI064       1.000e+000  6.174e-002         1.00        1.066
08-ISO-FS40F-HE     1.300e-001  6.174e-002         1.41        1.066
04-CWSTP25-F-HE     1.200e-001  5.332e-002         1.39        1.056
08-ISO-FS54F-HE     3.000e-002  5.055e-002         2.63        1.053
01-CMSIAC1C--PR     3.588e-001  4.633e-002         1.08        1.049
86-INSTRRCRF-HE     1.800e-002  4.559e-002         3.49        1.048
01-CMSIAC1B--PR     3.588e-001  4.554e-002         1.08        1.048
XCOM-AFZ-BWI4       8.139e-001  3.908e-002         1.01        1.041
05B-MDPTD61F-HE     3.100e-001  3.728e-002         1.08        1.039
08-FPSISO29F-HE     1.000e+000  3.307e-002         1.00        1.034
IE-CY06B            7.340e-005  2.859e-002       390.48        1.029
IE-FI06B            7.080e-005  2.818e-002       399.01        1.029
01-CMSIAC1A--PR     1.000e+000  2.600e-002         1.00        1.027
01-CMSIAC1A--PS     1.000e+000  2.600e-002         1.00        1.027
IE-SI06B            3.220e-005  2.001e-002       622.44        1.020
XEQN-AFSTI064       1.000e+000  1.979e-002         1.00        1.020
08-FPSISO56F-HE     3.000e-002  1.979e-002         1.64        1.020
08-ISO-FS18F-HE     1.000e+000  1.788e-002         1.00        1.018
86-INSTRFCRF-HE     1.800e-002  1.664e-002         1.91        1.017
36--LHS-DIAG-HE     1.761e-003  1.609e-002        10.12        1.016
05B-MDPTD36F-HE     4.700e-001  1.540e-002         1.02        1.016
08-FPISO68F-HE      1.600e-002  1.390e-002         1.85        1.014
04-CWSTP66-F-HE     1.200e-002  1.340e-002         2.10        1.014
05BPT--AFW1C-PS     2.013e-002  1.284e-002         1.63        1.013
XEQN-AFSCX064       1.000e+000  1.233e-002         1.00        1.012
04-CWSTP22-F-HE     1.200e-001  1.233e-002         1.09        1.012
SL21-CD             2.000e-001  1.217e-002         1.05        1.012
XCOM-AFZ-BWIB       8.139e-001  1.209e-002         1.00        1.012
XCOM-AFZ-BFI4       8.772e-001  1.178e-002         1.00        1.012
04-CWSTP60-F-HE     1.200e-002  1.099e-002         1.91        1.011
XCOM-AFX-2TI4       3.600e-001  1.030e-002         1.02        1.010
02-SW4A-B66F-HE     2.000e-002  9.800e-003         1.48        1.010
08-FPISO29-F-HE     1.000e+000  9.252e-003         1.00        1.009
XCOM-AFZ-BCY4       8.139e-001  8.498e-003         1.00        1.009
02-SW4A-B60F-HE     2.000e-002  7.900e-003         1.39        1.008
08-ISO-FS33F-HE     4.400e-001  7.697e-003         1.01        1.008
XCOM-OCTI06BM       9.080e-001  6.948e-003         1.00        1.007
XCOM-AFZ-BSI4       8.772e-001  6.697e-003         1.00        1.007
06--OC6----F-HE     9.200e-002  6.164e-003         1.06        1.006
XCOM-AFZ-BTIB       8.772e-001  5.628e-003         1.00        1.006
XCOM-AFX-2WI4       3.600e-001  5.101e-003         1.01        1.005
05B-CST-SWS--HE     7.043e-003  4.504e-003         1.63        1.005
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Table 13
Basic Event Importance Measures (continued)

01-CMSIAC1B--TM	3.510e-002	4.454e-003	1.12	1.004
XEQN-AFSFI064	1.000e+000	4.430e-003	1.00	1.004
08-FPISO56-F-HE	2.400e-002	4.430e-003	1.18	1.004
01-CMSIAC1C--TM	2.860e-002	3.692e-003	1.13	1.004
04-CWSTP51-F-HE	1.400e-002	3.615e-003	1.25	1.004
XEQN-AFSCY064	1.000e+000	3.615e-003	1.00	1.004
XCOM-OCWI06BM	9.080e-001	3.440e-003	1.00	1.003
XCOM-AFZ-BCXB	8.139e-001	2.405e-003	1.00	1.002
05BPM--AFW1B-PR	8.159e-004	2.335e-003	3.86	1.002
08-FPSISO45F-HE	6.600e-002	2.151e-003	1.03	1.002
01-CMSIAC1C--PS	1.476e-002	1.905e-003	1.13	1.002
01-CMSIAC1B--PS	1.476e-002	1.873e-003	1.13	1.002
IE-WX06B	4.690e-005	1.760e-003	38.52	1.002
05BPT--AFW1C-PR	2.637e-003	1.682e-003	1.64	1.002
XEQN-AFSSI064	1.000e+000	1.679e-003	1.00	1.002
02-SW4A-B51F-HE	2.000e-002	1.679e-003	1.08	1.002
XCOM-AFX-2FI4	3.600e-001	1.538e-003	1.00	1.002
05BMVI-MS102-FO	2.375e-003	1.515e-003	1.64	1.002
08-ISO-FS2HF-HE	1.700e-002	1.398e-003	1.08	1.001
XEQN-AFSWX064	1.000e+000	1.398e-003	1.00	1.001
XCOM-AFZ-BFIB	8.772e-001	1.261e-003	1.00	1.001
XCOM-AFX-2CY4	3.600e-001	1.109e-003	1.00	1.001
XCOM-OCFI06BM	9.080e-001	1.037e-003	1.00	1.001
04-CWSTP13-F-HE	2.600e-001	1.005e-003	1.00	1.001
XCOM-AFX-2SI4	3.600e-001	8.739e-004	1.00	1.001
01-CMSIAC1A--TM	3.100e-002	8.059e-004	1.03	1.001
05B-MDPTD1CF-HE	1.600e-001	7.738e-004	1.00	1.001
IE-TX06B	1.870e-005	7.545e-004	41.35	1.001
XCOM-OCCY06BM	9.080e-001	7.477e-004	1.00	1.001
01-CMSKPRCCF123	4.630e-003	7.106e-004	1.15	1.001
XCOM-AFZ-BCYB	8.139e-001	7.055e-004	1.00	1.001
01-CMSKPRCCF23	2.170e-003	6.792e-004	1.31	1.001
XCOM-AFZ-BWXB	9.366e-001	6.309e-004	1.00	1.001
XEQN-AFSTX064	1.000e+000	6.113e-004	1.00	1.001
08-FPSISO3CF-HE	3.000e-002	6.113e-004	1.02	1.001
08-FPISO45-F-HE	6.600e-002	6.018e-004	1.01	1.001
XCOM-OCSI06BM	9.080e-001	5.892e-004	1.00	1.001
05B-CST-DIAG-HE	8.656e-004	5.534e-004	1.64	1.001
05BFAFWB-CAL-AE	8.158e-004	5.216e-004	1.64	1.001
05BFAFWA-CAL-AE	8.158e-004	5.216e-004	1.64	1.001
XCOM-AFZ-BSIB	8.772e-001	4.764e-004	1.00	1.000
04-CWSTP19-F-HE	1.200e-001	4.539e-004	1.00	1.000
04-CWSTP29-F-HE	4.300e-002	4.179e-004	1.01	1.000
05BPMSKPSCCF23	4.320e-005	3.948e-004	10.14	1.000
05BPM--AFW1B-PS	8.049e-004	3.671e-004	1.46	1.000
XCOM-SLCTI06M	8.000e-001	3.240e-004	1.00	1.000
05BSVAFW111C-FO	4.999e-004	3.187e-004	1.64	1.000
01-AV-SW420C-FO	2.168e-003	2.798e-004	1.13	1.000
01-AV-SW420B-FO	2.168e-003	2.751e-004	1.13	1.000
27A-ORR----F-HE	5.000e-003	2.440e-004	1.05	1.000
02-AV-SW4B---FC	4.758e-004	2.334e-004	1.49	1.000
02-AV-SW4A---FC	4.758e-004	2.331e-004	1.49	1.000
05BSVAFW111B-FO	4.999e-004	2.280e-004	1.46	1.000
16-BATCLG--F-HE	7.900e-002	2.254e-004	1.00	1.000
XCOM-AFZ-ATIB	7.210e-001	2.187e-004	1.00	1.000
08-ISO-FS55F-HE	3.000e-002	1.816e-004	1.01	1.000

Table 13
Basic Event Importance Measures (continued)

08-ISO-FS97F-HE	3.000e-002	1.802e-004	1.01	1.000
04-CWSTP45-F-HE	1.700e-002	1.617e-004	1.01	1.000
XCOM-SLCWI06M	8.000e-001	1.604e-004	1.00	1.000
05BPMRKPRCCF23	1.740e-005	1.593e-004	10.16	1.000
05B-MDPTD2HF-HE	4.100e-002	1.390e-004	1.00	1.000
01-CMSKPRCCF13	2.170e-003	1.389e-004	1.06	1.000
01-CMSKPRCCF12	2.170e-003	1.368e-004	1.06	1.000
47-CN-AFP1XB-RC	2.999e-004	1.367e-004	1.46	1.000
47-CN-AFP2XB-RC	2.999e-004	1.367e-004	1.46	1.000
27BCV-SWT242-FC	9.999e-004	1.268e-004	1.13	1.000
33-PM---SI1B-TM	2.000e-003	9.756e-005	1.05	1.000
XCOM-AFZ-AWIB	5.770e-001	9.340e-005	1.00	1.000
03-XV--MU2A--FC	1.000e-004	8.703e-005	1.87	1.000
47-RE-AFP1XB-RF	1.859e-004	8.474e-005	1.46	1.000
47-RE-AFP2XB-RF	1.859e-004	8.474e-005	1.46	1.000
02-SW4A-B29F-HE	2.000e-002	8.311e-005	1.00	1.000
02-SW4A-B45F-HE	2.000e-002	8.293e-005	1.00	1.000
08-FPSISO1CF-HE	3.000e-002	7.168e-005	1.00	1.000
08-FPSISO2CF-HE	3.000e-002	7.152e-005	1.00	1.000
06-CV-KFOCCF12	1.080e-004	6.881e-005	1.64	1.000
01-SV-SW403C-FO	4.999e-004	6.446e-005	1.13	1.000
27BCV-SWT251-FC	9.999e-004	6.399e-005	1.06	1.000
38-BY-BRA101-OP	9.957e-005	6.344e-005	1.64	1.000
01-SV-SW402B-FO	4.999e-004	6.337e-005	1.13	1.000
03-AS-HTLVLC-OP	7.197e-005	6.259e-005	1.87	1.000
XCOM-AFZ-AFIB	7.210e-001	6.110e-005	1.00	1.000
01-CMAKPSCCF123	3.820e-004	5.863e-005	1.15	1.000
01-AV-SW420A-FO	2.168e-003	5.627e-005	1.03	1.000
01-CMAKPSCCF23	1.790e-004	5.600e-005	1.31	1.000
05BSV-KFOCCF23	6.050e-006	5.529e-005	10.14	1.000
33-PM---SI1B-PS	1.047e-003	5.107e-005	1.05	1.000
33-CV---SI6A-FC	9.999e-004	4.877e-005	1.05	1.000
XCOM-SLCFI06M	8.000e-001	4.833e-005	1.00	1.000
STBY-SWPB2	2.500e-001	4.566e-005	1.00	1.000
STBY-SWPB1	2.500e-001	4.235e-005	1.00	1.000
STBY-SWPA1	2.500e-001	4.019e-005	1.00	1.000
STBY-SWPA2	2.500e-001	4.019e-005	1.00	1.000
33-PM---SI1B-PR	8.159e-004	3.979e-005	1.05	1.000
33-XV---SI7B-AE	7.991e-004	3.897e-005	1.05	1.000
XCOM-SLCCY06M	8.000e-001	3.451e-005	1.00	1.000
02-PM-SW1B2--TM	1.140e-002	3.316e-005	1.00	1.000
05BCVD-AFW1C-FO	5.000e-005	3.184e-005	1.64	1.000
02-PM-SW1B1--TM	1.020e-002	2.980e-005	1.00	1.000
05BAV--AFW2B-OC	1.032e-005	2.950e-005	3.86	1.000
XCOM-SLCSI06M	8.000e-001	2.717e-005	1.00	1.000
STBY-CCWPA	5.000e-001	2.397e-005	1.00	1.000
01-AVSKFOCCF23	7.410e-005	2.315e-005	1.31	1.000
05BCVD-AFW1B-FO	5.000e-005	2.276e-005	1.46	1.000
05BCVI-AFW4B-FO	5.000e-005	2.276e-005	1.46	1.000
33--MAN-HPI--HE	4.434e-004	2.162e-005	1.05	1.000
35-MV-CVC301-FO	6.968e-004	2.065e-005	1.03	1.000
01-SV-SW402A-FO	4.999e-004	1.292e-005	1.03	1.000
XEQN-OCWI06B4	1.000e+000	1.215e-005	1.00	1.000
27BCV-KFCCCF12	7.830e-005	1.202e-005	1.15	1.000
05BCVDKFOCCF23	1.310e-006	1.197e-005	10.14	1.000
01-CV-IA503-2FC	6.452e-002	1.188e-005	1.00	1.000

Table 13
Basic Event Importance Measures (continued)

01-CMAKPSCCF13	1.790e-004	1.143e-005	1.06	1.000
01-CMAKPSCCF12	1.790e-004	1.125e-005	1.06	1.000
STBY-CCWPB	5.000e-001	9.154e-006	1.00	1.000
05BCVD-AFW1C-FC	9.999e-004	9.138e-006	1.01	1.000
05BCVD-MU311C-FC	1.000e-003	9.138e-006	1.01	1.000
03-AV--MU3B--CO	1.032e-005	8.834e-006	1.86	1.000
03-AV--MU3A--CO	1.032e-005	8.834e-006	1.86	1.000
SL21-NO-CD	6.000e-001	7.950e-006	1.00	1.000
05BCVIKFOCCF12	1.490e-005	6.757e-006	1.45	1.000
06--OC2----F-HE	7.400e-002	6.469e-006	1.00	1.000
02-TURB-HDR--HE	8.576e-003	6.369e-006	1.00	1.000
02-CV-SW400B2FO	5.000e-005	6.281e-006	1.13	1.000
38-BY-BRB101-OP	9.957e-005	6.153e-006	1.06	1.000
03-TK----CST-RP	6.482e-007	5.924e-006	10.14	1.000
XEQN-OCTI06B4	1.000e+000	5.664e-006	1.00	1.000
33-PM-KPSCCF12	1.100e-004	5.354e-006	1.05	1.000
02-FL-TWS----PL	1.200e-004	5.291e-006	1.04	1.000
XCOM-AFZ-ACXB	5.770e-001	5.234e-006	1.00	1.000
38-CBA104-14-CO	7.512e-006	4.731e-006	1.63	1.000
38-CBA101----CO	7.512e-006	4.731e-006	1.63	1.000
38-CBA102-04-CO	7.512e-006	4.731e-006	1.63	1.000
01-AVSKFOCCF13	7.410e-005	4.698e-006	1.06	1.000
01-AVSKFOCCF123	3.060e-005	4.696e-006	1.15	1.000
01-AVSKFOCCF12	7.410e-005	4.623e-006	1.06	1.000
02-PM-SW1B1--PS	1.449e-003	4.116e-006	1.00	1.000
02-PM-SW1B2--PS	1.449e-003	4.093e-006	1.00	1.000
38-CBB102-04-CO	7.512e-006	3.757e-006	1.50	1.000
38-CBB104-04-CO	7.512e-006	3.757e-006	1.50	1.000
39-CB--1-505-CO	7.829e-006	3.561e-006	1.45	1.000
05BSB-BDPTBY-FA	6.548e-003	3.483e-006	1.00	1.000
02-CV-SW401C2FO	5.000e-005	3.168e-006	1.06	1.000
02-CV--SW1B2-FC	9.999e-004	2.814e-006	1.00	1.000
02-CV--SW1B1-FC	9.999e-004	2.799e-006	1.00	1.000
47-CN1KRCCCF1-4	5.580e-006	2.498e-006	1.45	1.000
33-CV---SI6B-FO	5.000e-005	2.433e-006	1.05	1.000
02-PM-SW1B1--AE	7.991e-004	2.228e-006	1.00	1.000
02-PM-SW1B2--AE	7.991e-004	2.216e-006	1.00	1.000
XCOM-AFZ-ACYB	5.770e-001	2.177e-006	1.00	1.000
39-TR-RAT----SG	2.400e-005	1.993e-006	1.08	1.000
01-SVSKFOCCF123	1.290e-005	1.980e-006	1.15	1.000
01-SVSKFOCCF23	6.050e-006	1.881e-006	1.31	1.000
39-CN60452A2-CO	3.284e-003	1.711e-006	1.00	1.000
39-CN60452A1-CO	3.284e-003	1.711e-006	1.00	1.000
05BRE-62T604-RB	3.279e-003	1.709e-006	1.00	1.000
33-PM-KPRCCF12	3.350e-005	1.630e-006	1.05	1.000
XCOM-OCTI06BB	9.221e-001	1.599e-006	1.00	1.000
35-PM-CHGP1C-TM	1.180e-002	1.576e-006	1.00	1.000
35-PM-CHGP1A-TM	7.650e-003	1.574e-006	1.00	1.000
02-PM-SW1B1--PR	1.397e-004	1.544e-006	1.01	1.000
02-PM-SW1B2--PR	1.397e-004	1.536e-006	1.01	1.000
38-BS-BRA102-SG	2.400e-006	1.480e-006	1.62	1.000
38-BS-BRA104-SG	2.400e-006	1.480e-006	1.62	1.000
35-PM-KPRCCF123	1.250e-005	1.467e-006	1.12	1.000
XCOM-AFZ-AWXB	8.560e-001	1.440e-006	1.00	1.000
02-CV-KFOCCF123	8.680e-006	1.332e-006	1.15	1.000
XEQN-OCFI06B4	1.000e+000	1.259e-006	1.00	1.000

Table 13
Basic Event Importance Measures (continued)

39-TR-TAT----SG	2.400e-005	1.227e-006	1.05	1.000
40-TR--1-62--SG	9.845e-006	1.198e-006	1.12	1.000
39-BS-BUS6---SG	2.400e-006	1.173e-006	1.49	1.000
38-BS-BRB102-SG	2.400e-006	1.173e-006	1.49	1.000
38-BS-BRB104-SG	2.400e-006	1.173e-006	1.49	1.000
XCOM-OCWI06BB	9.221e-001	1.134e-006	1.00	1.000
35-PM-CHGP1A-PR	2.102e-004	1.087e-006	1.01	1.000
39-BS-BUS5---SG	2.400e-006	1.073e-006	1.45	1.000
STBY-CHGPC	3.330e-001	1.064e-006	1.00	1.000
39-CB--1-607-CO	7.829e-006	9.470e-007	1.12	1.000
47-CN1KRCCCF34	2.130e-006	9.256e-007	1.43	1.000
47-CN1KRCCCF23	2.130e-006	9.256e-007	1.43	1.000
47-CN1KRCCCF12	2.130e-006	9.256e-007	1.43	1.000
47-CN1KRCCCF14	2.130e-006	9.256e-007	1.43	1.000
47-CN1KRCCCF24	2.130e-006	9.256e-007	1.43	1.000
40-CB--15208-CO	7.512e-006	9.211e-007	1.12	1.000
40-CB--16208-CO	7.512e-006	9.087e-007	1.12	1.000
40-CB--16201-CO	7.512e-006	9.087e-007	1.12	1.000
02-CV-KFCCCF1-4	5.100e-005	8.694e-007	1.02	1.000
40-TR--1-52--SG	9.845e-006	8.393e-007	1.09	1.000
05BSB-CDPTBY-FA	6.548e-003	8.041e-007	1.00	1.000
31-PM--CCW1A-TM	4.820e-003	7.873e-007	1.00	1.000
38-BYAKOPCCF12	1.230e-006	7.529e-007	1.61	1.000
05BMV-AFW10B-OC	1.200e-006	7.344e-007	1.61	1.000
47-REAKRFCCF1-4	1.730e-006	7.273e-007	1.42	1.000
31-PM--CCW1A-PR	2.004e-003	6.721e-007	1.00	1.000
33-CV6KFOCCF12	1.370e-005	6.668e-007	1.05	1.000
XCOM-AFZ-ASIB	8.560e-001	6.587e-007	1.00	1.000
40-CB--15201-CO	7.512e-006	6.317e-007	1.08	1.000
XEQN-OCWX06B4	1.000e+000	6.314e-007	1.00	1.000
36--LHS-DEP--HE	1.000e-006	6.121e-007	1.61	1.000
38ISA-BRB107-FC	1.000e-003	6.112e-007	1.00	1.000
35-TL--LT141-FA	2.400e-005	5.980e-007	1.02	1.000
35-TL--LT112-FA	2.400e-005	5.980e-007	1.02	1.000
39-CB-1-601--CO	7.829e-006	5.956e-007	1.08	1.000
02-PMSKPSCCF34	3.000e-005	4.886e-007	1.02	1.000
10-GE-DG1B---PR	3.904e-002	4.853e-007	1.00	1.000
XEQN-OCTX06B4	1.000e+000	4.713e-007	1.00	1.000
38-CBB101----CO	7.512e-006	4.348e-007	1.06	1.000
33-CV1KFOCCF1-4	8.600e-006	4.186e-007	1.05	1.000
XCOM-OCCX06B4	9.080e-001	4.177e-007	1.00	1.000
33-CV2KFOCCF1-4	8.530e-006	4.151e-007	1.05	1.000
47-CN1KRCCCF134	1.010e-006	4.134e-007	1.41	1.000
47-CN1KRCCCF123	1.010e-006	4.134e-007	1.41	1.000
47-CN1KRCCCF234	1.010e-006	4.134e-007	1.41	1.000
47-CN1KRCCCF124	1.010e-006	4.134e-007	1.41	1.000
05BCN62T1165-CO	3.284e-003	3.818e-007	1.00	1.000
05BCN-33X165-CO	3.284e-003	3.818e-007	1.00	1.000
05BRE62T1165-RB	3.279e-003	3.812e-007	1.00	1.000
05BRE-62T165-RB	3.279e-003	3.812e-007	1.00	1.000
02-XV-SW600B-AE	7.991e-004	3.778e-007	1.00	1.000
39-CB-1-501--CO	7.829e-006	3.758e-007	1.05	1.000
01-SVSKFOCCF13	6.050e-006	3.693e-007	1.06	1.000
01-SVSKFOCCF12	6.050e-006	3.636e-007	1.06	1.000
02-MV-SW601B-FO	6.968e-004	3.295e-007	1.00	1.000
02-CV-KFOCCF23	2.140e-006	3.281e-007	1.15	1.000

Table 13
Basic Event Importance Measures (continued)

XCOM-OCFI06BB	9.221e-001	3.113e-007	1.00	1.000
05BCVI-AFW4B-OC	1.200e-007	3.102e-007	3.59	1.000
02-CV-KFCCCF34	1.780e-005	2.859e-007	1.02	1.000
47-ADAKFACCF1-6	6.880e-007	2.740e-007	1.40	1.000
02-SV33044---FO	4.999e-004	2.737e-007	1.00	1.000
40-BS-MCC52A-SG	2.400e-006	2.674e-007	1.11	1.000
40-BS-BUS62--SG	2.400e-006	2.612e-007	1.11	1.000
40-BS-MCC62A-SG	2.400e-006	2.612e-007	1.11	1.000
47-REAKRFCCF12	6.600e-007	2.553e-007	1.39	1.000
47-REAKRFCCF23	6.600e-007	2.553e-007	1.39	1.000
47-REAKRFCCF24	6.600e-007	2.553e-007	1.39	1.000
47-REAKRFCCF14	6.600e-007	2.553e-007	1.39	1.000
47-REAKRFCCF34	6.600e-007	2.553e-007	1.39	1.000
02-MV-SW10B--OC	1.200e-006	2.410e-007	1.20	1.000
02-CV-KFOCCF12	2.140e-006	2.329e-007	1.11	1.000
40-BS-BUS52--SG	2.400e-006	1.804e-007	1.08	1.000
40-CB--15204-CO	7.512e-006	1.727e-007	1.02	1.000
40-CB--15209-CO	7.512e-006	1.571e-007	1.02	1.000
31-CV---CC3B-FC	9.999e-004	1.516e-007	1.00	1.000
02-PMRKPRCCF34	7.210e-007	1.429e-007	1.20	1.000
02-PMSKPSCCF1-4	9.770e-006	1.340e-007	1.01	1.000
XCOM-OCCY06B4	9.080e-001	1.285e-007	1.00	1.000
39-CN60452A2-RC	2.999e-004	1.264e-007	1.00	1.000
05BCN-62T604-RC	2.999e-004	1.264e-007	1.00	1.000
39-CN60452A1-RC	2.999e-004	1.264e-007	1.00	1.000
05BCNPS15503JRC	2.999e-004	1.264e-007	1.00	1.000
31-XV---CC4A-AE	7.991e-004	1.201e-007	1.00	1.000
02-CVSKFOCCF1-4	8.530e-006	1.168e-007	1.01	1.000
02-CV-KFOCCF13	2.140e-006	1.165e-007	1.05	1.000
31-PM--CCW1A-PS	7.720e-004	1.160e-007	1.00	1.000
10-GE-DG1B---TM	1.180e-002	1.152e-007	1.00	1.000
05BSB-KFACCF123	8.450e-005	1.103e-007	1.00	1.000
02-CV--SW1B1-FO	5.000e-005	1.047e-007	1.00	1.000
47-REAKRFCCF134	3.130e-007	1.047e-007	1.33	1.000
47-REAKRFCCF124	3.130e-007	1.047e-007	1.33	1.000
47-REAKRFCCF234	3.130e-007	1.047e-007	1.33	1.000
47-REAKRFCCF123	3.130e-007	1.047e-007	1.33	1.000
33-CV1KFOCCF234	2.150e-006	1.046e-007	1.05	1.000
33-CV1KFOCCF134	2.150e-006	1.046e-007	1.05	1.000
33-CV1KFOCCF123	2.150e-006	1.046e-007	1.05	1.000
33-CV1KFOCCF124	2.150e-006	1.046e-007	1.05	1.000
02-CV--SW1B2-FO	5.000e-005	1.045e-007	1.00	1.000
35-PMBATP1B--PS	1.400e-003	9.594e-008	1.00	1.000
XCOM-OCSI06B4	9.080e-001	8.329e-008	1.00	1.000
03-CVS-MU301-OC	1.200e-007	7.713e-008	1.64	1.000
01-FL-A-B-C--PL	2.399e-004	7.687e-008	1.00	1.000
01-AVSA121---FO	2.168e-003	7.687e-008	1.00	1.000
35-CVCVC704A-FC	9.999e-004	6.760e-008	1.00	1.000
02-CV-KFCCCF234	5.550e-006	6.723e-008	1.01	1.000
02-CV-KFCCCF134	5.550e-006	6.723e-008	1.01	1.000
02-PMRKPRCCF1-4	3.220e-007	6.240e-008	1.19	1.000
35-PMBATP1B--PR	8.159e-004	5.516e-008	1.00	1.000
02-PMSKPSCCF24	3.000e-005	5.493e-008	1.00	1.000
02-PMSKPSCCF14	3.000e-005	5.493e-008	1.00	1.000
02-PMSKPSCCF13	3.000e-005	5.493e-008	1.00	1.000
02-PMSKPSCCF23	3.000e-005	5.493e-008	1.00	1.000

Table 13
Basic Event Importance Measures (continued)

33-CV2KFOCCF12	1.010e-006	4.916e-008	1.05	1.000
33-CV2KFOCCF34	1.010e-006	4.916e-008	1.05	1.000
33-CV2KFOCCF23	1.010e-006	4.916e-008	1.05	1.000
33-CV2KFOCCF14	1.010e-006	4.916e-008	1.05	1.000
03-XV--MU300-OC	8.834e-008	4.790e-008	1.54	1.000
03-XV---MU1A-OC	8.834e-008	4.790e-008	1.54	1.000
03-XV---MU1B-OC	8.834e-008	4.790e-008	1.54	1.000
40-BS-MCC52E-SG	2.400e-006	4.667e-008	1.02	1.000
02-PMSKPSCCF234	4.090e-006	4.436e-008	1.01	1.000
02-PMSKPSCCF134	4.090e-006	4.436e-008	1.01	1.000
40-BS-MCC5262SG	2.400e-006	3.955e-008	1.02	1.000
33-CV2KFOCCF124	8.110e-007	3.947e-008	1.05	1.000
33-CV1KFOCCF23	8.110e-007	3.947e-008	1.05	1.000
33-CV2KFOCCF123	8.110e-007	3.947e-008	1.05	1.000
33-CV2KFOCCF234	8.110e-007	3.947e-008	1.05	1.000
33-CV1KFOCCF34	8.110e-007	3.947e-008	1.05	1.000
33-CV2KFOCCF134	8.110e-007	3.947e-008	1.05	1.000
33-CV1KFOCCF12	8.110e-007	3.947e-008	1.05	1.000
33-CV1KFOCCF14	8.110e-007	3.947e-008	1.05	1.000
02-PMRKPRCCF234	2.260e-007	3.922e-008	1.17	1.000
02-PMRKPRCCF134	2.260e-007	3.922e-008	1.17	1.000
35-PM-KPRCCF13	2.610e-006	3.724e-008	1.01	1.000
XCOM-OCCX06BB	9.221e-001	3.679e-008	1.00	1.000
05BRE-KRBCCF123	4.230e-005	3.655e-008	1.00	1.000
35-PM-CHGP1C-PR	2.995e-004	3.519e-008	1.00	1.000
05BSB-KFACCF23	3.960e-005	3.421e-008	1.00	1.000
33-TK---RWST-RP	6.482e-007	3.155e-008	1.05	1.000
02-CV-KFCCCF23	1.780e-005	3.133e-008	1.00	1.000
02-CV-KFCCCF14	1.780e-005	3.133e-008	1.00	1.000
02-CV-KFCCCF24	1.780e-005	3.133e-008	1.00	1.000
02-CV-KFCCCF13	1.780e-005	3.133e-008	1.00	1.000
31-PM-KPRCCF12	7.140e-005	3.102e-008	1.00	1.000
10-GE-DG1B---PS	5.627e-003	3.040e-008	1.00	1.000
01-AC-SW4B---LK	2.399e-004	2.823e-008	1.00	1.000
05BCN62T1165-RC	2.999e-004	2.635e-008	1.00	1.000
05BCN-62T165-RC	2.999e-004	2.635e-008	1.00	1.000
05BCN-33X165-RC	2.999e-004	2.635e-008	1.00	1.000
05BCNPS15504JRC	2.999e-004	2.635e-008	1.00	1.000
01-PSPS16121-OP	2.999e-007	2.287e-008	1.08	1.000
01-PSPS16107-OP	2.999e-007	2.287e-008	1.08	1.000
16-FN-DGBF---PS	3.940e-003	2.129e-008	1.00	1.000
02-FLT-TW1B2-PS	1.400e-003	2.058e-008	1.00	1.000
03-CV-MU311B-OC	1.200e-007	1.842e-008	1.15	1.000
XCOM-OCCY06BB	9.221e-001	1.813e-008	1.00	1.000
06-MV-KOCCCF12	2.820e-008	1.500e-008	1.53	1.000
05BMV-KOCCCF12	2.820e-008	1.500e-008	1.53	1.000
31-PM--CCW1B-PR	2.004e-003	1.446e-008	1.00	1.000
03-XV-MU310B-OC	8.834e-008	1.356e-008	1.15	1.000
35-PM-KPRCCF12	2.610e-006	1.211e-008	1.00	1.000
38IIV-BRD109-OP	2.192e-004	1.069e-008	1.00	1.000
XCOM-OCWX06BB	9.221e-001	1.067e-008	1.00	1.000
02-FLT-TW1B2-PR	8.159e-004	1.040e-008	1.00	1.000
XCOM-SLCTI06B	4.000e-001	7.842e-009	1.00	1.000
31-CV---CC3A-FO	5.000e-005	5.551e-009	1.00	1.000
31-PM-KPSCCF12	4.870e-005	5.407e-009	1.00	1.000
31-HX--CCW1B-LK	2.400e-005	5.329e-009	1.00	1.000

Table 13
Basic Event Importance Measures (continued)

38ISA-KFCCCF12	4.700e-005	5.027e-009	1.00	1.000
XCOM-OCSI06BB	9.221e-001	4.682e-009	1.00	1.000
03-CV-MU311C-OC	1.200e-007	4.456e-009	1.04	1.000
XCOM-SLCCX06M	8.000e-001	4.338e-009	1.00	1.000
XCOM-SLCWI06B	4.000e-001	4.184e-009	1.00	1.000
39-CB-1-501--FO	4.999e-004	3.823e-009	1.00	1.000
39-CB-1-503--FC	4.999e-004	3.823e-009	1.00	1.000
05BSB-KFACCF12	3.960e-005	3.441e-009	1.00	1.000
02-PP-SWTB---RP	8.160e-008	3.232e-009	1.04	1.000
02-CN-KRCCCF12	1.410e-005	3.016e-009	1.00	1.000
STBY-CWPNONE	5.590e-001	2.683e-009	1.00	1.000
04--MAN-CPT--HE	2.984e-003	2.683e-009	1.00	1.000
04--LO-LEVEL-FB	5.140e-004	2.683e-009	1.00	1.000
02-CVSKFOCCF34	1.010e-006	2.501e-009	1.00	1.000
STBY-CHGPA	3.330e-001	2.499e-009	1.00	1.000
35--CHG-STBY-HE	1.991e-003	2.499e-009	1.00	1.000
XCOM-OCTX06BB	9.221e-001	2.470e-009	1.00	1.000
02-CVSKFOCCF134	8.110e-007	2.008e-009	1.00	1.000
02-CVSKFOCCF234	8.110e-007	2.008e-009	1.00	1.000
02-MV-KOCCCF12	2.820e-008	1.117e-009	1.04	1.000

Attachment A

Sensitivity Analyses HEPs for operator actions
Less than 30 minute time window increased by 500% and 1000%

Sensitivity analyses were performed to investigate the impact of increasing the frequencies for operator actions with less than a 30 minute time window by 500% and 1000%. Note that an upper limit of 0.5 was used for all events, i.e., no HEP was increased above a value of 0.5. Separate directories were created, SDI 051116 30 MIN 5X, for quantification of the sensitivity analysis which increased the HEP frequencies by 500% for operator actions with less than a 30 minute time window and SDI 051116 30 MIN 10X for quantification of the sensitivity analysis which increased the HEP frequencies by 1000% for operator actions with less than a 30 minute time window. The batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity analyses is in the KNPP.BED file used for quantification. The changes to the KNPP.BED file are shown below:

Basic Event	Description	Base Case	<1/2hr.X5	<1/2hr.X10
02-SW4A-B29F-HE	CLOSE SW-4A SW-4B DURING FLOOD - 29 MIN.	2.00E-02	1.00E-01	2.00E-01
04-CWSTP13-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 13 MINUTES	2.60E-01	5.00E-01	5.00E-01
04-CWSTP19-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 19 MINUTES	1.20E-01	5.00E-01	5.00E-01
04-CWSTP22-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 22 MINUTES	1.20E-01	5.00E-01	5.00E-01
04-CWSTP25-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 25 MINUTES	1.20E-01	5.00E-01	5.00E-01
04-CWSTP29-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 29 MINUTES	4.30E-02	2.15E-01	4.30E-01
08-FPSISO29F-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 29 MIN.	1.0	1.0	1.0

The model was then quantified as described in Section 4.0 for the base case. KNPP.BED reset the Human Error Probabilities to those shown above.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with increasing the HEPs for operator actions less than 30 minute time window increased by 500% and 1000% is documented in Tables A.1 and A.2 respectively. The Core Damage Probability if the frequencies for HEPs of operator actions within a 30 minute time window are increased by 500% is 7.97E-05. The Core Damage Probability if the frequencies for HEPs of operator actions within a 30 minute time window are increased by 1000% is 7.98E-05. The reason the two numbers are so close is that for all but two of the actions both sensitivities used 0.5.

Table A-1
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 500%

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 7.966E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   1.46E-005   IE-CX06B          04-CWSTP25-F-HE
     3   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
     4   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B         08-ISO-FS40F-HE
     5   2.72E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B         04-CWSTP22-F-HE
     6   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     7   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B         08-FPSISO56F-HE
     8   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     9   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    10   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    11   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    12   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
    13   5.86E-007   IE-TI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    14   5.86E-007   IE-TI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    15   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
    16   4.46E-007   36--LHS-DIAG-HE   IE-TI06B         08-FPSISO29F-HE
    17   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4    XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B         08-FPSISO68F-HE
    18   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
    19   3.13E-007   IE-WI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-ISO-FS18F-HE
    20   3.13E-007   IE-WI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-ISO-FS18F-HE
    21   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064    IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    22   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE  XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    23   2.39E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064    IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
    24   2.38E-007   36--LHS-DIAG-HE   IE-WI06B         08-ISO-FS18F-HE
    25   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4    06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    26   2.15E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4    XCOM-AFZ-BWI4
```

Table A-1 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 500%

		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
27	2.14E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
28	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
29	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
30	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
31	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
32	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
33	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
34	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
35	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
36	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
37	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
38	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
39	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
40	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
41	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
42	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
43	8.37E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
44	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
45	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
46	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
47	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
48	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
49	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
50	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
51	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE

Table A-1 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 500%

		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
52	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
53	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
54	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
55	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
56	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
57	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
58	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
59	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
60	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
61	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
62	3.66E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
63	3.66E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
64	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
65	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
66	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
67	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
68	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
69	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
70	3.13E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
71	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
72	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
73	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
74	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
75	2.82E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	

Table A-1 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 500%

76	2.78E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
77	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
78	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP19-F-HE
79	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE
80	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
81	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
82	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
83	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
84	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
85	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
86	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
87	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
88	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
89	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
90	2.09E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
91	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
92	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
93	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
94	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
95	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
96	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
97	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
98	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
99	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
100	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	

Table A-2
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 1000%

```
==========================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==========================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 7.982E-005
--------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   1.46E-005   IE-CX06B          04-CWSTP25-F-HE
     3   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     4   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     5   2.72E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     6   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     7   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     8   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     9   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    10   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    11   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    12   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    13   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    14   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    15   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
    16   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    17   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    18   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    19   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    20   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    21   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    22   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    23   2.39E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
    24   2.38E-007   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS18F-HE
    25   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    26   2.15E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
```

Table A-2 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 1000%

		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
27	2.14E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
28	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
29	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
30	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
31	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
32	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
33	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
34	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
35	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
36	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
37	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
38	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
39	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
40	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
41	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
42	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
43	8.37E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
44	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
45	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
46	7.32E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
47	7.32E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
48	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
49	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
50	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
51	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM

Table A-2 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 1000%

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
52	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
53	5.56E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
54	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
55	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
56	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
57	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
58	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
59	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
60	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
61	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
62	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
63	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
64	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
65	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
66	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
67	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
68	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
69	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
70	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
71	3.13E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
72	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
73	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
74	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
75	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
76	2.82E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B

Table A-2 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 30-Minute Time Window Increased by 1000%

		05BMVI-MS102-FO	04-CWSTP22-F-HE	
77	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
78	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE
79	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP19-F-HE
80	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
81	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
82	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
83	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
84	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
85	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
86	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
87	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
88	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
89	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
90	2.09E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
91	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
92	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
93	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
94	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
95	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
96	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
97	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
98	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
99	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
100	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	

Attachment B

Sensitivity Analysis of HEPs for Operator Actions
with Less than a One-Hour Time Window Increased by 500% and 1000%

Sensitivity analyses were performed to investigate the impact of increasing the frequencies for operator actions with less than a 1 hour time window by 500% and 1000%. Note that an upper limit of 0.5 was used for all events, i.e., no HEP was increased above a value of 0.5. A separate directory was created, SDI 051116 HEP 60 min 5X, for quantification of the sensitivity analysis which increased the HEP frequencies by 500% for operator actions with less than a 1 hour time window and SDI 051116 HEP 60 min 10X, for quantification of the sensitivity analysis which increased the HEP frequencies by 1000% for operator actions with less than a 1 hour time window. The batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity analyses is in the KNPP.BED file used for quantification. The changes to the KNPP.BED file are shown below:

Basic Event	Description	Base Case	<1hr.X5	<1hr.X10
02-SW4A-B29F-HE	CLOSE SW-4A SW-4B DURING FLOOD - 29 MIN.	2.00E-02	.1	.2
02-SW4A-B45F-HE	CLOSE SW-4A SW-4B DURING FLOOD - 45 MIN.	2.00E-02	.1	.2
02-SW4A-B51F-HE	CLOSE SW-4A SW-4B DURING FLOOD - 51 MIN.	2.00E-02	.1	.2
04-CWSTP13-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 13 MINUTES	2.60E-01	.5	.5
04-CWSTP19-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 19 M INUTES	1.20E-01	.5	.5
04-CWSTP22-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 22 M INUTES	1.20E-01	.5	.5
04-CWSTP25-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 25 M INUTES	1.20E-01	.5	.5
04-CWSTP29-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 29 M INUTES	4.30E-02	.215	0.43
04-CWSTP45-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 45 M INUTES	1.70E-02	8.50E-2	0.17
04-CWSTP51-F-HE	TRIP CW PUMP DURINGFLOOD EVENT - 51 M INUTES	1.40E-02	7.00E-2	0.14
05B-MDPTD36F-HE	Start DT AFW Pump before loss of MD AFW Pump - 36 min.	4.70E-01	.5	.5
05B-MDPTD49F-HE	Start TD AFW Pump before loss of MD AFW Pump - 49 min.	4.70E-01	.5	.5
06--OC6---F-HE	FAIL TO COOLDOWN PER ES-1.2	9.20E-02	.46	.5
08-FPISO29-F-HE	ISOL FIRE PUMP DURING FLOOD EVENT - 29 MINUTES	1.0	1.0	1.0
08-FPISO45-F-HE	ISOL FIRE PUMP DURING FLOOD EVENT - 45 MINUTES	6.60E-02	.33	.5
08-FPISO56-F-HE	ISOL FIRE PUMP DURING FLOOD EVENT - 56 MINUTES	2.40E-02	.12	.24
08-FPSISO29F-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 29 MIN.	1.0	1.0	1.0
08-FPSISO45F-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 45 MIN.	6.60E-02	0.33	0.50
08-FPSISO56F-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 56 MIN.	3.00E-02	.15	.30
08-ISO-FS33F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 33 MIN	4.4E-01	.5	.5
08-ISO-FS40F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 40 MIN	1.3E-01	.5	.5
08-ISO-FS54F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 54 MIN.	3.00E-02	.15	.30
08-ISO-FS55F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 55 MIN.	3.00E-02	.15	.30

The model was then quantified as described in Section 4.0 for the base case. KNPP.BED reset the Human Error Probabilities as shown above.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with these models are documented in Tables B.1 and B.2. The Core Damage Probability if the frequencies for HEPs of operator actions within a 1 hour time window are increased by 500% is 1.17E-04. The Core Damage Probability if the frequencies for HEPs of operator actions within a 1 hour time window are increased by 1000% is 1.46E-04.

Table B-1
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window
Increased by 500%

```
==============================================================================
WinNUPRA 3.0 Production        File: CDF-TBFLDMIN      Licensed to: KEWAUNEE
==============================================================================
   Equation File                                  = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced               = FLOOD.BED
   Number of cut sets in equation                 = 10458
   Top event unavailability  (rare event)         = 1.168E-004
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   1.46E-005   IE-CX06B          04-CWSTP25-F-HE
     3   1.34E-005   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     4   1.04E-005   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     5   4.66E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     6   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     7   4.01E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     8   2.89E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     9   2.69E-006   XCOM-AFX-2WI4     XCOM-AFZ-BWI4     06--OC6----F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    10   1.10E-006   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    11   1.09E-006   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    12   1.04E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
    13   1.02E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    14   9.74E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    15   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    16   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    17   6.70E-007   XCOM-AFZ-BTIB     XEQN-AFSTI064     IE-TI06B
                     05BPT--AFW1C-PS   08-FPSISO56F-HE
    18   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    19   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    20   6.31E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    21   5.99E-007   XCOM-AFZ-BTIB     86-INSTRFCRF-HE   XEQN-AFSTI064
                     IE-TI06B          08-FPSISO56F-HE
    22   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    23   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    24   4.52E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
    25   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
```

Table B-1 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window Increased by 500%

26	3.95E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
27	3.81E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
28	3.62E-007	XCOM-AFZ-BSI4	06-NOINDAFWF-HE	IE-SI06B
		02-SW4A-B60F-HE		
29	3.27E-007	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
30	3.13E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
31	3.13E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
32	2.59E-007	XCOM-OCTI06BM	XCOM-AFX-2TI4	XCOM-AFZ-BTI4
		SL21-CD	IE-TI06B	08-FPSISO68F-HE
33	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
34	2.36E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
35	2.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
36	2.11E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
37	1.94E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
38	1.94E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
39	1.74E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
40	1.65E-007	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
41	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
42	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
43	1.56E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
44	1.56E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
45	1.50E-007	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
46	1.47E-007	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
47	1.43E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
48	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
49	1.34E-007	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
50	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		

Table B-1 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window
Increased by 500%

51	1.29E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
52	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
53	1.19E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
54	1.17E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
55	1.14E-007	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
56	9.53E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
57	9.36E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
58	8.78E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
59	8.29E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
60	8.25E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
61	7.91E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
62	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
63	7.42E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
64	5.86E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
65	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
66	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
67	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
68	5.69E-008	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPT--AFW1C-PS	02-SW4A-B51F-HE	
69	5.42E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
70	5.42E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
71	5.25E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05B-CST-SWS--HE	08-FPISO56-F-HE	
72	5.08E-008	XCOM-AFZ-BSIB	86-INSTRFCRF-HE	XEQN-AFSSI064
		IE-SI06B	02-SW4A-B51F-HE	
73	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
74	4.96E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
75	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		

Table B-1 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window Increased by 500%

76	4.69E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
77	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
78	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
79	4.42E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
80	4.42E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
81	4.28E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PR
		08-ISO-FS54F-HE		
82	4.11E-008	36--LHS-DIAG-HE	IE-FI06B	08-FPISO45-F-HE
83	3.86E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
84	3.86E-008	XCOM-AFZ-BWI4	IE-WI06B	05BMVI-MS102-FO
		08-ISO-FS54F-HE		
85	3.66E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
86	3.66E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
87	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
88	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
89	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
90	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
91	3.09E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
92	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
93	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
94	2.90E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
95	2.88E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-DIAG-HE	08-FPSISO56F-HE	
96	2.86E-008	XCOM-AFZ-BWI4	IE-WI06B	36--LHS-DIAG-HE
		08-ISO-FS54F-HE		
97	2.78E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
98	2.78E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
99	2.75E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
100	2.72E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BFAFWA-CAL-AE	08-FPSISO56F-HE	

Table B-1 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window Increased by 500%

Table B-2
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window Increased by 1000%

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                              = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced           = FLOOD.BED
   Number of cut sets in equation             = 10425
   Top event unavailability  (rare event)     = 1.462E-004
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   2.08E-005   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     3   1.46E-005   IE-CX06B          04-CWSTP25-F-HE
     4   1.34E-005   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     5   9.32E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     6   8.02E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     7   5.85E-006   XCOM-AFX-2WI4     XCOM-AFZ-BWI4     06--OC6----F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     8   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     9   2.89E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
    10   2.09E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
    11   2.03E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    12   1.34E-006   XCOM-AFZ-BTIB     XEQN-AFSTI064     IE-TI06B
                     05BPT--AFW1C-PS   08-FPSISO56F-HE
    13   1.20E-006   XCOM-AFZ-BTIB     86-INSTRFCRF-HE   XEQN-AFSTI064
                     IE-TI06B          08-FPSISO56F-HE
    14   1.20E-006   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    15   1.17E-006   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    16   1.09E-006   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    17   9.74E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    18   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    19   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    20   7.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSSI064     IE-SI06B          02-SW4A-B51F-HE
    21   6.54E-007   XCOM-AFZ-BWI4     IE-WI06B          05BPT--AFW1C-PS
                     08-ISO-FS54F-HE
    22   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    23   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    24   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    25   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
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Table B-2 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window Increased by 1000%

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
26	4.69E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
27	4.52E-007	XCOM-AFZ-BCY4	06-NOINDAFWF-HE	IE-CY06B
		04-CWSTP60-F-HE		
28	4.46E-007	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO29F-HE
29	3.81E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
30	3.62E-007	XCOM-AFZ-BSI4	06-NOINDAFWF-HE	IE-SI06B
		02-SW4A-B60F-HE		
31	3.13E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
32	3.13E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
33	3.00E-007	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
34	2.93E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
35	2.93E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
36	2.68E-007	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
37	2.40E-007	XCOM-OCTI06BM	XCOM-AFX-2TI4	XCOM-AFZ-BTI4
		SL21-CD	IE-TI06B	08-FPSISO68F-HE
38	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
39	2.36E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
40	2.29E-007	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
41	2.23E-007	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
42	2.11E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
43	1.79E-007	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
44	1.76E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
45	1.74E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
46	1.66E-007	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
47	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
48	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
49	1.58E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
50	1.56E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE

Table B-2 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window Increased by 1000%

51	1.56E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
52	1.48E-007	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
53	1.43E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
54	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
55	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
56	1.29E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
57	1.27E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
58	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
59	1.19E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
60	1.17E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
61	1.14E-007	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPT--AFW1C-PS	02-SW4A-B51F-HE	
62	1.05E-007	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05B-CST-SWS--HE	08-FPISO56-F-HE	
63	1.02E-007	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
64	1.02E-007	XCOM-AFZ-BSIB	86-INSTRFCRF-HE	XEQN-AFSSI064
		IE-SI06B	02-SW4A-B51F-HE	
65	9.53E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
66	8.56E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PR
		08-ISO-FS54F-HE		
67	8.25E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
68	8.21E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
69	8.21E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
70	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
71	7.71E-008	XCOM-AFZ-BWI4	IE-WI06B	05BMVI-MS102-FO
		08-ISO-FS54F-HE		
72	7.32E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
73	7.32E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
74	6.23E-008	36--LHS-DIAG-HE	IE-FI06B	08-FPISO45-F-HE
75	5.80E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
76	5.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B

Table B-2 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window
Increased by 1000%

		05B-CST-DIAG-HE	08-FPSISO56F-HE	
77	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
78	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
79	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
80	5.72E-008	XCOM-AFZ-BWI4	IE-WI06B	36--LHS-DIAG-HE
		08-ISO-FS54F-HE		
81	5.56E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
82	5.43E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BFAFWB-CAL-AE	08-FPSISO56F-HE	
83	5.43E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BFAFWA-CAL-AE	08-FPSISO56F-HE	
84	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
85	4.96E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
86	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
87	4.69E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
88	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
89	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
90	4.42E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
91	4.42E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
92	3.98E-008	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05B-CST-SWS--HE	02-SW4A-B51F-HE	
93	3.93E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PR	08-FPISO56-F-HE	
94	3.58E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
95	3.54E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BMVI-MS102-FO	08-FPISO56-F-HE	
96	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
97	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
98	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
99	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
100	3.33E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BSVAFW111C-FO	08-FPSISO56F-HE	

Table B-2 (continued)
Sensitivity Analysis of HEPs for Operator Actions With Less Than A 60-Minute Time Window Increased by 1000%

Attachment C

Sensitivity Analysis of HEPs for Unproceduralized Operator Actions
Increased by 500% and 1000%

Sensitivity analyses were performed to investigate the impact of increasing the unproceduralized operator action frequencies by 500% and 1000%. Note that an upper limit of 0.5 was used for all events, i.e., no HEP was increased above a value of 0.5. Separate directories were created, SDI 051116 No Proc 5X, for quantification of the sensitivity analysis which increased the unproceduralized operator action frequencies by 500% and SDI 051116 No Proc 10X for quantification of the sensitivity analysis which increased the unproceduralized operator action frequencies by 1000%. The batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity analyses is in the KNPP.BED file used for quantification. The changes to the KNPP.BED file are shown below:

Basic Event	Description	Base Case	No Proc 5X	No Proc 10X
04-CWSTP13-F-HE	TRIP CW PUMP DURING FLOOD EVENT - 13 MINUTES	2.60E-01	.5	.5
04-CWSTP19-F-HE	TRIP CW PUMP DURING FLOOD EVENT - 19 MINUTES	1.20E-01	.5	.5
04-CWSTP22-F-HE	TRIP CW PUMP DURING FLOOD EVENT - 22 MINUTES	1.20E-01	.5	.5
04-CWSTP25-F-HE	TRIP CW PUMP DURING FLOOD EVENT - 25 MINUTES	1.20E-01	.5	.5
04-CWSTP29-F-HE	TRIP CW PUMP DURING FLOOD EVENT – 29 MINUTES	4.30E-02	.5	.5
04-CWSTP45-F-HE	TRIP CW PUMP DURING FLOOD EVENT - 45 MINUTES	1.70E-02	8.50E-02	.17
04-CWSTP51-F-HE	TRIP CW PUMP DURING FLOOD EVENT - 51 MINUTES	1.40E-02	0.07	0.14
04-CWSTP60-F-HE	TRIP CW PUMP DURING FLOOD EVENT – 60 MINUTES	1.20E-02	0.06	0.12
04-CWSTP66-F-HE	TRIP CW PUMP DURING FLOOD EVENT – 66 MINUTES	1.20E-02	0.06	0.12
05B-BYALOP-F-HE	FAIL TO BYPASS AFW ALOP PERMISSIVE LARGE FW BREAK	4.40E-01	.5	.5
05B-MDPTD1CF-HE	Start TD AFW Pump before loss of MD AFW Pump - 108 min.	1.60E-01	.5	.5
05B-MDPTD2HF-HE	Start TD AFW Pump before loss of MD AFW Pump - 2 Hr.	4.10E-02	.205	.41
05B-MDPTD36F-HE	Start DT AFW Pump before loss of MD AFW Pump - 36 min.	4.70E-01	.5	.5
05B-MDPTD49F-HE	Start TD AFW Pump before loss of MD AFW Pump - 49 min.	4.70E-01	.5	.5
05B-MDPTD61F-HE	Start TD AFW Pump before loss of MD AFW Pump - 61 min.	3.10E-01	.5	.5
06-NOINDAFWF-HE	Operator fails to feed S/G without Level indication	6.40E-01	.64	.64
08-FPISO29-F-HE	ISOL FIRE PUMP DURING FLOOD EVENT - 29 MINUTES	1.0	1.0	1.0
08-FPISO45-F-HE	ISOL FIRE PUMP DURING FLOOD EVENT - 45 MINUTES	6.60E-02	.33	.5
08-FPISO56-F-HE	ISOL FIRE PUMP DURING FLOOD EVENT - 56 MINUTES	2.40E-02	.12	.24
08-FPISO68-F-HE	ISOL FIRE PUMP DURING FLOOD EVENT – 68 MINUTES	1.60E-02	0.08	0.16

The model was then quantified as described in Section 4.0 for the base case. KNPP.BED reset the Human Error Probabilities to those shown above.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with these models are documented in Tables C.1 and C.2. The Core Damage Probability if the unproceduralized operator action frequencies are increased by 500% is 9.58E-05. The Core Damage Probability if the unproceduralized operator action frequencies are increased by 1000% is 1.10E-04.

Table C-1

Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 500%

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                              = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced           = FLOOD.BED
   Number of cut sets in equation             = 10650
   Top event unavailability  (rare event)     = 9.579E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   1.46E-005   IE-CX06B          04-CWSTP25-F-HE
     3   4.40E-006   IE-CY06B          04-CWSTP66-F-HE
     4   3.95E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     5   3.76E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     6   3.29E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     7   2.81E-006   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
     8   2.18E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     9   2.01E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
    10   1.91E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
    11   1.71E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    12   1.71E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    13   1.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-FI06B          08-FPISO68F-HE
    14   1.16E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    15   9.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    16   9.11E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    17   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    18   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    19   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    20   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    21   3.85E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    22   3.19E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    23   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    24   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    25   2.87E-007   XCOM-OCFI06BM     XCOM-AFX-2FI4     XCOM-AFZ-BFI4
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Table C-1 (continued)
Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 500%

		SL21-CD	IE-FI06B	08-FPISO68F-HE
26	2.74E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
27	2.45E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
28	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
29	2.28E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
30	2.23E-007	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
31	2.05E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
32	2.04E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
33	1.95E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
34	1.79E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
35	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
36	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
37	1.45E-007	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
38	1.45E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
39	1.45E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
40	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
41	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
42	1.33E-007	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
43	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
44	1.19E-007	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
45	1.18E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
46	1.18E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
47	1.13E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
48	1.06E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
49	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
50	1.04E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	

Table C-1 (continued)
Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 500%

51	9.58E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
52	9.29E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
53	8.84E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
54	8.51E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
55	8.51E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
56	8.02E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
57	7.97E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
58	7.17E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
59	6.87E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
60	6.46E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
61	6.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
62	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
63	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
64	5.42E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
65	5.42E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
66	5.18E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD2HF-HE
		XEQN-AFSTX064	IE-TX06B	08-FPSISO3CF-HE
67	4.96E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
68	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
69	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
70	4.64E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05B-CST-SWS--HE	08-FPISO56-F-HE	
71	4.14E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
72	4.14E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
73	4.11E-008	36--LHS-DIAG-HE	IE-FI06B	08-FPISO45-F-HE
74	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
75	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE

Table C-1 (continued)
Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 500%

76	3.59E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
77	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
78	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
79	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
80	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
81	3.26E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
82	3.23E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
83	3.09E-008	XCOM-AFZ-BFI4	IE-FI06B	05B-CST-SWS--HE
		08-FPISO68F-HE		
84	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
85	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
86	2.98E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
87	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
88	2.80E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
89	2.69E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
90	2.60E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
91	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP19-F-HE
92	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE
93	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
94	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
95	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
96	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
97	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
98	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
99	2.40E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
100	2.40E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	

Table C-2
Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 1000%

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10664
   Top event unavailability  (rare event)       = 1.095E-004
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   1.46E-005   IE-CX06B          04-CWSTP25-F-HE
     3   8.81E-006   IE-CY06B          04-CWSTP66-F-HE
     4   5.62E-006   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
     5   4.37E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
     6   3.95E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064    IE-WI06B         08-ISO-FS40F-HE
     7   3.82E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSFI064    IE-FI06B         08-FPISO56-F-HE
     8   3.29E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064    IE-CX06B         04-CWSTP22-F-HE
     9   2.55E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-FI06B         08-FPISO68F-HE
    10   2.31E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCY064    IE-CY06B         04-CWSTP51-F-HE
    11   2.01E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
    12   2.01E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
    13   1.98E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     IE-CY06B         04-CWSTP60-F-HE
    14   1.71E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064    IE-TI06B         08-FPSISO56F-HE
    15   9.11E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B         08-ISO-FS54F-HE
    16   9.11E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B         08-FPSISO68F-HE
    17   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    18   5.86E-007   IE-TI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-FPSISO29F-HE
    19   5.86E-007   IE-TI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-FPSISO29F-HE
    20   5.74E-007   XCOM-OCFI06BM     XCOM-AFX-2FI4    XCOM-AFZ-BFI4
                     SL21-CD          IE-FI06B         08-FPISO68F-HE
    21   4.46E-007   XCOM-OCCY06BM     XCOM-AFX-2CY4    XCOM-AFZ-BCY4
                     SL21-CD          IE-CY06B         04-CWSTP60-F-HE
    22   4.46E-007   36--LHS-DIAG-HE   IE-TI06B         08-FPSISO29F-HE
    23   3.19E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
    24   3.13E-007   IE-WI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-ISO-FS18F-HE
    25   3.13E-007   IE-WI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR  86-INSTRRCRF-HE  08-ISO-FS18F-HE
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Table C-2 (continued)
Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 1000%

26	2.91E-007	XCOM-AFX-2FI4 IE-FI06B	XCOM-AFZ-BFI4 08-FPISO68F-HE	06--OC6----F-HE
27	2.74E-007	XCOM-AFZ-BWIB 05BPT--AFW1C-PS	XEQN-AFSWI064 08-ISO-FS40F-HE	IE-WI06B
28	2.65E-007	XCOM-AFZ-BFIB 05BPT--AFW1C-PS	XEQN-AFSFI064 08-FPISO56-F-HE	IE-FI06B
29	2.45E-007	XCOM-AFZ-BWIB IE-WI06B	86-INSTRFCRF-HE 08-ISO-FS40F-HE	XEQN-AFSWI064
30	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
31	2.37E-007	XCOM-AFZ-BFIB IE-FI06B	86-INSTRFCRF-HE 08-FPISO56-F-HE	XEQN-AFSFI064
32	2.28E-007	XCOM-AFZ-BCXB 05BPT--AFW1C-PS	XEQN-AFSCX064 04-CWSTP22-F-HE	IE-CX06B
33	2.26E-007	XCOM-AFX-2CY4 IE-CY06B	XCOM-AFZ-BCY4 04-CWSTP60-F-HE	06--OC6----F-HE
34	2.05E-007	XCOM-OCWI06BM SL21-CD	XCOM-AFX-2WI4 IE-WI06B	XCOM-AFZ-BWI4 08-ISO-FS54F-HE
35	2.05E-007	XCOM-OCTI06BM SL21-CD	XCOM-AFX-2TI4 IE-TI06B	XCOM-AFZ-BTI4 08-FPSISO68F-HE
36	2.04E-007	XCOM-AFZ-BCXB IE-CX06B	86-INSTRFCRF-HE 04-CWSTP22-F-HE	XEQN-AFSCX064
37	1.79E-007	05B-BYALOP-F-HE XEQN-AFSWX064	05B-FRACTDP-OFF IE-WX06B	05B-MDPTD1CF-HE 08-ISO-FS2HF-HE
38	1.77E-007	XCOM-AFZ-BFI4 08-FPISO68F-HE	IE-FI06B	05BPT--AFW1C-PS
39	1.64E-007	IE-FI06B 01-CMSIAC1C--PR	01-CMSIAC1A--PR 86-INSTRRCRF-HE	01-CMSIAC1B--PR 08-FPISO29-F-HE
40	1.64E-007	IE-FI06B 01-CMSIAC1C--PR	01-CMSIAC1A--PS 86-INSTRRCRF-HE	01-CMSIAC1B--PR 08-FPISO29-F-HE
41	1.60E-007	XCOM-AFZ-BCYB 05BPT--AFW1C-PS	XEQN-AFSCY064 04-CWSTP51-F-HE	IE-CY06B
42	1.45E-007	05B-BYALOP-F-HE IE-SI06B	05B-FRACTDP-OFF 02-SW4A-B60F-HE	05B-MDPTD61F-HE
43	1.45E-007	05B-BYALOP-F-HE XEQN-AFSSI064	05B-FRACTDP-OFF IE-SI06B	05B-MDPTD61F-HE 02-SW4A-B51F-HE
44	1.43E-007	XCOM-AFZ-BCYB IE-CY06B	86-INSTRFCRF-HE 04-CWSTP51-F-HE	XEQN-AFSCY064
45	1.38E-007	IE-WI06B 01-CMSIAC1C--PR	01-CMSIAC1A--PR 86-INSTRFCRF-HE	01-CMSIAC1B--PR 08-ISO-FS33F-HE
46	1.38E-007	IE-WI06B 01-CMSIAC1C--PR	01-CMSIAC1A--PS 86-INSTRFCRF-HE	01-CMSIAC1B--PR 08-ISO-FS33F-HE
47	1.37E-007	XCOM-AFZ-BCY4 04-CWSTP60-F-HE	IE-CY06B	05BPT--AFW1C-PS
48	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
49	1.18E-007	XCOM-AFZ-BTIB 05BPT--AFW1C-PS	XEQN-AFSTI064 08-FPSISO56F-HE	IE-TI06B
50	1.06E-007	XCOM-AFZ-BTIB IE-TI06B	86-INSTRFCRF-HE 08-FPSISO56F-HE	XEQN-AFSTI064

Table C-2 (continued)
Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 1000%

51	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
52	1.04E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
53	1.04E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
54	1.04E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD2HF-HE
		XEQN-AFSTX064	IE-TX06B	08-FPSISO3CF-HE
55	9.58E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
56	9.29E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
57	9.27E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05B-CST-SWS--HE	08-FPISO56-F-HE	
58	8.51E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
59	8.51E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
60	8.21E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
61	8.21E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
62	7.97E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
63	6.46E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
64	6.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
65	6.32E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
66	6.23E-008	36--LHS-DIAG-HE	IE-FI06B	08-FPISO45-F-HE
67	6.18E-008	XCOM-AFZ-BFI4	IE-FI06B	05B-CST-SWS--HE
		08-FPISO68F-HE		
68	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
69	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
70	5.61E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
71	4.96E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
72	4.81E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
73	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
74	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
75	4.14E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
76	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR

Table C-2 (continued)
Sensitivity Analysis of HEPs for Unproceduralized Operator Action
Increased by 1000%

		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
77	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
78	3.59E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
79	3.47E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PR	08-FPISO56-F-HE	
80	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
81	3.38E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
82	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
83	3.38E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
84	3.26E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
85	3.23E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
86	3.13E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BMVI-MS102-FO	08-FPISO56-F-HE	
87	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
88	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
89	2.98E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
90	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
91	2.89E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
92	2.89E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
93	2.69E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
94	2.60E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
95	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE
96	2.57E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP19-F-HE
97	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
98	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
99	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
100	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE

Attachment D

Sensitivity Analysis of High Energy Line Break (HELB) Frequencies
Increased by 500% AND 1000%

Sensitivity analyses were performed to investigate the impact of increasing the high energy line break frequencies by factors of five and ten. Separate directories were created, SDI HELB 5X, for quantification of the sensitivity analysis which increased the high energy line break frequencies by 500% and SDI HELB 10X, for quantification of the sensitivity analysis which increased the high energy line break frequencies by 1000%. The batch quantification file, IE-FLOODW.IN, was used to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity analyses for the increased HELB line break is changes to the FLDINIT.BED file. The initiating event frequencies were changed as follows:

	Base Case Initiator Frequency	HELB 5X	HELB 10X
TI (Large Main Steam Break)	2.53E-4	1.27E-03	2.53E-03
TX (Moderate Main Steam)	1.87E-5	9.35E-5	1.87E-4
WI (Large Feedwater Break)	1.35E-4	6.75E-4	1.35E-3
WX (Moderate Feedwater)	4.69E-5	2.35E-4	4.69E-4

The model was then quantified as described in Section 4.0 for the base case. FLDINIT.BED reset the initiating event frequencies to those shown above.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with this model are documented in Tables D.1 and D.2. The Core Damage Probability if the high energy line break frequencies are increased by 500% is 1.42E-04. The Core Damage Probability if the high energy line break frequencies are increased by 1000% is 2.36E-04.

Table D-1
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 500%

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 14902
   Top event unavailability  (rare event)       = 1.417E-004
------------------------------------------------------------------------------
    1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
    2   2.14E-005   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                    08-FPSISO68F-HE
    3   1.63E-005   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                    XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
    4   1.05E-005   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                    08-ISO-FS54F-HE
    5   4.68E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                    IE-TI06B          08-FPSISO68F-HE
    6   4.68E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                    XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    7   3.77E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                    IE-WI06B          08-ISO-FS54F-HE
    8   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
    9   2.94E-006   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
   10   2.94E-006   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
   11   2.24E-006   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
   12   2.19E-006   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                    SL21-CD           IE-TI06B          08-FPSISO68F-HE
   13   1.56E-006   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
   14   1.56E-006   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
   15   1.44E-006   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                    05BPT--AFW1C-PS   08-ISO-FS40F-HE
   16   1.29E-006   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                    IE-WI06B          08-ISO-FS40F-HE
   17   1.19E-006   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS18F-HE
   18   1.11E-006   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                    IE-TI06B          08-FPSISO68F-HE
   19   1.08E-006   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                    SL21-CD           IE-WI06B          08-ISO-FS54F-HE
   20   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
   21   6.88E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
   22   6.88E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
   23   6.73E-007   XCOM-AFZ-BTIB     XEQN-AFSTI064     IE-TI06B
                    05BPT--AFW1C-PS   08-FPSISO56F-HE
   24   6.73E-007   XCOM-AFZ-BTI4     IE-TI06B          05BPT--AFW1C-PS
                    08-FPSISO68F-HE
   25   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                    XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
   26   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
   27   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
```

Table D-1 (continued)
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 500%

		08-FPISO68F-HE		
28	6.02E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
29	5.46E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
30	5.23E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
31	5.03E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
32	4.59E-007	XCOM-AFZ-BCY4	06-NOINDAFWF-HE	IE-CY06B
		04-CWSTP60-F-HE		
33	3.62E-007	XCOM-AFZ-BSI4	06-NOINDAFWF-HE	IE-SI06B
		02-SW4A-B60F-HE		
34	3.32E-007	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
35	2.89E-007	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
36	2.88E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
37	2.88E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
38	2.53E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
39	2.35E-007	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
40	2.35E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
41	2.35E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
42	2.35E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
43	2.33E-007	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
44	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
45	1.94E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
46	1.94E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
47	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
48	1.88E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
49	1.70E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
50	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
51	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
52	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	

Table D-1 (continued)
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 500%

53	1.53E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
54	1.53E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
55	1.48E-007	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
56	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
57	1.26E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
58	1.25E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
59	1.25E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
60	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
61	1.21E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
62	1.21E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
63	1.21E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
64	1.21E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	1.16E-007	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
66	1.06E-007	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
67	9.13E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
68	8.81E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
69	8.81E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
70	7.94E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
71	7.94E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
72	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
73	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
74	7.53E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
75	6.74E-008	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	
76	6.73E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
77	6.73E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
78	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE

Table D-1 (continued)
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 500%

79	6.44E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
80	6.44E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
81	6.44E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
82	6.44E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
83	6.18E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
84	5.89E-008	XCOM-AFZ-BTI4	IE-TI06B	36--LHS-DIAG-HE
		08-FPSISO68F-HE		
85	5.89E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
86	5.83E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
87	5.83E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
88	5.74E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
89	5.65E-008	XEQN-AFSTX064	IE-TX06B	05BPT--AFW1C-PS
		08-FPSISO3CF-HE		
90	5.63E-008	IE-WI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-ISO-FS18F-HE		
91	5.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
92	5.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
93	5.49E-008	05BPMSKPSCCF23	IE-TI06B	08-FPSISO29F-HE
94	5.13E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
95	5.05E-008	86-INSTRFCRF-HE	XEQN-AFSTX064	IE-TX06B
		08-FPSISO3CF-HE		
96	4.96E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
97	4.96E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
98	4.85E-008	IE-WI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
99	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
100	4.55E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD2HF-HE
		XEQN-AFSTX064	IE-TX06B	08-FPSISO3CF-HE

Table D-2
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 1000%

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 17535
   Top event unavailability  (rare event)       = 2.363E-004
------------------------------------------------------------------------------
     1   4.26E-005   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     2   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     3   3.27E-005   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     4   2.11E-005   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     5   9.32E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     6   9.32E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     7   7.54E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     8   5.86E-006   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
     9   5.86E-006   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    10   4.46E-006   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    11   4.35E-006   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    12   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
    13   3.13E-006   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    14   3.13E-006   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    15   2.88E-006   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    16   2.57E-006   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    17   2.38E-006   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS18F-HE
    18   2.21E-006   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    19   2.15E-006   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    20   1.38E-006   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    21   1.38E-006   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    22   1.34E-006   XCOM-AFZ-BTI4     IE-TI06B          05BPT--AFW1C-PS
                     08-FPSISO68F-HE
    23   1.34E-006   XCOM-AFZ-BTIB     XEQN-AFSTI064     IE-TI06B
                     05BPT--AFW1C-PS   08-FPSISO56F-HE
    24   1.20E-006   XCOM-AFZ-BTIB     86-INSTRFCRF-HE   XEQN-AFSTI064
                     IE-TI06B          08-FPSISO56F-HE
    25   1.09E-006   XCOM-AFX-2WI4     XCOM-AFZ-BWI4     06--OC6----F-HE
                     IE-WI06B          08-ISO-FS54F-HE
```

Table D-2 (continued)
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 1000%

26	1.05E-006	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
27	1.01E-006	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
28	8.81E-007	IE-CY06B	04-CWSTP66-F-HE	
29	6.64E-007	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
30	6.52E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCX064	IE-CX06B	04-CWSTP22-F-HE
31	6.44E-007	IE-SI06B	02-SW4A-B66F-HE	
32	6.36E-007	XCOM-AFZ-BFI4	06-NOINDAFWF-HE	IE-FI06B
		08-FPISO68F-HE		
33	5.76E-007	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
34	5.74E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
35	5.74E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
36	5.05E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
37	4.69E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
38	4.69E-007	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
39	4.67E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
40	4.67E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
41	4.66E-007	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
42	4.59E-007	XCOM-AFZ-BCY4	06-NOINDAFWF-HE	IE-CY06B
		04-CWSTP60-F-HE		
43	3.87E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
44	3.87E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
45	3.77E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
46	3.62E-007	XCOM-AFZ-BSI4	06-NOINDAFWF-HE	IE-SI06B
		02-SW4A-B60F-HE		
47	3.39E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
48	3.06E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
49	3.06E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
50	2.94E-007	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
51	2.52E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
52	2.49E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE

Table D-2 (continued)
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 1000%

53	2.49E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
54	2.41E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
55	2.41E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
56	2.41E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
57	2.41E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
58	2.32E-007	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
59	2.11E-007	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
60	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
61	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
62	1.82E-007	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
63	1.76E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
64	1.76E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
65	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
66	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
67	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
68	1.58E-007	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
69	1.58E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
70	1.50E-007	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
71	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
72	1.35E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
73	1.35E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
74	1.34E-007	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	
75	1.29E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
76	1.29E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
77	1.29E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE

Table D-2 (continued)
Sensitivity Analyses for High Energy Line Break Frequencies Increased by 1000%

78	1.29E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
79	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
80	1.24E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
81	1.17E-007	XCOM-AFZ-BTI4	IE-TI06B	36--LHS-DIAG-HE
		08-FPSISO68F-HE		
82	1.17E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
83	1.17E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
84	1.17E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
85	1.13E-007	XEQN-AFSTX064	IE-TX06B	05BPT--AFW1C-PS
		08-FPSISO3CF-HE		
86	1.13E-007	IE-WI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-ISO-FS18F-HE		
87	1.10E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
88	1.10E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
89	1.09E-007	05BPMSKPSCCF23	IE-TI06B	08-FPSISO29F-HE
90	1.01E-007	86-INSTRFCRF-HE	XEQN-AFSTX064	IE-TX06B
		08-FPSISO3CF-HE		
91	9.88E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
92	9.88E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPSISO29F-HE	
93	9.70E-008	IE-WI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
94	9.11E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD2HF-HE
		XEQN-AFSTX064	IE-TX06B	08-FPSISO3CF-HE
95	9.02E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD49F-HE
		IE-WI06B	05BPM--AFW1B-PR	08-ISO-FS33F-HE
96	8.71E-008	XCOM-SLCTI06M	XCOM-OCTI06BM	XCOM-AFX-2TI4
		XCOM-AFZ-BTI4	27A-ORR----F-HE	IE-TI06B
		08-FPSISO68F-HE		
97	8.69E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PR
		08-ISO-FS54F-HE		
98	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
99	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
100	7.83E-008	XCOM-AFZ-BWI4	IE-WI06B	05BMVI-MS102-FO
		08-ISO-FS54F-HE		

Attachment E

Sensitivity Analysis of Circulating Water Expansion Joint
Rupture Frequency Increased by 500% and 1000%

Sensitivity analyses were performed to investigate the impact of increasing the circulating water expansion joint break frequencies by 500% and 1000%. Separate directories were created, SDI 051116 EXP JOINTS 5X, for quantification of the sensitivity analysis which increased the circulating water expansion joint break frequencies by 500% and SDI 051116 EXP JOINTS 10X, for quantification of the sensitivity analysis which increased the circulating water expansion joint break frequencies by 1000%. A batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity cases is the increase in the circulating water initiating event frequencies used for quantification.

Batch job FLOOD.BCL was run using the Event BED File, FLDINIT.BED and KNPP.BED as inputs to create the FLOOD.BED file which was used for the quantification. KNPP.BED contained the basic events for the Kewaunee Nuclear Plant Internal Events PRA. FLDINIT.BED reset the initiating event frequencies for circulating water breaks as shown below:

	Base Case Initiator Frequency		CWJ 5X		CWJ 10X	
CI (Large Circ Water Break)		3.74E-5		1.35E-4		2.56E-4
CX (Moderate Circ Water)		2.92E-5		1.26E-4		2.48E-4
CY (Small Circ Water)		7.34E-5		3.67E-4		7.34E-4

The total frequency of large breaks in the circulating system inlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of large pipe ruptures, or,

F_{CWIN} = 2.43E-05 per year + 1.31E-05 per year

F_{CWIN} = 3.74E-05 per year.

The total frequency of large breaks in the circulating system inlet piping for this sensitivity is the sum of the frequency of five and ten times the expansion joint ruptures plus the frequency of large pipe ruptures, or,

$F_{CWIN} = 5 * F_{CWINExp} + F_{CWINPipe}$ and $F_{CWIN} = 10 * F_{CWINExp} + F_{CWINPipe}$

F_{CWIN} = 5 * 2.43E-05 per year + 1.31E-05 per year and 10 * 2.43E-05 + 1.31E-05

F_{CWIN} = 1.35E-04 per year and 2.56E-04.

The total frequency of moderate breaks in the circulating system outlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = F_{CWOUTExp} + F_{CWOUTPipe}$.

F_{CWIN} = 2.43E-05 per year + 4.87E-06 per year

F_{CWIN} = 2.92E-05 per year.

The total frequency of moderate breaks in the circulating system outlet piping for the sensitivity analyses is the sum of the frequency of five and ten times the expansion joint ruptures and the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = 5 * F_{CWOUTExp} + F_{CWOUTPipe}$ and $10 * F_{CWOUTExp} + F_{CWOUTPipe}$

F_{CWOUT} = 5 * 2.43E-05 per year + 4.87E-06 per year and 10 * 2.43 + 4.87E-06

F_{CWOUT} = 1.26E-04 per year and 2.48E-04 per year.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with these models are documented in Tables E.1 and E.2. The Core Damage Probability if the circulating water expansion joint break frequencies are increased by 500% is 1.86E-04. The Core Damage Probability if the circulating water expansion joint break frequencies are increased by 1000% is 3.34E-04.

Table E-1

Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 500%

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN        Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 12083
   Top event unavailability  (rare event)       = 1.855E-004
------------------------------------------------------------------------------
     1   1.35E-004   IE-CI06B          04-CW-TRIP-F-HE
     2   1.51E-005   IE-CX06B          04-CWSTP25-F-HE
     3   4.40E-006   IE-CY06B          04-CWSTP66-F-HE
     4   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
     5   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B         08-ISO-FS40F-HE
     6   2.81E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B         04-CWSTP22-F-HE
     7   2.29E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
     8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     9   9.56E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B         04-CWSTP51-F-HE
    10   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B         08-FPSISO56F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    12   8.20E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
    16   5.86E-007   IE-TI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    17   5.86E-007   IE-TI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    18   4.46E-007   36--LHS-DIAG-HE   IE-TI06B         08-FPSISO29F-HE
    19   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4    XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B         08-FPSISO68F-HE
    20   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
    21   3.13E-007   IE-WI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-ISO-FS18F-HE
    22   3.13E-007   IE-WI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-ISO-FS18F-HE
    23   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064    IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    24   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE  XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    25   2.48E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064    IE-CX06B
```

Table E-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 500%

		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
26	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
27	2.34E-007	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
28	2.22E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
29	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
30	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
31	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
32	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
33	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
34	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
35	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
36	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
37	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
38	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
39	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
40	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
41	1.19E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
42	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
43	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
44	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
45	8.67E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
46	8.42E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
47	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
48	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
49	7.59E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
50	7.59E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE

Table E-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 500%

51	7.53E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
52	7.22E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
53	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
54	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
55	5.77E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
56	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
57	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
58	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
59	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
60	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
61	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
62	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
63	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
64	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
65	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
66	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
67	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
68	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
69	3.66E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
70	3.66E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
71	3.50E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
72	3.50E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
73	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
74	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
75	3.24E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B

Table E-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 500%

		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
76	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
77	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
78	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
79	2.95E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
80	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
81	2.92E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
82	2.78E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
83	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
84	2.66E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
85	2.52E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
86	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
87	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
88	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
89	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
90	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
91	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
92	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
93	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
94	2.17E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
95	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
96	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
97	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
98	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
99	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
100	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		

Table E-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 500%

Table E-2
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 1000%

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                  = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced               = FLOOD.BED
   Number of cut sets in equation                 = 13102
   Top event unavailability  (rare event)         = 3.344E-004
------------------------------------------------------------------------------
     1   2.56E-004   IE-CI06B          04-CW-TRIP-F-HE
     2   2.98E-005   IE-CX06B          04-CWSTP25-F-HE
     3   8.81E-006   IE-CY06B          04-CWSTP66-F-HE
     4   5.54E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     5   4.59E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     6   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     7   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     9   1.91E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    10   1.64E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    12   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    16   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    17   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    18   4.88E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
    19   4.69E-007   XCOM-OCCY06BM     XCOM-AFX-2CY4     XCOM-AFZ-BCY4
                     SL21-CD           IE-CY06B          04-CWSTP60-F-HE
    20   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    21   4.36E-007   XCOM-AFZ-BCXB     86-INSTRFCRF-HE   XEQN-AFSCX064
                     IE-CX06B          04-CWSTP22-F-HE
    22   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    23   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    24   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    25   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
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Table E-2 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 1000%

26	2.88E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
27	2.57E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
28	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
29	2.37E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
30	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
31	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
32	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
33	1.71E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
34	1.68E-007	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
35	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
36	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
37	1.51E-007	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
38	1.49E-007	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
39	1.49E-007	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
40	1.44E-007	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
41	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
42	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
43	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
44	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
45	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
46	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
47	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
48	1.14E-007	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
49	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
50	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
51	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	

Table E-2 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 1000%

52	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
53	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
54	7.32E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
55	7.32E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
56	6.90E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
57	6.90E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
58	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
59	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
60	6.39E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
61	5.89E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
62	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
63	5.75E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
64	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
66	5.56E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
67	5.24E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
68	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
69	5.05E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
70	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
71	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
72	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
73	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
74	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
75	4.27E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
76	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE

Table E-2 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Increased by 1000%

77	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
78	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
79	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
80	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
81	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
82	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
83	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
84	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
85	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
86	2.89E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
87	2.89E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
88	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
89	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
90	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
91	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
92	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
93	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
94	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
95	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
96	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
97	2.23E-008	05B-FRACTDP-OFF	05B-MDPTD36F-HE	IE-CX06B
		05BPM--AFW1B-PR	04-CWSTP13-F-HE	
98	2.21E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PR	04-CWSTP51-F-HE	
99	2.20E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP45-F-HE
100	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		

Attachment F

Sensitivity Analysis of Random Pipe Break Frequencies
Increased by 500% and 1000%

Sensitivity analyses were performed to investigate the impact of increasing the random pipe break frequencies by 500% and 1000%. Separate directories were created, SDI 051116 RANDOM 5X and SDI 051116 RANDOM 10X, for quantification of the sensitivity analyses which increased the random pipe break frequencies by 500% and 1000% respectively. The batch quantification file, IE-FLOODW.IN, was used to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity case is the values were changed for initiating events in the FLDINIT.BED file as shown below:

	Base Case Initiator Frequency	Random 5X	Random 10X
SI (Large Service Water Break)	3.22E-5	1.61E-4	3.22E-4
CI (Large Circ Water Break)	3.74E-5	8.98E-5	1.55E-4
CX (Moderate Circ Water)	2.92E-5	4.86E-5	7.30E-5
FI (Large Fire Protection Break)	7.08E-5	3.54E-4	7.08E-4

The Large Service Water Break and Large Fire Protection Break frequencies could be increased by 500% and 1000% since their initiating event frequency was based solely on piping failures. However, the Large and Moderate Circulating Water Break initiating event frequencies are based on pipe breaks and circulating water expansion joint ruptures.

The total frequency of large breaks in the circulating system inlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of large pipe ruptures, or,

$F_{CWIN} = F_{CWINExp} + F_{CWINPipe}$.

F_{CWIN} = 2.43E-05 per year + 1.31E-05 per year

F_{CWIN} = 3.74E-05 per year.

The total frequency of large breaks in the circulating system inlet piping for this sensitivity is the sum of the frequency of expansion joint ruptures and five or ten times the frequency of large pipe ruptures, or,

$F_{CWIN} = F_{CWINExp} + 5 * F_{CWINPipe}$ and $F_{CWINExp} + 10 * F_{CWINPipe}$

F_{CWIN} = 2.43E-05 per year + 5 * 1.31E-05 per year and 2.43E-05 + 10 * 1.31E-05

F_{CWIN} = 8.98E-05 per year and 1.55E-04.

The total frequency of moderate breaks in the circulating system outlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = F_{CWOUTExp} + F_{CWOUTPipe}$.

F_{CWOUT} = 2.43E-05 per year + 4.87E-06 per year

F_{CWOUT} = 2.92E-05 per year.

The total frequency of moderate breaks in the circulating system outlet piping for the sensitivity analyses is the sum of the frequency of expansion joint ruptures and five or ten times the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = F_{CWOUTExp} + 5 * F_{CWOUTPipe}$ and $F_{CWOUTExp} + 10 * F_{CWOUTPipe}$

F_{CWIN} = 2.43E-05 per year + 5 * 4.87E-06 per year and 2.43E-05 + 10 * 4.87E-06

F_{CWIN} = 4.86E-05 per year and 7.30E-05 per year.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with these models are documented in Tables F.1 and F.2. The Core Damage Probability if the random pipe break frequencies are increased by 500% is 1.34E-04. The Core Damage Probability if the random pipe break frequencies are increased by 1000% is 2.19e-04.

Table F-1
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 500%

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN        Licensed to: KEWAUNEE
==============================================================================
   Equation File                              = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced           = FLOOD.BED
   Number of cut sets in equation             = 12437
   Top event unavailability  (rare event)     = 1.338E-004
------------------------------------------------------------------------------
     1   8.98E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   5.83E-006   IE-CX06B          04-CWSTP25-F-HE
     3   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
     4   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B         08-ISO-FS40F-HE
     5   3.22E-006   IE-SI06B          02-SW4A-B66F-HE
     6   3.18E-006   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
     7   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     8   1.81E-006   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
     9   1.09E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B         04-CWSTP22-F-HE
    10   1.04E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B         08-FPISO56-F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B         08-FPSISO56F-HE
    12   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    13   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    14   8.21E-007   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    15   8.21E-007   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    16   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    17   6.95E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-FI06B          08-FPISO68F-HE
    18   6.23E-007   36--LHS-DIAG-HE   IE-FI06B         08-FPISO29-F-HE
    19   5.86E-007   IE-TI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    20   5.86E-007   IE-TI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    21   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
    22   4.46E-007   36--LHS-DIAG-HE   IE-TI06B         08-FPSISO29F-HE
    23   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4    XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B         08-FPSISO68F-HE
    24   3.95E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSSI064     IE-SI06B         02-SW4A-B51F-HE
    25   3.95E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-SI06B          02-SW4A-B60F-HE
    26   3.25E-007   XCOM-OCFI06BM     XCOM-AFX-2FI4    XCOM-AFZ-BFI4
                     SL21-CD           IE-FI06B         08-FPISO68F-HE
    27   3.13E-007   IE-WI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
```

Table F-1 (continued)
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 500%

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
28	3.13E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
29	2.88E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
30	2.57E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
31	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
32	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
33	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
34	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
35	1.85E-007	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
36	1.65E-007	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
37	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
38	1.50E-007	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
39	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
40	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
41	1.34E-007	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
42	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
43	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
44	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
45	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
46	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
47	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
48	1.00E-007	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
49	9.55E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
50	9.36E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
51	8.54E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
52	8.06E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
53	8.03E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM

Table F-1 (continued)
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 500%

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
54	8.03E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
55	7.66E-008	02-AV-SW4A---FC	IE-SI06B	
56	7.66E-008	02-AV-SW4B---FC	IE-SI06B	
57	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
58	6.54E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
59	6.54E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
60	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
61	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
62	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
63	5.69E-008	XCOM-AFZ-BSI4	IE-SI06B	05BPT--AFW1C-PS
		02-SW4A-B60F-HE		
64	5.69E-008	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPT--AFW1C-PS	02-SW4A-B51F-HE	
65	5.42E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
66	5.42E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
67	5.25E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05B-CST-SWS--HE	08-FPISO56-F-HE	
68	5.08E-008	XCOM-AFZ-BSIB	86-INSTRFCRF-HE	XEQN-AFSSI064
		IE-SI06B	02-SW4A-B51F-HE	
69	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
70	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
71	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
72	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
73	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
74	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
75	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
76	4.11E-008	36--LHS-DIAG-HE	IE-FI06B	08-FPISO45-F-HE
77	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
78	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
79	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	

Table F-1 (continued)
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 500%

80	3.50E-008	XCOM-AFZ-BFI4	IE-FI06B	05B-CST-SWS--HE
		08-FPISO68F-HE		
81	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
82	3.37E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
83	3.37E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
84	3.37E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
85	3.37E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
86	3.34E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
87	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
88	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
89	2.95E-008	IE-FI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPISO29-F-HE		
90	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
91	2.93E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
92	2.93E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
93	2.54E-008	IE-FI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
94	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
95	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
96	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
97	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
98	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
99	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
100	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE

Table F-2
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 1000%

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                              = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced           = FLOOD.BED
   Number of cut sets in equation             = 13700
   Top event unavailability  (rare event)     = 2.185E-004
------------------------------------------------------------------------------
     1   1.55E-004   IE-CI06B          04-CW-TRIP-F-HE
     2   8.76E-006   IE-CX06B          04-CWSTP25-F-HE
     3   6.44E-006   IE-SI06B          02-SW4A-B66F-HE
     4   6.36E-006   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
     5   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
     6   3.62E-006   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
     7   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B         08-ISO-FS40F-HE
     8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     9   2.09E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B         08-FPISO56-F-HE
    10   1.64E-006   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    11   1.64E-006   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    12   1.63E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B         04-CWSTP22-F-HE
    13   1.39E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-FI06B          08-FPISO68F-HE
    14   1.25E-006   36--LHS-DIAG-HE   IE-FI06B         08-FPISO29-F-HE
    15   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B         08-FPSISO56F-HE
    16   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    17   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    18   7.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-SI06B          02-SW4A-B60F-HE
    19   7.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSSI064     IE-SI06B         02-SW4A-B51F-HE
    20   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    21   6.50E-007   XCOM-OCFI06BM     XCOM-AFX-2FI4    XCOM-AFZ-BFI4
                     SL21-CD           IE-FI06B         08-FPISO68F-HE
    22   5.86E-007   IE-TI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    23   5.86E-007   IE-TI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    24   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
    25   4.46E-007   36--LHS-DIAG-HE   IE-TI06B         08-FPSISO29F-HE
    26   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4    XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B         08-FPSISO68F-HE
    27   3.69E-007   XCOM-OCSI06BM     XCOM-AFX-2SI4    XCOM-AFZ-BSI4
```

Table F-2 (continued)
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 1000%

		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
28	3.29E-007	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
29	3.13E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
30	3.13E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
31	3.00E-007	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
32	2.88E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
33	2.68E-007	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
34	2.57E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
35	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
36	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
37	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
38	2.00E-007	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
39	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
40	1.87E-007	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
41	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
42	1.61E-007	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
43	1.61E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
44	1.61E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
45	1.53E-007	02-AV-SW4A---FC	IE-SI06B	
46	1.53E-007	02-AV-SW4B---FC	IE-SI06B	
47	1.44E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
48	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
49	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
50	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
51	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
52	1.31E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
53	1.31E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE

Table F-2 (continued)
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 1000%

54	1.28E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
55	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
56	1.14E-007	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPT--AFW1C-PS	02-SW4A-B51F-HE	
57	1.14E-007	XCOM-AFZ-BSI4	IE-SI06B	05BPT--AFW1C-PS
		02-SW4A-B60F-HE		
58	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
59	1.08E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
60	1.08E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
61	1.05E-007	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05B-CST-SWS--HE	08-FPISO56-F-HE	
62	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
63	1.02E-007	XCOM-AFZ-BSIB	86-INSTRFCRF-HE	XEQN-AFSSI064
		IE-SI06B	02-SW4A-B51F-HE	
64	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
65	8.23E-008	36--LHS-DIAG-HE	IE-FI06B	08-FPISO45-F-HE
66	7.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05B-CST-SWS--HE
		08-FPISO68F-HE		
67	6.75E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
68	6.75E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
69	6.75E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
70	6.75E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPISO29-F-HE
71	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
72	5.90E-008	IE-FI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPISO29-F-HE		
73	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
74	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
75	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
76	5.09E-008	IE-FI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
77	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
78	5.02E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
79	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	

Table F-2 (continued)
Sensitivity Analysis for Random Pipe Break Frequencies Increased by 1000%

80	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
81	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
82	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
83	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
84	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
85	4.40E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
86	4.40E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
87	3.98E-008	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05B-CST-SWS--HE	02-SW4A-B51F-HE	
88	3.98E-008	XCOM-AFZ-BSI4	IE-SI06B	05B-CST-SWS--HE
		02-SW4A-B60F-HE		
89	3.93E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PR	08-FPISO56-F-HE	
90	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
91	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
92	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
93	3.54E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BMVI-MS102-FO	08-FPISO56-F-HE	
94	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
95	3.34E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
96	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
97	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
98	3.06E-008	05BPMSKPSCCF23	IE-FI06B	08-FPISO29-F-HE
99	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
100	2.77E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSKPRCCF23
		86-INSTRRCRF-HE	08-FPISO29-F-HE	

Attachment G

Sensitivity Analysis of HEPs During HELBs for First Operator
To Isolate the Break

Sensitivity analyses were performed to investigate the impact of changing the success probability of the operator action to isolate fire system flow following a HELB. This sensivity begins with the base case and varies the HEP for the first isolation following a HELB event to 0.1, 0.3, and 0.6. A separate directory was created, SDI 051116 HEP 1ISO1, for quantification of the sensitivity analysis which set the first isolation to 0.1. Directory SDI 051116 HEP 1ISO3 was created for quantification of the sensitivity analysis which set the first isolation to 0.3, and directory SDI 051116 HEP 1ISO6 was created for quantification of the sensitivity analysis which set the first isolation to 0.6. For each of the sensitivity cases, the following basic events were changed:

08-FPSISO1CF-HE
08-FPSISO29F-HE
08-ISO-FS18F-HE
08-ISO-FS55F-HE.

The batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity analyses is in the KNPP.BED file used for quantification.

The model was then quantified as described in Section 4.0 for the base case. KNPP.BED reset the Human Error Probabilities as shown above.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with these models are documented in Tables G-1, G-2, and G-3. The Core Damage Probability if the probability for the first isolation following a HELB is set to 0.1 is 6.27E-05. The Core Damage Probability if the probability for the first isolation following a HELB is set to 0.3 is 6.35E-05. The Core Damage Probability if the probability for the first isolation following a HELB is set to 0.6 is 6.47E-04.

Table G-1
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.1

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 6.274E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
     3   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
     4   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B         08-ISO-FS40F-HE
     5   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     6   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     7   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B         08-FPSISO56F-HE
     8   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
     9   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    10   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B         04-CWSTP22-F-HE
    11   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    12   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
    13   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
    14   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4    XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B         08-FPSISO68F-HE
    15   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
    16   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064    IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    17   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE  XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    18   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4    06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    19   2.15E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4    XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B         08-ISO-FS54F-HE
    20   2.09E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B         08-FPISO56-F-HE
    21   1.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B         04-CWSTP51-F-HE
    22   1.64E-007   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    23   1.64E-007   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    24   1.64E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    25   1.39E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
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Table G-1 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.1

		IE-FI06B	08-FPISO68F-HE	
26	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
27	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
28	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
29	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
30	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
31	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
32	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
33	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
34	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
35	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
36	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
37	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
38	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
39	5.86E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
40	5.86E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
41	5.74E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
42	5.13E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
43	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
44	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
45	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
46	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
47	4.46E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO29F-HE
48	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
49	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
50	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	

Table G-1 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.1

51	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
52	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
53	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
54	3.13E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
55	3.13E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
56	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
57	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
58	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
59	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
60	2.38E-008	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
61	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
62	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
63	2.01E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
64	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
65	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
66	1.76E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
67	1.76E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
68	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
69	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
70	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
71	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
72	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
73	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
74	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
75	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		

Table G-1 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.1

76	1.53E-008	02-AV-SW4B---FC	IE-SI06B	
77	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
78	1.51E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
79	1.50E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
80	1.44E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
81	1.35E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
82	1.35E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
83	1.34E-008	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	
84	1.34E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE
85	1.31E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
86	1.31E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
87	1.24E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
88	1.17E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
89	1.17E-008	XCOM-AFZ-BTI4	IE-TI06B	36--LHS-DIAG-HE
		08-FPSISO68F-HE		
90	1.17E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
91	1.17E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
92	1.14E-008	XCOM-AFZ-BSI4	IE-SI06B	05BPT--AFW1C-PS
		02-SW4A-B60F-HE		
93	1.14E-008	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPT--AFW1C-PS	02-SW4A-B51F-HE	
94	1.13E-008	XEQN-AFSTX064	IE-TX06B	05BPT--AFW1C-PS
		08-FPSISO3CF-HE		
95	1.10E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
96	1.10E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
97	1.09E-008	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
98	1.09E-008	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
99	1.08E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE
100	1.08E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPISO45-F-HE

Table G-2
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.3

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 6.352E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
     3   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
     4   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B         08-ISO-FS40F-HE
     5   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     6   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B         08-FPSISO56F-HE
     7   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     8   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
     9   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    10   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B         04-CWSTP22-F-HE
    11   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    12   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
    13   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
    14   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4    XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B         08-FPSISO68F-HE
    15   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
    16   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064    IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    17   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE  XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    18   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4    06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    19   2.15E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4    XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B         08-ISO-FS54F-HE
    20   2.09E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B         08-FPISO56-F-HE
    21   1.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B         04-CWSTP51-F-HE
    22   1.76E-007   IE-TI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    23   1.76E-007   IE-TI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    24   1.64E-007   IE-FI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPISO29-F-HE
    25   1.64E-007   IE-FI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
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Table G-2 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.3

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
26	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
27	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
28	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
29	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
30	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
31	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
32	1.34E-007	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO29F-HE
33	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
34	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
35	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
36	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
37	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
38	9.39E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
39	9.39E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
40	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
41	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
42	7.13E-008	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
43	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
44	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
45	5.74E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
46	5.13E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
47	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
48	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
49	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
50	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
51	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR

Table G-2 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.3

		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
52	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
53	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
54	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
55	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
56	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
57	3.26E-008	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
58	3.26E-008	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
59	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
60	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
61	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
62	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
63	2.48E-008	IE-WX06B	36--LHS-DIAG-HE	08-ISO-FS55F-HE
64	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
65	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
66	2.01E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
67	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
68	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
69	1.76E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE

Table G-2 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.3

70	1.76E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
71	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
72	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
73	1.73E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
74	1.72E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
75	1.72E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
76	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
77	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
78	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
79	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
80	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
81	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
82	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
83	1.53E-008	02-AV-SW4B---FC	IE-SI06B	
84	1.51E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
85	1.50E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
86	1.44E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
87	1.40E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
88	1.40E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
89	1.40E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
90	1.35E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
91	1.35E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
92	1.34E-008	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	
93	1.34E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE
94	1.31E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
95	1.31E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR

Table G-2 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.3

		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
96	1.30E-008	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
97	1.30E-008	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
98	1.24E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
99	1.17E-008	XCOM-AFZ-BTI4	IE-TI06B	36--LHS-DIAG-HE
		08-FPSISO68F-HE		
100	1.17E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	

Table G-3
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.6

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 6.469E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     3   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
     4   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     5   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     6   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     7   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     8   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
     9   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    10   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
    11   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    12   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    13   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
    14   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    15   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    16   3.52E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    17   3.52E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    18   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    19   2.67E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    20   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    21   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    22   2.15E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    23   2.09E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
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Table G-3 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.6

24	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
25	1.88E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
26	1.88E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
27	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
28	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
29	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
30	1.43E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
31	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
32	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
33	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
34	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
35	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
36	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
37	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
38	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
39	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
40	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
41	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
42	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
43	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
44	6.52E-008	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
45	6.52E-008	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
46	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
47	5.74E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
48	5.13E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
49	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE

Table G-3 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.6

		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
50	4.96E-008	IE-WX06B	36--LHS-DIAG-HE	08-ISO-FS55F-HE
51	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
52	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
53	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
54	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
55	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
56	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
57	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
58	3.46E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
59	3.44E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
60	3.44E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
61	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
62	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
63	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
64	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
65	2.80E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
66	2.80E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
67	2.80E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
68	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
69	2.60E-008	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
70	2.60E-008	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
71	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
72	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
73	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
74	2.01E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B

Table G-3 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.6

		05B-CST-SWS--HE	04-CWSTP22-F-HE	
75	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
76	1.98E-008	IE-TX06B	36--LHS-DIAG-HE	08-FPSISO1CF-HE
77	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
78	1.84E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
79	1.84E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
80	1.76E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
81	1.76E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
82	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
83	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
84	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
85	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
86	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
87	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
88	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
89	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
90	1.53E-008	02-AV-SW4B---FC	IE-SI06B	
91	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
92	1.51E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
93	1.50E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
94	1.50E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
95	1.50E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
96	1.45E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
97	1.45E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
98	1.45E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
99	1.45E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE

Table G-3 (continued)
Sensitivity Analysis of HEPs for First Isolation Following
A HELB Set to 0.6

100	1.44E-008	XCOM-AFZ-BCY4 04-CWSTP60-F-HE	IE-CY06B	05BPT--AFW1C-PS

Attachment H

Sensitivity Analysis of HEPs During HELBs to
Time-Required To Isolate the Break

Sensitivity analyses were performed to investigate the impact of changing the time required for the operator to isolate flow from the fire system following a HELB. For this sensitivity, a 38-minute window was assumed required as the time required for the operators to recognize, respond, and perform the actions needed to isolate fire system flow. The HEPs used fro this sensitivity were recalculated using the 38 mnute window with the exception of the actions to perform the first modeled isolation. For these four events, three cases were run with the HEP for the first isolation set to 0.1, 0.3, and 0.6. A separate directory was created, SDI 051116 HEP 2ISO1, for quantification of the sensitivity analysis which set the first isolation to 0.1. Directory SDI 051116 HEP 2ISO3 was created for quantification of the sensitivity analysis which set the first isolation to 0.3, and directory SDI 051116 HEP 2ISO6 was created for quantification of the sensitivity analysis which set the first isolation to 0.6. For each of the sensitivity cases, the following basic events were changed:

Basic Event	Description	Base Case	Revised Probability
08-FPSISO1CF-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT(SM)-100 MIN	3.00E-02	0.1, 0.3, 0.6
08-FPSISO29F-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 29 MIN.	1.00	0.1, 0.3, 0.6
08-FPSISO2CF-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT(SM)-150 MIN	3.00E-02	3.00E-02
08-FPSISO3CF-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT(SM)-170 MIN	3.00E-02	3.00E-02
08-FPSISO45F-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT - 45 MIN.	6.60E-02	1.70E-01
08-FPSISO56F-HE	ISOLATE FIRE SPRINKLERS DURING FLOOD/MS EVENT – 56 MIN.	3.00E-02	3.50E-02
08-ISO-FS18F-HE	ISOLATE SPRINKLERS LARGE FLOOD/FW EVENT IN 18 MIN	1.00	0.1, 0.3, 0.6
08-ISO-FS2HF-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 2 HR.	1.70E-02	1.70E-02
08-ISO-FS33F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 33 MIN	0.44	9.00E-01
08-ISO-FS40F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 40 MIN	0.13	3.80E-01
08-ISO-FS54F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVENT IN 54 MIN	3.00E-02	3.80E-02
08-ISO-FS55F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVE NT (SM) - 55 MIN.	3.00E-02	0.1, 0.3, 0.6
08-ISO-FS97F-HE	ISOLATE SPRINKLERS DURING FLOOD/FW EVE NT (SM) - 97 MIN.	3.00E-02	3.00E-02

The batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity analyses is in the KNPP.BED file used for quantification.

The model was then quantified as described in Section 4.0 for the base case. KNPP.BED reset the

Human Error Probabilities as shown above.

The quantification is associated with the model. The overall list of cutsets for pipe breaks in the Turbine Building associated with these models are documented in Tables H-1, H-2, and H-3. The Core Damage Probability if the probability for the first isolation following a HELB is set to 0.1 is 7.27E-05. The Core Damage Probability if the probability for the first isolation following a HELB is set to 0.3 is 7.32E-05. The Core Damage Probability if the probability for the first isolation following a HELB is set to 0.6 is 7.34E-05.

Table H-1
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.1

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 7.239E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   9.55E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     3   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     4   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
     5   2.67E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     6   1.09E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     7   9.55E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     8   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     9   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    10   8.40E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    11   7.52E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    12   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
    13   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    14   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    15   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
    16   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    17   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    18   2.94E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05B-CST-SWS--HE   08-ISO-FS40F-HE
    19   2.82E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    20   2.82E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    21   2.73E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    22   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    23   2.14E-007   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS33F-HE
    24   2.09E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
    25   1.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
```

Table H-1 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.1

26	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
27	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
28	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
29	1.56E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
30	1.40E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
31	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
32	1.38E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
33	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
34	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
35	1.10E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
36	9.97E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
37	9.97E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
38	9.92E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
39	8.40E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
40	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
41	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
42	7.57E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
43	7.35E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
44	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
45	5.86E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
46	5.86E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
47	5.74E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
48	5.47E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
49	5.13E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
50	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE

Table H-1 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.1

51	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
52	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
53	4.46E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO29F-HE
54	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
55	3.61E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
56	3.41E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
57	3.41E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
58	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
59	3.13E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
60	3.13E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
61	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
62	2.94E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
63	2.75E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
64	2.75E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
65	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
66	2.38E-008	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
67	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
68	2.24E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
69	2.24E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
70	2.09E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BSVAFW111C-FO	08-ISO-FS40F-HE	
71	2.05E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
72	2.01E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
73	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
74	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
75	1.85E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD49F-HE
		IE-WI06B	05BPM--AFW1B-PR	08-ISO-FS33F-HE

Table H-1 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.1

76	1.84E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
77	1.76E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
78	1.76E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
79	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
80	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
81	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
82	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
83	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
84	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
85	1.53E-008	02-AV-SW4B---FC	IE-SI06B	
86	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
87	1.51E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
88	1.50E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
89	1.44E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
90	1.37E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
91	1.34E-008	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	
92	1.34E-008	IE-CX06B	36--LHS-DIAG-HE	04-CWSTP13-F-HE
93	1.31E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
94	1.31E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
95	1.17E-008	XCOM-AFZ-BTI4	IE-TI06B	36--LHS-DIAG-HE
		08-FPSISO68F-HE		
96	1.16E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
97	1.16E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
98	1.16E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS33F-HE
99	1.16E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRFCRF-HE	08-ISO-FS33F-HE
100	1.14E-008	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPT--AFW1C-PS	02-SW4A-B51F-HE	

Table H-2
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.3

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 7.317E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   9.55E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     3   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     4   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
     5   2.67E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     6   1.09E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     7   9.55E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     8   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     9   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    10   8.40E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    11   7.52E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    12   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
    13   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    14   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    15   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
    16   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    17   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    18   2.94E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05B-CST-SWS--HE   08-ISO-FS40F-HE
    19   2.82E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    20   2.82E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    21   2.73E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    22   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    23   2.14E-007   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS33F-HE
    24   2.09E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
    25   1.91E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
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Table H-2 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.3

26	1.76E-007	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
27	1.76E-007	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
28	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
29	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
30	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
31	1.56E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
32	1.40E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
33	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
34	1.38E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
35	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
36	1.34E-007	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO29F-HE
37	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
38	1.10E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
39	9.97E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
40	9.97E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
41	9.92E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
42	9.39E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
43	9.39E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
44	8.40E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
45	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
46	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
47	7.57E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
48	7.35E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
49	7.13E-008	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
50	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
51	5.74E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	

Table H-2 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.3

52	5.47E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
53	5.13E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
54	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
55	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
56	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
57	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
58	3.61E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
59	3.41E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
60	3.41E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
61	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
62	3.26E-008	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
63	3.26E-008	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
64	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
65	2.94E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
66	2.75E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
67	2.75E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
68	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
69	2.48E-008	IE-WX06B	36--LHS-DIAG-HE	08-ISO-FS55F-HE
70	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
71	2.24E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
72	2.24E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
73	2.09E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BSVAFW111C-FO	08-ISO-FS40F-HE	
74	2.05E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
75	2.01E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
76	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS

Table H-2 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.3

		08-FPISO68F-HE		
77	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
78	1.85E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD49F-HE
		IE-WI06B	05BPM--AFW1B-PR	08-ISO-FS33F-HE
79	1.84E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
80	1.76E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
81	1.76E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
82	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
83	1.73E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
84	1.72E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
85	1.72E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
86	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
87	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
88	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
89	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
90	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
91	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
92	1.53E-008	02-AV-SW4B---FC	IE-SI06B	
93	1.51E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
94	1.50E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
95	1.44E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
96	1.40E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
97	1.40E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
98	1.40E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
99	1.37E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
100	1.34E-008	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	

Table H-3
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.6

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN          Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 10611
   Top event unavailability  (rare event)       = 7.434E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   9.55E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     3   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     4   3.50E-006   IE-CX06B          04-CWSTP25-F-HE
     5   2.67E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     6   1.09E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     7   9.55E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     8   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     9   8.81E-007   IE-CY06B          04-CWSTP66-F-HE
    10   8.40E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    11   7.52E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    12   6.52E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
    13   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    14   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    15   4.59E-007   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
    16   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    17   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    18   3.52E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    19   3.52E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    20   2.94E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05B-CST-SWS--HE   08-ISO-FS40F-HE
    21   2.82E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    22   2.82E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRFCRF-HE   08-ISO-FS33F-HE
    23   2.73E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    24   2.67E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    25   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
```

Table H-3 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.6

26	2.14E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
27	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
28	1.91E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCY064	IE-CY06B	04-CWSTP51-F-HE
29	1.88E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
30	1.88E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
31	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
32	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
33	1.64E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		IE-CY06B	04-CWSTP60-F-HE	
34	1.56E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
35	1.43E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
36	1.40E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
37	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
38	1.38E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
39	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
40	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
41	1.10E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
42	9.97E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
43	9.97E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
44	9.92E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
45	8.40E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
46	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
47	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
48	7.57E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
49	7.35E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
50	6.52E-008	IE-WX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE
51	6.52E-008	IE-WX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS55F-HE

Table H-3 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.6

52	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
53	5.74E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
54	5.47E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
55	5.13E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
56	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
57	4.96E-008	IE-WX06B	36--LHS-DIAG-HE	08-ISO-FS55F-HE
58	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
59	4.69E-008	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
60	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
61	3.61E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
62	3.46E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
63	3.44E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
64	3.44E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	3.41E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
66	3.41E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
67	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
68	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
69	2.94E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
70	2.80E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
71	2.80E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
72	2.80E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
73	2.75E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
74	2.75E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
75	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
76	2.60E-008	IE-TX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR

Table H-3 (continued)
Sensitivity Analysis of HEPs for 38-Minute Window for HELB Isolations
And the HEP for the First Isolation Following a HELB Set to 0.6

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
77	2.60E-008	IE-TX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO1CF-HE
78	2.37E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
79	2.24E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
80	2.24E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRFCRF-HE	08-ISO-FS33F-HE
81	2.09E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BSVAFW111C-FO	08-ISO-FS40F-HE	
82	2.05E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
83	2.01E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
84	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
85	1.98E-008	IE-TX06B	36--LHS-DIAG-HE	08-FPSISO1CF-HE
86	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
87	1.85E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD49F-HE
		IE-WI06B	05BPM--AFW1B-PR	08-ISO-FS33F-HE
88	1.84E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
89	1.84E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
90	1.84E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
91	1.76E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
92	1.76E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
93	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
94	1.68E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
95	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
96	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
97	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
98	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
99	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
100	1.53E-008	02-AV-SW4B---FC	IE-SI06B	

Attachment I

Sensitivity Analyses Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500% and 1000%
Using base line, 0.05 and 0.12 for CW pump trip HEPs in Moderate Circulating Water Break Analysis

Sensitivity analyses were performed to investigate the impact of increasing the circulating water expansion joint medium and small break frequencies by 500% and 1000% along with selected values for HEPs used to model the trip of the Circ water pumps following the moderate circulating water break event. For this sensitivity, a total of six cases were quantified.

The initial two cases varied only the frequency of the circulating water expansion joint failure using base-case values for all HEPs. Directories were created, SDI 051128 EXP JOINTS 5X, for quantification of the sensitivity analysis which increased the circulating water expansion joint break frequencies for medium and small breaks by 500% and SDI 051128 EXP JOINTS 10X, for quantification of the sensitivity analysis which increased the circulating water expansion joint break frequencies for medium and small breaks by 1000%.

The next case was quantified using a value of 0.05 for all HEPs representing failure to trip the circulating water pumps following a moderate circulating water break and with the circulating water expansion joint break frequencies for medium and small breaks increased by 500%, the directory SDI 051128 EXP JOINTS 5X 05 was used.

The fourth case was quantified using a value of 0.12 for all HEPs representing failure to trip the circulating water pumps following a moderate circulating water break and with the circulating water expansion joint break frequencies for medium and small size breaks increased by 500%, the directory SDI 051128 EXP JOINTS 5X 12 was used.

For the fifth case, directory SDI 051128 EXP JOINTS 10X 05 was used. This case was quantified using a value of 0.05 for all HEPs representing failure to trip the circulating water pumps following a moderate circulating water break and with the circulating water expansion joint break frequencies for medium and small size breaks increased by 1000%.

The final case used directory SDI 051128 EXP JOINTS 10X 12 and was quantified using a value of 0.12 for all HEPs representing failure to trip the circulating water pumps following a moderate circulating water break and with the circulating water expansion joint break frequencies for medium and small size breaks increased by 1000%.

A batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only difference between the base case and the sensitivity cases is the increase in the circulating water initiating event frequencies for medium and small breads used for quantification.

Batch job FLOOD.BCL was run using the Event BED File, FLDINIT.BED and KNPP.BED as inputs to create the FLOOD.BED file which was used for the quantification. KNPP.BED contained the basic events for the Kewaunee Nuclear Plant Internal Events PRA. FLDINIT.BED reset the initiating event frequencies for circulating water breaks as shown below:

	Base Case Initiator Frequency	CWI 5X	CWI 10X
CI (Large Circ Water Break)	3.74E-5	Unchanged	Unchanged
CX (Moderate Circ Water)	2.92E-5	1.26E-4	2.48E-4
CY (Small Circ Water)	7.34E-5	3.67E-4	7.34E-4

The total frequency of large breaks in the circulating system inlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of large pipe ruptures, or,

F_{CWIN} = 2.43E-05 per year + 1.31E-05 per year

F_{CWIN} = 3.74E-05 per year.

This remains unchanged from the base case and is used for all sensitivities.

The total frequency of moderate breaks in the circulating system outlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = F_{CWOUTExp} + F_{CWOUTPipe}$.

F_{CWIN} = 2.43E-05 per year + 4.87E-06 per year

F_{CWIN} = 2.92E-05 per year.

The total frequency of moderate breaks in the circulating system outlet piping for the sensitivity analyses is the sum of the frequency of five and ten times the expansion joint ruptures and the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = 5 * F_{CWOUTExp} + F_{CWOUTPipe}$ and $10 * F_{CWOUTExp} + F_{CWOUTPipe}$

F_{CWOUT} = 5 * 2.43E-05 per year + 4.87E-06 per year and 10 * 2.43 + 4.87E-06

F_{CWOUT} = 1.26E-04 per year and 2.48E-04 per year.

The overall list of cutsets for pipe breaks in the Turbine Building associated with these models are documented in Tables E-1 through E-6. The Core Damage Frequency for all 6 cases is presented below. Note that the seismic contribution has been added to the non-seismic CDF to provide the total CDF presented in the table below.

Case	CDF (non-Seismic)	CDF (Seismic)	Total CDF
SDI 051128 Base Case	6.571E-05	6.6E-06	7.231E-05
SDI 051128 EXP JOINTS 5X	8.784E-05	6.6E-06	9.444E-05
SDI 051128 EXP JOINTS 5X 05	7.668E-05	6.6E-06	8.328E-05
SDI 051128 EXP JOINTS 5X 12	8.769E-05	6.6E-06	9.429E-05
SDI 051128 EXP JOINTS 10X	1.157E-04	6.6E-06	1.223E-04
SDI 051128 EXP JOINTS 10X 05	9.369E-05	6.6E-06	1.003E-04
SDI 051128 EXP JOINTS 10X 12	1.154E-04	6.6E-06	1.220E-04

Table I-1
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%

```
==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                                  = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced               = FLOOD.BED
   Number of cut sets in equation                 = 12083
   Top event unavailability  (rare event)         = 8.784E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   1.51E-005   IE-CX06B          04-CWSTP25-F-HE
     3   4.40E-006   IE-CY06B          04-CWSTP66-F-HE
     4   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     5   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     6   2.81E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     7   2.29E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     9   9.56E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    10   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    12   8.20E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    16   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    17   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    18   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    19   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    20   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    21   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    22   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    23   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    24   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    25   2.48E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
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Table I-1 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%

26	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
27	2.34E-007	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
28	2.22E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
29	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
30	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
31	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
32	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
33	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
34	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
35	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
36	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
37	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
38	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
39	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
40	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
41	1.19E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
42	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
43	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
44	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
45	8.67E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
46	8.42E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
47	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
48	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
49	7.59E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
50	7.59E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
51	7.53E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064

Table I-1 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%

		IE-CY06B	04-CWSTP51-F-HE	
52	7.22E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
53	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
54	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
55	5.77E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
56	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
57	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
58	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
59	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
60	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
61	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
62	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
63	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
64	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
65	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
66	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
67	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
68	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
69	3.66E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
70	3.66E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
71	3.50E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
72	3.50E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
73	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
74	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
75	3.24E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	

Table I-1 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%

76	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
77	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
78	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
79	2.95E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
80	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
81	2.92E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
82	2.78E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
83	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
84	2.66E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
85	2.52E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
86	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
87	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
88	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
89	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
90	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
91	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
92	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
93	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
94	2.17E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
95	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
96	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
97	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
98	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
99	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
100	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	

Table I-2
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 12083
   Top event unavailability  (rare event)       = 7.668E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   6.30E-006   IE-CX06B          04-CWSTP25-F-HE
     3   4.40E-006   IE-CY06B          04-CWSTP66-F-HE
     4   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     5   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     6   2.29E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     7   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     8   1.17E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     9   9.56E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    10   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    12   8.20E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    16   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    17   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    18   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    19   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    20   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    21   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    22   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    23   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    24   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    25   2.38E-007   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS18F-HE
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Table I-2 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

26	2.34E-007	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
27	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
28	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
29	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
30	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
31	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
32	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
33	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
34	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
35	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
36	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
37	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
38	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
39	1.19E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
40	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
41	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
42	1.03E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
43	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
44	9.23E-008	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
45	8.42E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
46	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
47	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
48	7.53E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
49	7.22E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
50	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS

Table I-2 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

		08-ISO-FS54F-HE		
51	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
52	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
53	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
54	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
55	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
56	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
57	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
58	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
59	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
60	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
61	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
62	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
63	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
64	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
65	3.66E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
66	3.66E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
67	3.61E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
68	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
69	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
70	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
71	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
72	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
73	2.95E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	

Table I-2 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

74	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
75	2.78E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
76	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
77	2.52E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
78	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
79	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
80	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
81	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
82	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
83	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
84	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
85	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
86	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
87	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
88	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
89	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
90	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
91	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
92	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
93	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
94	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
95	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
96	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
97	1.53E-008	02-AV-SW4B---FC	IE-SI06B	
98	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
99	1.50E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B

Table I-2 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
100	1.46E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE

Table I-3
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 12083
   Top event unavailability  (rare event)       = 8.769E-005
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   1.51E-005   IE-CX06B          04-CWSTP25-F-HE
     3   4.40E-006   IE-CY06B          04-CWSTP66-F-HE
     4   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE  IE-TI06B
                     08-FPSISO68F-HE
     5   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B         08-ISO-FS40F-HE
     6   2.81E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B         04-CWSTP22-F-HE
     7   2.29E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE  IE-CY06B
                     04-CWSTP60-F-HE
     8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE  IE-WI06B
                     08-ISO-FS54F-HE
     9   9.56E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B         04-CWSTP51-F-HE
    10   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B         08-FPSISO56F-HE
    12   8.20E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF  05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE  IE-FI06B
                     08-FPISO68F-HE
    16   5.86E-007   IE-TI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    17   5.86E-007   IE-TI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-FPSISO29F-HE
    18   4.46E-007   36--LHS-DIAG-HE   IE-TI06B         08-FPSISO29F-HE
    19   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4    XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B         08-FPSISO68F-HE
    20   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE  IE-SI06B
                     02-SW4A-B60F-HE
    21   3.13E-007   IE-WI06B          01-CMSIAC1A--PR  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-ISO-FS18F-HE
    22   3.13E-007   IE-WI06B          01-CMSIAC1A--PS  01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE  08-ISO-FS18F-HE
    23   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064    IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    24   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE  XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    25   2.48E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064    IE-CX06B
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Table I-3 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
26	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
27	2.34E-007	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
28	2.22E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
29	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
30	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
31	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
32	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
33	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
34	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
35	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
36	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
37	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
38	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
39	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
40	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
41	1.19E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
42	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
43	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
44	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
45	8.67E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
46	8.42E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
47	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
48	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
49	7.53E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
50	7.22E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS

Table I-3 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

		04-CWSTP60-F-HE		
51	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
52	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
53	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
54	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
55	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
56	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
57	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
58	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
59	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
60	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
61	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
62	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
63	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
64	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
65	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
66	3.66E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
67	3.66E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
68	3.50E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
69	3.50E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
70	3.50E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
71	3.50E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
72	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
73	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	

Table I-3 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

74	3.24E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
75	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
76	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
77	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
78	2.95E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
79	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
80	2.92E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
81	2.78E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
82	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
83	2.66E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
84	2.66E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
85	2.52E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
86	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
87	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
88	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
89	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
90	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
91	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
92	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
93	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
94	2.17E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
95	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
96	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
97	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
98	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
99	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B

Table I-3 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 500%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

		05BPT--AFW1C-PR	08-FPSISO56F-HE	
100	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		

Table I-4
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 13102
   Top event unavailability  (rare event)       = 1.157E-004
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   2.98E-005   IE-CX06B          04-CWSTP25-F-HE
     3   8.81E-006   IE-CY06B          04-CWSTP66-F-HE
     4   5.54E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     5   4.59E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     6   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     7   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     9   1.91E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    10   1.64E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    12   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    16   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    17   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    18   4.88E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
    19   4.69E-007   XCOM-OCCY06BM     XCOM-AFX-2CY4     XCOM-AFZ-BCY4
                     SL21-CD           IE-CY06B          04-CWSTP60-F-HE
    20   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    21   4.36E-007   XCOM-AFZ-BCXB     86-INSTRFCRF-HE   XEQN-AFSCX064
                     IE-CX06B          04-CWSTP22-F-HE
    22   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    23   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    24   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    25   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
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Table I-4 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%

26	2.88E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
27	2.57E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
28	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
29	2.37E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
30	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
31	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
32	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
33	1.71E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
34	1.68E-007	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
35	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
36	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
37	1.51E-007	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
38	1.49E-007	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
39	1.49E-007	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
40	1.44E-007	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
41	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
42	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
43	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
44	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
45	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
46	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
47	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
48	1.14E-007	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
49	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
50	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
51	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	

Table I-4 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%

52	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
53	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
54	7.32E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
55	7.32E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
56	6.90E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
57	6.90E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
58	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
59	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
60	6.39E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
61	5.89E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
62	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
63	5.75E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
64	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
66	5.56E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
67	5.24E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
68	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
69	5.05E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
70	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
71	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
72	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
73	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
74	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
75	4.27E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
76	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE

Table I-4 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%

77	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
78	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
79	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
80	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
81	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
82	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
83	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
84	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
85	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
86	2.89E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
87	2.89E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
88	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
89	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
90	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
91	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
92	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
93	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
94	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
95	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
96	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
97	2.23E-008	05B-FRACTDP-OFF	05B-MDPTD36F-HE	IE-CX06B
		05BPM--AFW1B-PR	04-CWSTP13-F-HE	
98	2.21E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PR	04-CWSTP51-F-HE	
99	2.20E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP45-F-HE
100	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		

Table I-5
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

```
==========================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==========================================================================
  Equation File                                = CDF-TBFLDMIN.EQN
  Basic Event Data file referenced             = FLOOD.BED
  Number of cut sets in equation               = 13102
  Top event unavailability  (rare event)       = 9.369E-005
--------------------------------------------------------------------------
    1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
    2   1.24E-005   IE-CX06B          04-CWSTP25-F-HE
    3   8.81E-006   IE-CY06B          04-CWSTP66-F-HE
    4   4.59E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                    04-CWSTP60-F-HE
    5   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                    08-FPSISO68F-HE
    6   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                    XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
    7   2.31E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                    XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
    8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                    08-ISO-FS54F-HE
    9   1.91E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                    XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
   10   1.64E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                    IE-CY06B          04-CWSTP60-F-HE
   11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                    IE-TI06B          08-FPSISO68F-HE
   12   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                    XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
   13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                    IE-WI06B          08-ISO-FS54F-HE
   14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
   15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                    08-FPISO68F-HE
   16   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
   17   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                    01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
   18   4.69E-007   XCOM-OCCY06BM     XCOM-AFX-2CY4     XCOM-AFZ-BCY4
                    SL21-CD           IE-CY06B          04-CWSTP60-F-HE
   19   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
   20   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                    SL21-CD           IE-TI06B          08-FPSISO68F-HE
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Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

21	3.62E-007	XCOM-AFZ-BSI4	06-NOINDAFWF-HE	IE-SI06B
		02-SW4A-B60F-HE		
22	3.13E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
23	3.13E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
24	2.88E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
25	2.57E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
26	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
27	2.37E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
28	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
29	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
30	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
31	2.03E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PS	04-CWSTP22-F-HE	
32	1.82E-007	XCOM-AFZ-BCXB	86-INSTRFCRF-HE	XEQN-AFSCX064
		IE-CX06B	04-CWSTP22-F-HE	
33	1.68E-007	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
34	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
35	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
36	1.51E-007	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
37	1.44E-007	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
38	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
39	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
40	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
41	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
42	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
43	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
44	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
45	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE

Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

		IE-WI06B	08-ISO-FS54F-HE	
46	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
47	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
48	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
49	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
50	7.32E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
51	7.32E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
52	7.11E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
53	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
54	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
55	5.89E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
56	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
57	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
58	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
59	5.56E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
60	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
61	5.05E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
62	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
63	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
64	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
66	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
67	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
68	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
69	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	

Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

70	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
71	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
72	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
73	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
74	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
75	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
76	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
77	2.89E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
78	2.89E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
79	2.87E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
80	2.87E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
81	2.87E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
82	2.87E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
83	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
84	2.66E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
85	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
86	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
87	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
88	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
89	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
90	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
91	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
92	2.40E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
93	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		

Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.05 value for CW pump trip HEPs in Moderate Circulating Water Break

94	2.21E-008	XCOM-AFZ-BCYB 05BPT--AFW1C-PR	XEQN-AFSCY064 04-CWSTP51-F-HE	IE-CY06B
95	2.20E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP45-F-HE
96	2.18E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
97	2.18E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
98	2.11E-008	IE-TI06B 08-FPSISO29F-HE	01-CMSKPRCCF123	86-INSTRRCRF-HE
99	2.00E-008	XCOM-AFZ-BFI4 08-FPISO68F-HE	IE-FI06B	05BPT--AFW1C-PS
100	1.99E-008	XCOM-AFZ-BCYB 05BMVI-MS102-FO	XEQN-AFSCY064 04-CWSTP51-F-HE	IE-CY06B

Table I-6
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 13102
   Top event unavailability  (rare event)       = 1.154E-004
------------------------------------------------------------------------------
     1   3.73E-005   IE-CI06B          04-CW-TRIP-F-HE
     2   2.98E-005   IE-CX06B          04-CWSTP25-F-HE
     3   8.81E-006   IE-CY06B          04-CWSTP66-F-HE
     4   5.54E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     5   4.59E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     6   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     7   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     8   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     9   1.91E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    10   1.64E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    11   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    12   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    13   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    14   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    15   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    16   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    17   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    18   4.88E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
    19   4.69E-007   XCOM-OCCY06BM     XCOM-AFX-2CY4     XCOM-AFZ-BCY4
                     SL21-CD           IE-CY06B          04-CWSTP60-F-HE
    20   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    21   4.36E-007   XCOM-AFZ-BCXB     86-INSTRFCRF-HE   XEQN-AFSCX064
                     IE-CX06B          04-CWSTP22-F-HE
    22   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    23   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    24   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
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Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
25	3.13E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
26	2.88E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
27	2.57E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
28	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
29	2.37E-007	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
30	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
31	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
32	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
33	1.71E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
34	1.68E-007	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
35	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
36	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
37	1.51E-007	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
38	1.44E-007	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
39	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
40	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
41	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
42	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
43	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
44	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
45	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
46	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
47	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
48	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
49	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE

Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
50	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
51	7.32E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
52	7.32E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
53	6.90E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
54	6.90E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
55	6.90E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
56	6.90E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
57	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
58	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
59	6.39E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
60	5.89E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05B-CST-SWS--HE	04-CWSTP51-F-HE	
61	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
62	5.75E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
63	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
64	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	5.56E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP29-F-HE
66	5.24E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
67	5.24E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
68	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
69	5.05E-008	XCOM-AFZ-BCY4	IE-CY06B	05B-CST-SWS--HE
		04-CWSTP60-F-HE		
70	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
71	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
72	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
73	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
74	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B

Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
75	4.27E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
76	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
77	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
78	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
79	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
80	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
81	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
82	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
83	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
84	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
85	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
86	2.89E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
87	2.89E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP45-F-HE
88	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
89	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
90	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
91	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
92	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
93	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
94	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
95	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
96	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
97	2.21E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PR	04-CWSTP51-F-HE	
98	2.20E-008	36--LHS-DIAG-HE	IE-CY06B	04-CWSTP45-F-HE

Table I-5 (continued)
Sensitivity Analysis Circulating Water Expansion Joint
Medium and Small Break frequency increased by 1000%
0.12 value for CW pump trip HEPs in Moderate Circulating Water Break

99	2.11E-008	IE-TI06B 08-FPSISO29F-HE	01-CMSKPRCCF123	86-INSTRRCRF-HE
100	2.10E-008	XCOM-AFZ-BCXB 05B-CST-DIAG-HE	XEQN-AFSCX064 04-CWSTP22-F-HE	IE-CX06B

Attachment J

Sensitivity Analyses Circulating Water Expansion Joint
Break Frequency using IPE value

Sensitivity analyses were performed to investigate the impact of using the IPE circulating water expansion joint break frequencies for the large, medium and small break sizes. This triple counts the initiating event. A separate run was made assuming the IPE circulating water expansion joint break frequency for the large break size only. The small and medium are set to 0. Separate directories were created, SDI 051116 EXP JOINTS IPE, for quantification of the sensitivity analysis which uses the circulating water expansion joint break frequency from the IPE for large, medium and small break sizes, SDI 051116 EXP JOINTS IPE 0, for quantification of the sensitivity analysis which used the circulating water expansion joint break frequency from the IPE for large break size only with medium and small set to 0. A batch quantification file, IE-FLOODW.IN, was developed to perform all of the quantification steps needed to calculate the CDF. The only differences between the base case and the sensitivity cases is the change in the circulating water initiating event frequencies used for quantification and for the case when CY=0, deleting the CY event tree from the sequence file.

Batch job FLOOD.BCL was run using the Event BED File, FLDINIT.BED and KNPP.BED as inputs to create the FLOOD.BED file which was used for the quantification. KNPP.BED contained the basic events for the Kewaunee Nuclear Plant Internal Events PRA. FLDINIT.BED reset the initiating event frequencies for circulating water breaks as shown below:

	Base Case Initiator Frequency		CWI IPE		CWI IPE 0	
CI (Large Circ Water Break)		3.74E-5		2.13E-4		2.13E-4
CX (Moderate Circ Water)		2.92E-5		2.05E-4		4.87E-6
CY (Small Circ Water)		7.34E-5		2.00E-4		0

The total frequency of large breaks in the circulating system inlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of large pipe ruptures, or,

F_{CWIN} = 2.43E-05 per year + 1.31E-05 per year

F_{CWIN} = 3.74E-05 per year.

The total frequency of large breaks in the circulating system inlet piping for this sensitivity is the pipe break frequency plus the circ water expansion joint break frequency from the IPE.

$F_{CWIN} = F_{CWINExpIPE} + F_{CWINPipe}$

F_{CWIN} = 2.0E-04 per year + 1.31E-05 per year

F_{CWIN} = 2.13E-04 per year.

The total frequency of moderate breaks in the circulating system outlet piping for the base case is the sum of the frequency of expansion joint ruptures and the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = F_{CWOUTExp} + F_{CWOUTPipe}$.

F_{CWIN} = 2.43E-05 per year + 4.87E-06 per year

F_{CWIN} = 2.92E-05 per year.

The total frequency of moderate breaks in the circulating system outlet piping for the sensitivity analyses is the sum of the frequency of five and ten times the expansion joint ruptures and the frequency of moderate pipe ruptures, or,

$F_{CWOUT} = F_{CWOUTExpIPE} + F_{CWOUTPipe}$

F_{CWOUT} = 2.0E-04 per year + 4.87E-06 per year

F_{CWOUT} = 2.05E-04 per year.

With expansion joint failure set to 0, then **F_{CWOUT} = 4.87E-06 per year.**

Because the small size has no pipe contributor, when the IPE value is used, IE-CY06B is the same as the IPE value, 2E-4. When expansion joint frequency is set to 0, the IE-CY06B is 0. This case was run by omitting the CY sequences from the CDFTBFLD sequence file.

The Core Damage Frequency if the circulating water expansion joint break frequencies from the IPE are used for all break sizes is 2.712E-4. The top 100 cutsets for this sensitivity are provided in Table J-1. The Core Damage Frequency if the circulating water expansion joint break frequency from the IPE is used for the large break size only with medium and small break sizes set to 0 is 2.359E-4. The top 100 cutsets for this sensitivity run are provided in Table J-2.

Table J-1

Sensitivity Analysis of Circulating Water Expansion Joint Rupture Frequency Using IPE values for Large, Medium and Small Breaks

```
==========================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==========================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 11931
   Top event unavailability  (rare event)       = 2.712E-004
--------------------------------------------------------------------------
     1   2.13E-004   IE-CI06B          04-CW-TRIP-F-HE
     2   2.46E-005   IE-CX06B          04-CWSTP25-F-HE
     3   4.58E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCX064     IE-CX06B          04-CWSTP22-F-HE
     4   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     5   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     6   2.40E-006   IE-CY06B          04-CWSTP66-F-HE
     7   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     8   1.25E-006   XCOM-AFZ-BCY4     06-NOINDAFWF-HE   IE-CY06B
                     04-CWSTP60-F-HE
     9   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
    10   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
    11   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
    12   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
    13   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    14   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    15   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    16   5.21E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     XEQN-AFSCY064     IE-CY06B          04-CWSTP51-F-HE
    17   4.47E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD36F-HE
                     IE-CY06B          04-CWSTP60-F-HE
    18   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    19   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    20   4.03E-007   XCOM-AFZ-BCXB     XEQN-AFSCX064     IE-CX06B
                     05BPT--AFW1C-PS   04-CWSTP22-F-HE
    21   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    22   3.60E-007   XCOM-AFZ-BCXB     86-INSTRFCRF-HE   XEQN-AFSCX064
                     IE-CX06B          04-CWSTP22-F-HE
    23   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    24   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    25   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
```

Table J-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture Frequency Using IPE values for Large, Medium and Small Breaks

		05BPT--AFW1C-PS	08-ISO-FS40F-HE	
26	2.57E-007	XCOM-AFZ-BWIB	86-INSTRFCRF-HE	XEQN-AFSWI064
		IE-WI06B	08-ISO-FS40F-HE	
27	2.38E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS18F-HE
28	2.21E-007	XCOM-AFX-2TI4	XCOM-AFZ-BTI4	06--OC6----F-HE
		IE-TI06B	08-FPSISO68F-HE	
29	2.15E-007	XCOM-OCWI06BM	XCOM-AFX-2WI4	XCOM-AFZ-BWI4
		SL21-CD	IE-WI06B	08-ISO-FS54F-HE
30	2.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSFI064	IE-FI06B	08-FPISO56-F-HE
31	1.64E-007	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
32	1.64E-007	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
33	1.41E-007	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-SWS--HE	04-CWSTP22-F-HE	
34	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
35	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
36	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
37	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
38	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
39	1.28E-007	XCOM-OCCY06BM	XCOM-AFX-2CY4	XCOM-AFZ-BCY4
		SL21-CD	IE-CY06B	04-CWSTP60-F-HE
40	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
41	1.24E-007	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
42	1.24E-007	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP13-F-HE
43	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
44	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
45	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
46	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
47	9.39E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP13-F-HE
48	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
49	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
50	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
51	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4

Table J-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture Frequency Using IPE values for Large, Medium and Small Breaks

		SL21-CD	IE-FI06B	08-FPISO68F-HE
52	6.47E-008	XCOM-AFX-2CY4	XCOM-AFZ-BCY4	06--OC6----F-HE
		IE-CY06B	04-CWSTP60-F-HE	
53	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
54	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
55	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
56	5.70E-008	IE-CX06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
57	5.70E-008	IE-CX06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	04-CWSTP19-F-HE
58	5.28E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BPT--AFW1C-PR	04-CWSTP22-F-HE	
59	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
60	4.76E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05BMVI-MS102-FO	04-CWSTP22-F-HE	
61	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
62	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
63	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
64	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
66	4.59E-008	XCOM-AFZ-BCYB	XEQN-AFSCY064	IE-CY06B
		05BPT--AFW1C-PS	04-CWSTP51-F-HE	
67	4.33E-008	36--LHS-DIAG-HE	IE-CX06B	04-CWSTP19-F-HE
68	4.10E-008	XCOM-AFZ-BCYB	86-INSTRFCRF-HE	XEQN-AFSCY064
		IE-CY06B	04-CWSTP51-F-HE	
69	3.93E-008	XCOM-AFZ-BCY4	IE-CY06B	05BPT--AFW1C-PS
		04-CWSTP60-F-HE		
70	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
71	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
72	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
73	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
74	3.53E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		36--LHS-DIAG-HE	04-CWSTP22-F-HE	
75	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	

Table J-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture Frequency Using IPE values for Large, Medium and Small Breaks

76	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
77	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
78	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
79	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
80	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
81	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
82	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
83	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
84	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
85	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
86	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
87	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
88	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
89	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
90	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
91	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
92	1.99E-008	IE-CY06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
93	1.99E-008	IE-CY06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	04-CWSTP29-F-HE
94	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
95	1.84E-008	05B-FRACTDP-OFF	05B-MDPTD36F-HE	IE-CX06B
		05BPM--AFW1B-PR	04-CWSTP13-F-HE	
96	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
97	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
98	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
99	1.73E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B
		05B-CST-DIAG-HE	04-CWSTP22-F-HE	
100	1.63E-008	XCOM-AFZ-BCXB	XEQN-AFSCX064	IE-CX06B

Table J-1 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture Frequency Using IPE values for Large, Medium and Small Breaks

05BFAFWA-CAL-AE 04-CWSTP22-F-HE

Table J-2
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Using IPE values for Large Breaks, 0 for Medium and Small Breaks

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==============================================================================
WinNUPRA 3.0 Production      File: CDF-TBFLDMIN     Licensed to: KEWAUNEE
==============================================================================
   Equation File                                = CDF-TBFLDMIN.EQN
   Basic Event Data file referenced             = FLOOD.BED
   Number of cut sets in equation               = 8850
   Top event unavailability  (rare event)       = 2.359E-004
------------------------------------------------------------------------------
     1   2.13E-004   IE-CI06B          04-CW-TRIP-F-HE
     2   4.26E-006   XCOM-AFZ-BTI4     06-NOINDAFWF-HE   IE-TI06B
                     08-FPSISO68F-HE
     3   3.27E-006   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     XEQN-AFSWI064     IE-WI06B          08-ISO-FS40F-HE
     4   2.11E-006   XCOM-AFZ-BWI4     06-NOINDAFWF-HE   IE-WI06B
                     08-ISO-FS54F-HE
     5   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     IE-TI06B          08-FPSISO68F-HE
     6   9.32E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSTI064     IE-TI06B          08-FPSISO56F-HE
     7   7.54E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD49F-HE
                     IE-WI06B          08-ISO-FS54F-HE
     8   6.44E-007   IE-SI06B          02-SW4A-B66F-HE
     9   6.36E-007   XCOM-AFZ-BFI4     06-NOINDAFWF-HE   IE-FI06B
                     08-FPISO68F-HE
    10   5.86E-007   IE-TI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    11   5.86E-007   IE-TI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPSISO29F-HE
    12   5.84E-007   IE-CX06B          04-CWSTP25-F-HE
    13   4.46E-007   36--LHS-DIAG-HE   IE-TI06B          08-FPSISO29F-HE
    14   4.35E-007   XCOM-OCTI06BM     XCOM-AFX-2TI4     XCOM-AFZ-BTI4
                     SL21-CD           IE-TI06B          08-FPSISO68F-HE
    15   3.62E-007   XCOM-AFZ-BSI4     06-NOINDAFWF-HE   IE-SI06B
                     02-SW4A-B60F-HE
    16   3.13E-007   IE-WI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    17   3.13E-007   IE-WI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-ISO-FS18F-HE
    18   2.88E-007   XCOM-AFZ-BWIB     XEQN-AFSWI064     IE-WI06B
                     05BPT--AFW1C-PS   08-ISO-FS40F-HE
    19   2.57E-007   XCOM-AFZ-BWIB     86-INSTRFCRF-HE   XEQN-AFSWI064
                     IE-WI06B          08-ISO-FS40F-HE
    20   2.38E-007   36--LHS-DIAG-HE   IE-WI06B          08-ISO-FS18F-HE
    21   2.21E-007   XCOM-AFX-2TI4     XCOM-AFZ-BTI4     06--OC6----F-HE
                     IE-TI06B          08-FPSISO68F-HE
    22   2.15E-007   XCOM-OCWI06BM     XCOM-AFX-2WI4     XCOM-AFZ-BWI4
                     SL21-CD           IE-WI06B          08-ISO-FS54F-HE
    23   2.09E-007   05B-BYALOP-F-HE   05B-FRACTDP-OFF   05B-MDPTD61F-HE
                     XEQN-AFSFI064     IE-FI06B          08-FPISO56-F-HE
    24   1.64E-007   IE-FI06B          01-CMSIAC1A--PS   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPISO29-F-HE
    25   1.64E-007   IE-FI06B          01-CMSIAC1A--PR   01-CMSIAC1B--PR
                     01-CMSIAC1C--PR   86-INSTRRCRF-HE   08-FPISO29-F-HE
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Table J-2 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Using IPE values for Large Breaks, 0 for Medium and Small Breaks

26	1.39E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-FI06B	08-FPISO68F-HE	
27	1.38E-007	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
28	1.38E-007	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
29	1.34E-007	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PS	08-FPSISO56F-HE	
30	1.34E-007	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PS
		08-FPSISO68F-HE		
31	1.25E-007	36--LHS-DIAG-HE	IE-FI06B	08-FPISO29-F-HE
32	1.20E-007	XCOM-AFZ-BTIB	86-INSTRFCRF-HE	XEQN-AFSTI064
		IE-TI06B	08-FPSISO56F-HE	
33	1.09E-007	XCOM-AFX-2WI4	XCOM-AFZ-BWI4	06--OC6----F-HE
		IE-WI06B	08-ISO-FS54F-HE	
34	1.09E-007	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD36F-HE
		XEQN-AFSCX064	IE-CX06B	04-CWSTP22-F-HE
35	1.05E-007	36--LHS-DIAG-HE	IE-WI06B	08-ISO-FS33F-HE
36	1.01E-007	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-SWS--HE	08-ISO-FS40F-HE	
37	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		XEQN-AFSSI064	IE-SI06B	02-SW4A-B51F-HE
38	7.91E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD61F-HE
		IE-SI06B	02-SW4A-B60F-HE	
39	6.64E-008	XCOM-AFZ-BWI4	IE-WI06B	05BPT--AFW1C-PS
		08-ISO-FS54F-HE		
40	6.50E-008	XCOM-OCFI06BM	XCOM-AFX-2FI4	XCOM-AFZ-BFI4
		SL21-CD	IE-FI06B	08-FPISO68F-HE
41	5.76E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-TI06B
		05BPM--AFW1B-PR	08-FPSISO29F-HE	
42	5.74E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
43	5.74E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
44	5.05E-008	05B-BYALOP-F-HE	05B-FRACTDP-OFF	05B-MDPTD1CF-HE
		XEQN-AFSWX064	IE-WX06B	08-ISO-FS2HF-HE
45	4.69E-008	XCOM-AFZ-BTI4	IE-TI06B	05B-CST-SWS--HE
		08-FPSISO68F-HE		
46	4.69E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05B-CST-SWS--HE	08-FPSISO56F-HE	
47	4.67E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
48	4.67E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPSISO29F-HE
49	4.66E-008	05B-FRACTDP-OFF	05B-MDPTD49F-HE	IE-WI06B
		05BPM--AFW1B-PR	08-ISO-FS18F-HE	
50	3.87E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
51	3.87E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR

Table J-2 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Using IPE values for Large Breaks, 0 for Medium and Small Breaks

		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-FPSISO45F-HE
52	3.77E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BPT--AFW1C-PR	08-ISO-FS40F-HE	
53	3.69E-008	XCOM-OCSI06BM	XCOM-AFX-2SI4	XCOM-AFZ-BSI4
		SL21-CD	IE-SI06B	02-SW4A-B60F-HE
54	3.39E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BMVI-MS102-FO	08-ISO-FS40F-HE	
55	3.29E-008	XCOM-AFX-2FI4	XCOM-AFZ-BFI4	06--OC6----F-HE
		IE-FI06B	08-FPISO68F-HE	
56	3.06E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
57	3.06E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
58	3.00E-008	XCOM-AFZ-BFIB	XEQN-AFSFI064	IE-FI06B
		05BPT--AFW1C-PS	08-FPISO56-F-HE	
59	2.94E-008	36--LHS-DIAG-HE	IE-TI06B	08-FPSISO45F-HE
60	2.68E-008	XCOM-AFZ-BFIB	86-INSTRFCRF-HE	XEQN-AFSFI064
		IE-FI06B	08-FPISO56-F-HE	
61	2.52E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		36--LHS-DIAG-HE	08-ISO-FS40F-HE	
62	2.49E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
63	2.49E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-ISO-FS18F-HE
64	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
65	2.41E-008	IE-TI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
66	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
67	2.41E-008	IE-TI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-FPSISO29F-HE
68	2.32E-008	XCOM-AFZ-BWI4	IE-WI06B	05B-CST-SWS--HE
		08-ISO-FS54F-HE		
69	2.11E-008	IE-TI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-FPSISO29F-HE		
70	2.00E-008	XCOM-AFZ-BFI4	IE-FI06B	05BPT--AFW1C-PS
		08-FPISO68F-HE		
71	1.87E-008	XCOM-AFX-2SI4	XCOM-AFZ-BSI4	06--OC6----F-HE
		IE-SI06B	02-SW4A-B60F-HE	
72	1.82E-008	IE-TI06B	01-CMSIAC1A--TM	01-CMSIAC1B--PR
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPSISO29F-HE
73	1.76E-008	XCOM-AFZ-BTI4	IE-TI06B	05BPT--AFW1C-PR
		08-FPSISO68F-HE		
74	1.76E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BPT--AFW1C-PR	08-FPSISO56F-HE	
75	1.61E-008	05B-FRACTDP-OFF	05B-MDPTD61F-HE	IE-FI06B
		05BPM--AFW1B-PR	08-FPISO29-F-HE	
76	1.61E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM

Table J-2 (continued)
Sensitivity Analysis of Circulating Water Expansion Joint Rupture
Frequency Using IPE values for Large Breaks, 0 for Medium and Small Breaks

		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
77	1.61E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-FPISO29-F-HE
78	1.58E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		05BMVI-MS102-FO	08-FPSISO56F-HE	
79	1.58E-008	XCOM-AFZ-BTI4	IE-TI06B	05BMVI-MS102-FO
		08-FPSISO68F-HE		
80	1.53E-008	02-AV-SW4A---FC	IE-SI06B	
81	1.53E-008	02-AV-SW4B---FC	IE-SI06B	
82	1.50E-008	XCOM-AFZ-BWXB	XEQN-AFSWX064	IE-WX06B
		05BPT--AFW1C-PS	08-ISO-FS2HF-HE	
83	1.35E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
84	1.35E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--TM
		01-CMSIAC1C--PR	86-INSTRFCRF-HE	08-ISO-FS33F-HE
85	1.34E-008	XCOM-AFZ-BWXB	86-INSTRFCRF-HE	XEQN-AFSWX064
		IE-WX06B	08-ISO-FS2HF-HE	
86	1.31E-008	IE-FI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
87	1.31E-008	IE-FI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--TM	86-INSTRRCRF-HE	08-FPISO29-F-HE
88	1.29E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
89	1.29E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PS
		01-CMSIAC1C--PR	86-INSTRRCRF-HE	08-ISO-FS18F-HE
90	1.29E-008	IE-WI06B	01-CMSIAC1A--PS	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
91	1.29E-008	IE-WI06B	01-CMSIAC1A--PR	01-CMSIAC1B--PR
		01-CMSIAC1C--PS	86-INSTRRCRF-HE	08-ISO-FS18F-HE
92	1.24E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05B-CST-DIAG-HE	08-ISO-FS40F-HE	
93	1.17E-008	XCOM-AFZ-BTI4	IE-TI06B	36--LHS-DIAG-HE
		08-FPSISO68F-HE		
94	1.17E-008	XCOM-AFZ-BTIB	XEQN-AFSTI064	IE-TI06B
		36--LHS-DIAG-HE	08-FPSISO56F-HE	
95	1.17E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWB-CAL-AE	08-ISO-FS40F-HE	
96	1.17E-008	XCOM-AFZ-BWIB	XEQN-AFSWI064	IE-WI06B
		05BFAFWA-CAL-AE	08-ISO-FS40F-HE	
97	1.14E-008	XCOM-AFZ-BSIB	XEQN-AFSSI064	IE-SI06B
		05BPT--AFW1C-PS	02-SW4A-B51F-HE	
98	1.14E-008	XCOM-AFZ-BSI4	IE-SI06B	05BPT--AFW1C-PS
		02-SW4A-B60F-HE		
99	1.13E-008	XEQN-AFSTX064	IE-TX06B	05BPT--AFW1C-PS
		08-FPSISO3CF-HE		
100	1.13E-008	IE-WI06B	01-CMSKPRCCF123	86-INSTRRCRF-HE
		08-ISO-FS18F-HE		

Appendix F

Seismic Analysis

Seismic Analysis

Prepared by: Edward D Coen — Edward D. Coen
Signature — Print Name

10/28/05
Date

Reviewed by: David Moore by telephone ESE — David L Moore
Signature — Print Name

10/28/05
Date

1.0 DESCRIPTION

This analysis provides an evaluation of the potential risk from turbine building floods initiated by seismic events. The objective is to support the Significance Determination Process (SDP) associated with the turbine building flooding issue. It concerns the seismic initiator only.

The sections of this evaluation are organized as follows:

1. Introduction
2. Methodology
3. Seismic Hazard
4. Fragilities of Equipment and Structures
5. Plant and Systems Model
6. Quantification
7. Sensitivity Analyses

2.0 METHODOLOGY

This evaluation uses seismic probabilistic safety assessment (SPSA) methods to determine the potential core damage frequency from seismic initiated turbine building floods. The major steps in this evaluation are:

- Development of the seismic hazard
- Development of the fragilities of equipment and structures
- Development of event tree and fault tree models (or logic equations) for the plant systems, and development of human error probabilities (HEPs) including potential seismic stresses
- Quantification of the core damage frequency (CDF) using the above information

In addition, sensitivity analyses or qualitative assessments are performed to evaluate the impacts of uncertainties and conservatisms in the seismic models.

3.0 SEISMIC HAZARD

The size of a seismic event can be measured by the peak level of acceleration of the ground at the site, usually measured in units of "g." The seismic hazard for the site is expressed as the frequency of exceedance of the earthquake peak ground accelerations (pga). The mean seismic hazard, which incorporates the uncertainties of the seismic hazard parameters, is used for this evaluation, as permitted in NUREG-1407 (NRC, 1991). The most recent Kewaunee site seismic hazards were calculated by EPRI (EPRI, 1989) and by LLNL (NUREG-1488, NRC, 1994). For this SPSA, the EPRI mean seismic hazard, provided in Table 3-1, is used as the baseline. The LLNL mean seismic hazard, provided in Table 3-2, is used for a sensitivity study. The two mean hazard curves are compared in Figure 3-1. Further documentation of the methods and results are provided in the above references.

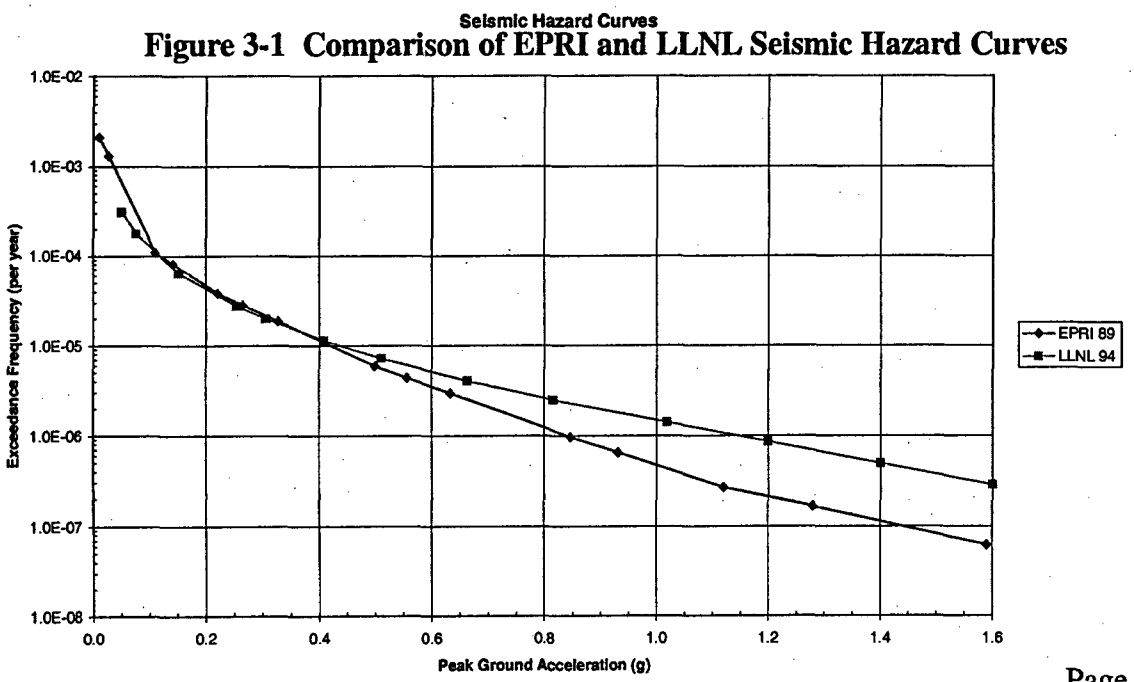
Table 3-1 EPRI Seismic Hazard

PGA (g)	Exceedance Frequency
0.110	1.10E-04
0.142	8.12E-05
0.221	3.80E-05
0.265	2.84E-05
0.327	1.87E-05
0.499	5.90E-06
0.555	4.41E-06
0.633	2.94E-06
0.846	9.60E-07
0.931	6.50E-07
1.120	2.70E-07
1.280	1.66E-07
1.590	6.20E-08

Table 3-2 LLNL Seismic Hazard

PGA (g)	Exceedance Frequency
0.011	2.10E-03
0.027	1.30E-03
0.050	3.10E-04
0.051	3.04E-04
0.077	1.78E-04
0.153	6.42E-05
0.255	2.75E-05
0.306	1.98E-05
0.408	1.14E-05
0.510	7.21E-06
0.663	4.04E-06
0.816	2.47E-06
1.020	1.41E-06
1.200	8.60E-07
1.400	4.96E-07
1.600	2.86E-07

Figure 3-1 Comparison of EPRI and LLNL Seismic Hazard Curves



4.0 FRAGILITIES OF EQUIPMENT, COMPONENTS AND STRUCTURES

As equipment, components or structures are subjected to increasing levels of seismic ground motion, there is an increased probability of their failure. The fragility of equipment (or a component or structure) provides a mathematical model of the probability of failure of the equipment when subjected to increasing levels of seismic peak ground acceleration. This fragility is expressed as a median acceleration level (A_m), or median capacity, expressed in units of "g," and an associated uncertainty estimator (β_c) that describes the level of uncertainty in estimating the median capacity.

For this SDP, the seismic fragilities were calculated by Stevenson & Associates (Stevenson & Associates, 2005). The systems (potential flood sources) evaluated are:

- Circulating Water (CW) - including Turbine Building Cooling and Water Box Priming/Venting
- Condensate (CD) - including Condenser Make-Up/Dump and AFW Pump Supply
- Feedwater (FW)
- Fire Protection - Water System (FP)
- Heater & Moisture Separator Drain Piping (HD)
- Service Water (SW)
- Service Water Pre-Treatment (SWPT)
- Steam Generator Blowdown (SGB)
- Steam Generator Blowdown Treatment (SGBT)
- Water Treatment (MUP) - including Demineralized Water to/from the Condensate Storage Tanks, supply piping to the Caustic & Sulfuric Acid systems, and Anion, Cation, & Mixed Bed exchangers, and the potable water system

Only the portions of these systems within the following plant areas are evaluated:

- Turbine Building, elevations 586', 606', 626'
- Administration Building, elevation 586' (Diesel Generator Rooms)
- Auxiliary Building, south of column line 4 on elevations 586', 606', 626', and south of column line 3 on elevation 642'
- Tank Storage Building, elevation 606', which houses the Condensate Storage Tanks and the Reactor Makeup Water Storage Tanks

These plant areas are essentially all of the power block on the Turbine Building side of the SV (Special Ventilation) boundary. It was assumed that a system rupture inside the SV boundary would not result in significant flooding in the Turbine Building.

4.1 Seismic Fragilities Methodology

The general method for developing the seismic fragility values is:

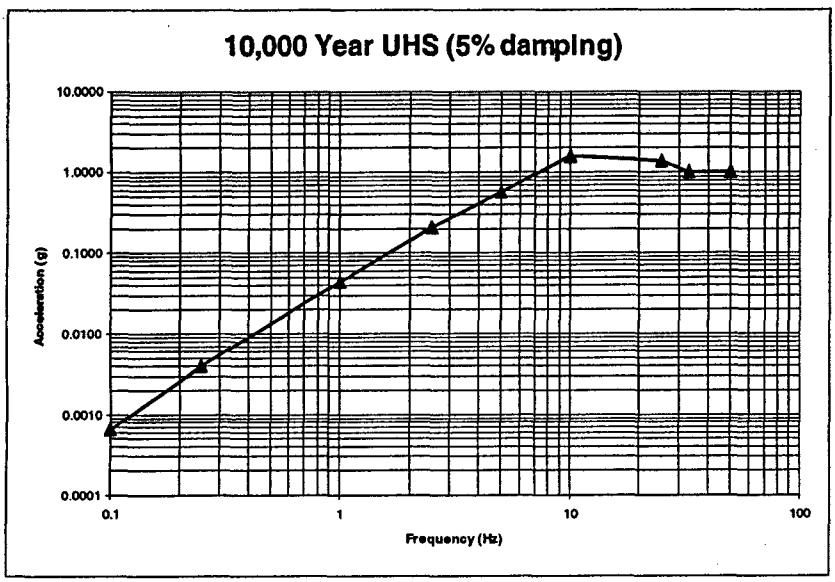
- Determine the portion of the subject system that is within the plant areas listed above using plant flow diagrams and walkdowns. Seismically qualified portions are screened since they have a high seismic capacity, and would not contribute to the flooding risk.
- Organize the non-seismically qualified piping on the flow diagrams into segments. Each pipe segment is identified using the number of the first valve on the segment.
- Walk down each pipe segment to identify any conditions that would result in a reduced seismic capacity, such as:
    - An unusual geometry that would concentrate large inertial loads in a local area
    - Branch pipes with stiff lateral supports connected to run pipes with flexible lateral supports
    - Dead weight supports that are vulnerable to lateral loads, such as short threaded rods with fixed end conditions, beam clamps, vertical stanchions where the pipe could move laterally and fall off, and poorly detailed or poorly constructed supports
    - Non-ductile components such as cast iron valves or fittings, threaded fittings, or victaulic couplings
    - Field-fabricated fittings that could result in high stress concentrations
    - Potential seismic interaction hazards such as unanchored equipment or masonry block walls
- Walk down each item of equipment, and either screen it based on a high seismic capacity, or identify the equipment as requiring further evaluation. The walkdown included consideration of any seismic interaction hazards such as masonry block walls.
- Establish median seismic capacities, and associated uncertainty estimates, based on the guidance provided in EPRI NP-6041 (EPRI, 1991) and EPRI TR-103959 (EPRI, 1994), using one of the following approaches:
    - For equipment and masonry walls that could be screened using EPRI NP-6041, the resulting HCLPF (High Confidence Low Probability of Failure) was converted to a median capacity. For instance, all concrete and steel structures of interest were screened.
    - For non-screened equipment and block walls, a HCLPF capacity using CDFM (Conservative Deterministic Failure Methodology) criteria was calculated, then converted to a median capacity. The composite variability (beta coefficient) was developed on a generic basis, and determined to be 0.4 for all equipment and block walls.
    - For all piping segments, median capacities were directly calculated based on establishing median capacity evaluation criteria by applying median properties to all relevant parameters, such as material properties, ductility, load combinations, and strength factors. Detailed piping models were developed for critical piping such as fire protection and service water. The composite variability (beta coefficient) was developed on a generic basis, and determined to be 0.5 for all piping segments.

Note that the determination of the fragility for a piping segment includes consideration of the pipe/support fragility, the fragility of attached equipment, and the impact on fragility parameters due to any seismic interaction hazards.

More detail on the calculation of fragilities is contained in the fragilities report (Stevenson & Associates, 2005).

4.2 Seismic Demand

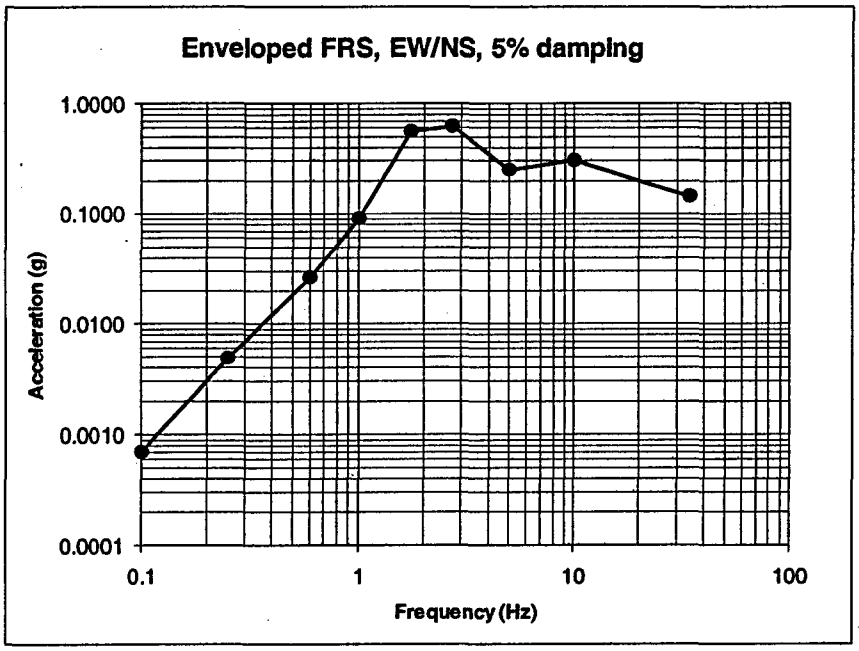
The ground response spectral shape is the Kewaunee median (50% non-exceedance probability) EPRI uniform hazard spectrum (UHS) corresponding to the 10,000 year return period as published in EPRI NP-6395-D (EPRI, 1989). The shape is shown below normalized to a peak ground acceleration (pga) of 1g.



Freq (Hz)	Acc. (g)
0.10	0.000660
0.25	0.00412
1.00	0.0440
2.50	0.208
5.00	0.581
10.00	1.55
25.00	1.39
33.00	1.00
50.00	1.00

Since rod hung piping systems can have frequencies less than 1 Hz, the low frequency portion of the spectral shape was established by linearly extrapolating (on a log-log basis) from 1 Hz down to 0.25 Hz, and assuming the region below 0.25 Hz to be constant displacement. The low frequency content of this ground spectrum is small. For a 1g pga, the constant displacement value is 0.64". This will result in relatively high capacities for low frequency components such as rod hung piping systems.

The floor response spectrum (FRS) corresponding to the above ground response spectrum (GRS) was calculated using the Blume structural model (Blume, 1971), which was used to develop the original design basis FRS. The model response is dominated by soil modes; as a result, the FRS do not vary greatly between elevations or as a function of direction. This allows, without adding undue conservatism, the FRS at all elevations evaluated to be represented by the envelope of the individual FRS. That single FRS is shown below.



Freq (Hz)	Acc. (g)
0.1	0.000705
0.25	0.00484
0.60	0.0262
1.00	0.0904
1.75	0.554
2.70	0.632
5.00	0.246
10.00	0.304
34.00	0.143

The Blume model did not consider any vertical soil springs or vertical building flexibility. For simplicity, 2/3 of the above horizontal FRS is conservatively used as the vertical FRS.

The condensate storage tanks (CSTs) and reactor makeup water storage tanks (RMSTs) are directly founded on compacted fill. As such, they are not evaluated based on the above FRS, rather the seismic accelerations determined from a detailed soil-structure interaction (SSI) analysis are used.

4.3 Seismic Fragility Results and Screening

The fragility analysis was very extensive, with reviews of 91 equipment and tank items, 12 masonry block walls, and 566 piping segments. Therefore, a probabilistic screening criterion was developed to screen out those items that could not contribute significantly to the overall seismic flooding CDF. Based on guidance in the ANS Standard for External Events PRA Methodology (ANS, 2003), a criterion of <1E-07/year potential frequency was selected as the screening frequency. That is, if a component has a seismic failure frequency of less than 1E-7/y, then it cannot contribute more than 1E-7/y to the overall core damage frequency. In fact, this is conservative, since most of the component failures would not directly cause core damage (that is, one or more additional component failures or operator errors would be required for core damage to occur). Therefore, their contribution could be much less than 1E-7/y. Using the EPRI seismic hazard curve presented in Section 3, the following median capacities (A_m) and uncertainty estimators ($ß_c$) corresponding to less than 1E-07/y were calculated:

Equipment, tanks, and block walls:	$A_m = 1.9g$	$ß_c = 0.4$	Frequency = 8.76E-08/y
Piping segments:	$A_m = 2.2g$	$ß_c = 0.5$	Frequency = 9.93E-08/y

The difference in the median capacity screening values is due to the impact of the beta uncertainty estimators. For the same median capacity (A_m), there is an increase in frequency with higher uncertainty (β_c).

In nuclear plants, experience has shown that most of the equipment, block walls, and piping segments have high seismic capacity due to safety margins and conservative design and installation criteria. For KPS, most of the investigated equipment, block walls, and piping segments were screened from further analysis based on their high seismic capacity. As mentioned before, all of the relevant structures, including the Turbine Building, were screened.

The equipment, block walls, and piping segments that were not screened using the 1E-07/y criterion are listed in Table 4-1 and Attachment 2. Table 4-1 includes all components that are included with seismic failures in the seismic flooding model and quantification. Attachment 2 lists components that would not contribute to seismic flooding risk, and provides the reason. For example, the piping segment may have insignificant (or no) flow due to its small size, or due to the loss of offsite power (LOSP). If the component is a small tank, its volume may not be significant compared to other flooding sources. The components in Attachment 2 are not in the seismic model since they would not impact the results.

Table 4-1 provides a summary table of the 29 components whose seismic failures are included in the seismic flooding model. The component descriptions and fragilities are detailed in the fragilities report (Stevenson & Associates, 2005). Volumes of tanks, hotwell, and main condenser are given in Attachments 3 and 6. Flows are calculated using the following formula:

$$Q = \frac{7.48 * 60}{12} \frac{\pi D^2}{4} \frac{\sqrt{2gP}}{\rho}$$

Where: Q is the volumetric flow rate in gallons/min

7.48 *60/12 is the conversion factor between gallons and cubic feet, between seconds and minutes, and between inches and feet

D is the break diameter in inches

g is the gravitational constant = 32.17 ft/sec^2

P is the pressure in psig

ρ is the density in lbm/ft^3 = 62.22 for 80°F water

The break diameter is assumed to be the nominal diameter of the piping, and conservatively does not include the reduction in area due to the pipe wall thickness. The piping pressure for fire protection (FP) and service water (SW) are from the System Descriptions (SD 08, Rev 2, Fire Protection System (FP), 5/23/2002; SD 02, Rev 3, Service Water System (SW), 3/10/2004).

As seen in Table 4-1, only 3 components have median seismic capacities less than 1.0g:

- FP335 (A_m = 0.42g): This is a 2" fire protection branch line from the main header in the Turbine Building to the hydrogen cooler wet system. Its failure would result in a flow of 1,336gpm into the Turbine Building.

- RMST (A_m = 0.54g): These are the two Reactor Make-up Water Storage Tanks, located in the Tank Storage Building. Each tank has a capacity of 40,000 gal. Failures of the two tanks are correlated as a single failure, since they are similarly designed, constructed, and located.

- CST (A_m = 0.67g): These are the two Condensate Storage Tanks, located in the Tank Storage Building. Each tank has a capacity of 75,000 gal, and is about 93% full on average (Kewaunee Evaluation X10068), for an expected volume of 70,000 gal each. Failures of the two CSTs are correlated as a single failure. When conservative in the quantitative analysis, failure of both CSTs and both RMSTs are correlated as well.

Note that it was conservatively assumed that the entire contents of the RMSTs and CSTs would drain into the basement of the Turbine Building (and Aux Building lower area). To reach the Turbine Building basement, this water would either drain into the piping trench in the Tank Storage Building, and then break through a marinite fire barrier to spill into the Turbine Building basement, or would fail a fire door (that opens inward into the Tank Storage Building from the Aux Building) or a masonry block wall (with a screened A_m = 2.9g), and then spill down a stairwell into the basement. Since there is also a door on the west side of the Tank Storage Building that opens outward into the yard area (and would therefore be expected to fail before the door that opens inward), a significant amount of water could be routed away from the Turbine Building basement. This potential diversion of water away from the Turbine Building flooding scenarios was neglected, and could be a major conservatism in the overall seismic flooding analysis.

Of the remaining 26 components, about one-half have median capacities greater than 1.5g, and would not be expected to contribute significantly to seismic flooding risk, but are still included in the flooding model. For piping segments, only fire protection, service water (including the supply to the service water pre-treatment system), and the condensate piping at the pump expansion joints are included in the list of significant flooding sources. All other piping systems were determined to be insignificant to flooding risk, either due to high seismic capacity, or low potential flow rates. In particular, the feedwater piping and equipment was determined to have high seismic capacity, and could be screened out of the seismic flooding analysis. Note that several piping segments are grouped together and correlated as single failures, based on similar design and location. These correlations are indicated in Table 4-1, and the combined flows are used for the analysis.

There are other piping segments where some correlation could be postulated, but was not assumed since that correlation would result in reduced risk. One example is piping segments SW2800, SW2820, and SW2810 (items 4, 5, and 6 on Table 4-1). Since they are connected, the failure of one or all three would release the same flow. If correlated, there would only be one failure event in the seismic model. By leaving them uncorrelated, it provides 3 separate failure events that are assumed to be independent, and thus increases the seismic flooding CDF. A

second example where correlation would reduce risk is the piping segments SW2501AB and SW2500 (items 16 and 21 in Table 4-1). These segments are the supply and discharge for the exciter air cooler, and failures of either or both result in the same flow. Rather than correlate them to one failure, it is conservative to include them as two independent failures.

Failure of the condensate pump piping expansion joints will drain the hotwell of the main condensers, resulting in a release of 48,000 gal (see Attachment 3). However, there would be no other flow from the condensate system since offsite power to the condensate pumps is failed, and there are check valves to prevent backflow through the pumps. Offsite power would be lost before the failure of the condensate piping expansion joints since the generic seismic capacity of offsite power is about $A_m = 0.3g$, which is much smaller than the 2.2g for the expansion joints.

For tanks, in addition to the RMSTs and CSTs discussed above, the following assumptions were made:

- SGBT-HMT ($A_m = 1.41g$): These 4 tanks each have a capacity of 10,000 gal, and are located in the Aux Building, but could drain into the Turbine Building. It was assumed that failure of all 4 of these tanks is correlated, resulting in a total spill volume of 40,000 gal.

- MAIN-COND ($A_m = 1.87g$): These two condensers have a combined hotwell capacity of 48,000 gal (above the Turbine Building basement floor 586' elevation) (see Attachment 3). The critical failure mode of the condensers is movement, which is then assumed to fail the condensers and drain the hotwell, as well as failing attached lines. In particular, it is assumed that the Circulating Water (CW) expansion joints would fail, draining the contents of the condenser tubes, which is equivalent to an additional 42,000 gal (see Attachment 3). In addition, it is assumed that the various steam dump lines from the Moisture Separator Reheaters (MSR) and other equipment fail at the normally closed valve, thus releasing steam into the basement, and initiating full flow of the FP sprinklers (6000gpm). Failure of the two condensers is correlated as a single failure. Note that offsite power would be lost before the condensers or CW expansion joints fail, since the generic seismic capacity of offsite power is about $A_m = 0.3g$, which is much smaller than the 1.87g for the condensers. Therefore the CW pumps would not have power.

- MSR ($A_m = 1.87g$): The failure of the Moisture Separator Reheaters is assumed to result in steam releases from the MSRs and connected steam piping that actuates sprinklers, and results in the maximum FP flow of 6000gpm. This may be conservative depending on the actual location of the failure, since the MSRs and piping connections are on the operating deck of the Turbine Building, and a steam release at that elevation would not cause actuation of the sprinklers. However, it is conservatively assumed that there are steam piping failures at lower elevations, resulting in sprinkler actuation. There is very little water released from failure of the MSRs, which primarily contain steam.

The equipment, tanks, and piping segments discussed above and listed in Table 4-1 are then used to develop the seismic plant and systems model.

Table 4-1 Components and Fragilities Included in Seismic Flooding Model

	Label	Description	Am (g)	Bc	Volume (gal)	Flow (gpm)	Notes	Flow Diag	Pres (psi)	Dia (in)	Density	Flow Calc
1	FP335	Branch to Hydrogen cooler wet system	0.42	0.5	0	1,336		OPERM-208	125	2	62.22	1336
2	RMST	Reactor Make-up Water Storage Tanks	0.54	0.4	80,000	0	Two tanks with 40,000 gal each					
3	CST	Condensate Storage Tanks	0.67	0.4	140,000	0	Two tanks with 75,000 gal each, 93% full as historical average					
4	SW2800	3" supply from SW	1.07	0.5	0	3,006		OPERM-394	125	3	62.22	3006
5	SW2820	3" supply from SW to flocculator (includes downstream lines)	1.07	0.5	0	3,006	downstream from SW2800	OPERM-394	125	3	62.22	3006
6	SW2810	3" supply from SW to waste sludge pumps	1.07	0.5	0	3,006	downstream from SW2800	OPERM-394	125	3	62.22	3006
7	FP320	Supply to Aux Bldg wet systems	1.08	0.5	0	3,006		OPERM-208	125	3	62.22	3006
8	SW2900	Alt supply to branch fed by SW5200	1.26	0.5	0	5,377	double flow since could come from both sides of break, break anywhere else would be less flow	OPERM-202-3	100	3	62.22	5377
9	FP276	Sub-branch to FP276 DV	1.28	0.5	0	6,000	run out flow of fire protection system	OPERM-208	125	6	62.22	12023
10	FP341-123	Sub-branches to HS on TB floor, 10,15	1.31	0.5	0	2,087	correlated 3 lines, but fed by single 2.5" branch	OPERM-208	125	2.5	62.22	2087
11	FP370	Header to FP370 HS supply	1.31	0.5	0	2,087		OPERM-208	125	2.5	62.22	2087
12	FP331	Deluge station by waste neutralizing tank	1.31	0.5	0	2,087		OPERM-208	125	2.5	62.22	2087
13	SW2200	Supply to Anal Instr Panel Refrig Unit	1.37	0.5	0	1,195		OPERM-202-3	100	2	62.22	1195
14	FP201	10" Fire Protection Header in TB	1.38	0.5	0	6,000	run out flow of fire protection system	OPERM-208				
15	SGBT-HMT	SGBT Hold-up & Monitor Tanks	1.41	0.4	40,000	0						
16	SW2501AB	Disch from Exciter Air Cooler	1.53	0.5	0	2,688	correlated 2 lines, max 3" flow, do not need to correlate with supply lines since total flow would be the same.	OPERM-202-3	100	3	62.22	2688
17	FP280	Branch to HS 8,14,20	1.67	0.5	0	2,087		OPERM-208	125	2.5	62.22	2087

	Label	Description	Am (g)	Bc	Volume (gal)	Flow (gpm)	Notes	Flow Diag	Pres (psi)	Dia (in)	Densit y	Flow Calc
18	FP250	Branch to HS 3,12,18	1.71	0.5	0	2,087		OPERM-208	125	2.5	62.22	2087
19	FP275	Branch to FP277 & 279 and TSC	1.76	0.5	0	6,000	run out flow of fire protection system (Note that this header could also fail several discharge lines from fan coils, but the flow would be 195gpm, which is not significant. See OPERM-606 in Attachment 2)	OPERM-208	125	8	62.22	21373
20	SW1801AB	Bypass branch on supply to Turbine Oil Coolers	1.8	0.5	0	9,558	correlated 2 lines	OPERM-202-3	100	4	62.22	9558
21	SW2500	Supply to Exciter Air Cooler	1.8	0.5	0	2,688	do not need to correlate with discharge lines, since total flow would be the same	OPERM-202-3	100	3	62.22	2688
22	MAIN-COND	Main Condensers	1.87	0.4	90,000	6,000	assumed to cause sprinkler actuation of 6000gpm no flow from CW or CD due to LOSP volume based on CW (42,000 gal) and normal hot well above 586' elevation (48,000 gal), see Attachment 3					
23	MSR	Moisture Separators Reheaters	1.87	0.4	0	6,000	assumed to cause sprinkler actuation of 6000gpm no significant water volume (mostly steam)					
24	FP275-1	Sub-branch to TSC	1.93	0.5	0	5,343		OPERM-208	125	4	62.22	5343
25	FP270	Branch to FP270 deluge valve	1.97	0.5	0	2,087		OPERM-208	125	2.5	62.22	2087
26	FP380A	Branch to FP282A DV	2.02	0.5	0	6,000	run out flow of fire protection system	OPERM-208	125	6	62.22	12023
27	FP345	Branch to FP347, 349, & TSC	2.03	0.5	0	6,000	run out flow of fire protection system	OPERM-208	125	8	62.22	21373
28	COND-PP-EJ	Supply to Cond Pumps	2.2	0.5	48,000	0	correlated 2 lines no flow due to LOSP volume based on hot well above 586' elevation, see Attachment 3	OPERM-204	0	0	62.22	0

	Label	Description	Am (g)	Bc	Volume (gal)	Flow (gpm)	Notes	Flow Diag	Pres (psi)	Dia (in)	Densit y	Flow Calc
29	FP321-1	Maint Bldg wet system (A2)	2.2	0.5	0	3,006	correlated 2 lines, max of 3" flow from header, do not need to correlate with header since same total flow	OPERM-208	125	3	62.22	3006

5.0 SEISMIC FLOODING PLANT AND SYSTEMS MODEL

The plant and systems model consists of the event trees, fault trees (or cut set equations), and basic events that represent the initiator seismic flooding events, and the plant response to potential flooding of the Turbine Building basement. This includes basic events for seismic failures, random equipment failures, and human errors.

5.1 Success Criteria

For seismic induced floods, success is defined as prevention of core damage by:

- Isolation of the flooding event before releasing 260,000 gal of water into the Turbine Building basement (and Aux Building low area)

AND

- Successful operation of AFW for decay heat removal

AND

- Successful operation of SI for reactor coolant makeup

AND

- Either successful boration and RCS cooldown to reduce flow from an RCP seal LOCA, OR occurrence of only a small RCP seal LOCA

AND

- Successful operation of support systems such as electrical power

AND

- Successful completion of required operator actions

The mission time is the traditional 24 hours, by which time additional resources can be mobilized to maintain plant stability.

Extensive details on these success criteria are included in the internal flooding analysis (see Appendices A, B, C, and D). Specific issues associated with the seismic flooding analysis are discussed below.

The volume of 260,000 gal for the flood is selected based on two Gothic computer runs (MPR, 2005). These runs showed that the 4kv switchgear Bus 6 and required loads on the associated 480v buses would not be failed by an instantaneous spill of 240,000 gal, but the 480v buses would just barely be failed by an instantaneous spill of 275,000 gal. The AFW turbine driven pump (TDP), B train AFW motor driven pump (MDP), and B train DG and auxiliaries would also not be impacted. The selection of 260,000 gal is conservative since:

- Based on more recent electrical evaluations, the switchgear can withstand higher flooding before failure, so the spill volume of 260,000 is conservative.

- The spill is assumed to be almost instantaneous, which is conservative for the dynamic Gothic models

5.2 Seismic Flooding Event Trees

Two event trees are used to delineate the potential accident sequences. The first event tree describes the potential flooding sources and combinations, and the potential for flood isolation. The second event tree, used only when flooding is successfully isolated before reaching the 260,000 g limit, describes the potential random success and failures of equipment and operator actions that are used to prevent core damage after the flooding. Figure 5-1 provides the seismic flooding event tree. There are 7 top events, other than the seismic initiator:

- HCE: High seismic capacity equipment
  Success of this event indicates that the main condenser, condensate pump piping expansion joints, and SGBT Hold-up and Monitor Tanks did not fail due to the seismic event. Failure indicates that one or more of these components failed. Since these components have relatively high seismic capacity, if they failed it was conservatively assumed that the CSTs and RMSTs would also be failed. This leads to a flood that exceeds 260,000 gal, and was assumed to lead directly to core damage.

- CST: Condensate Storage Tanks
  Success of this event indicates that the CSTs did not fail. Failure is conservatively assumed to fail both the CSTs and the RMSTs. Although the combined volume (220,000 gal) is less than the failure criterion of 260,000 gal, the CST failure is assumed to result in failure of the AFW pumps, due to the old pump discharge flow trip configuration. This is further assumed to result in core damage due to loss of decay heat removal. Note that this is conservative for several reasons. As mentioned previously, the failure was assumed to be instantaneous, giving no significant time for operators to stop the AFW pumps and switch to the SW for pump suction. Second, feed and bleed was assumed not to be successful, since the RWST would eventually empty, and recirculation switchover was assumed to not be available.

- RMST: Reactor Make-up Water Storage Tanks
  Success of this event indicates that the RMSTs do not fail. Failure is assumed to spill the maximum contents of both tanks almost instantaneously (80,000 gal total). Note that the CSTs do not fail in the associated event tree sequences, so AFW can be available. Unless additional flooding occurs, due to piping failure, this relatively small volume does not fail significant equipment, and can be easily mitigated.

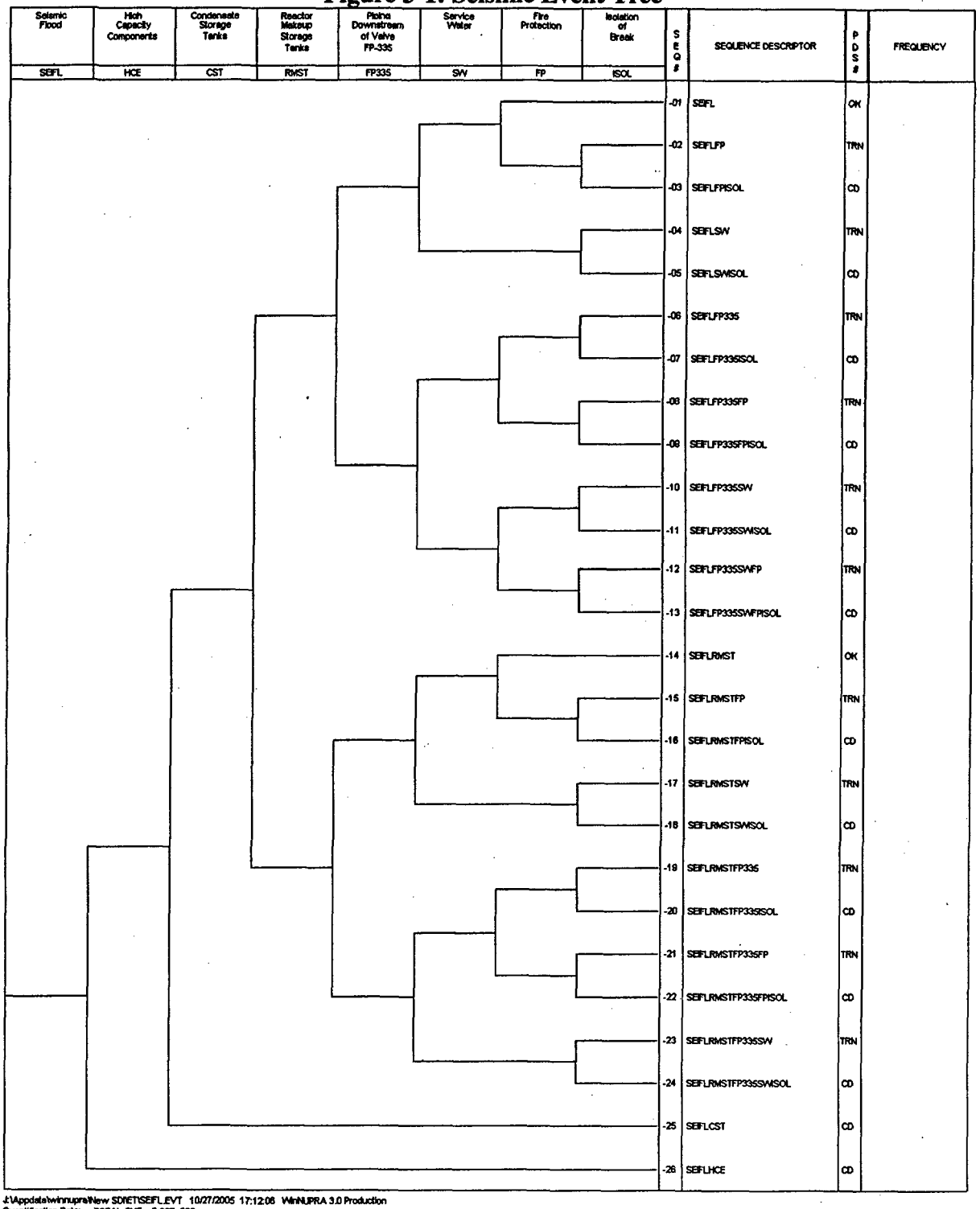
- FP335: Piping Downstream of Fire Protection Branch 335
  This one FP piping branch has a relatively low seismic capacity ($A_m = 0.42g$), and is therefore treated separately in the event tree. Failure results in a flood of 1,336gpm from this 2" diameter pipe. By itself, or with failure of the RMSTs, there is greater than 2 hours for isolation of this piping break by closing the FP header valves. It was conservatively assumed that this branch could not be isolated by the branch isolation valve (FP335) in the Turbine Building.

- SW: Service Water Piping
  Success of this event indicates that none of the SW piping segments failed due to the seismic event. Failure results in flooding from about 1200gpm to 10,000gpm, depending on the piping segment. The piping segments, seismic capacities, and flows are given in Table 4-1. Depending on the size of the piping failure, and the potential failure of previous event tree branches (ie, the RMST and/or FP335) the time for isolation can vary before reaching the 260,000 gal limit. This time impacts the potential for successful isolation. In addition to single failures of SW piping segments, multiple piping failures can occur. In these cases, the flow is the combined flow of all broken piping segments. The event heading nodal equations include single and multiple failures when appropriate.

- FP: Fire Protection Piping
  This event heading covers the remainder of FP piping segments, excluding FP335, which is a single event discussed above. As with the SW piping, the potential flow depends on the segment that fails. However, since the runout flow of the FP system (with both FP pumps operating) is limited to 6000gpm, the potential flow is constrained. Multiple segments can fail, and are included when appropriate. In addition, this event heading includes the potential failure of the moisture separator reheaters (MSR). As discussed in section 4.3, the MSRs do not directly contribute to the flood, since they contain mostly steam and very little water. However, depending on the location of breaks in attached steam piping, it may be possible to set off the fire sprinklers. Conservatively, it was assumed that failure of any MSR would actuate the sprinklers and result in the maximum FP runout flow of 6000gpm.

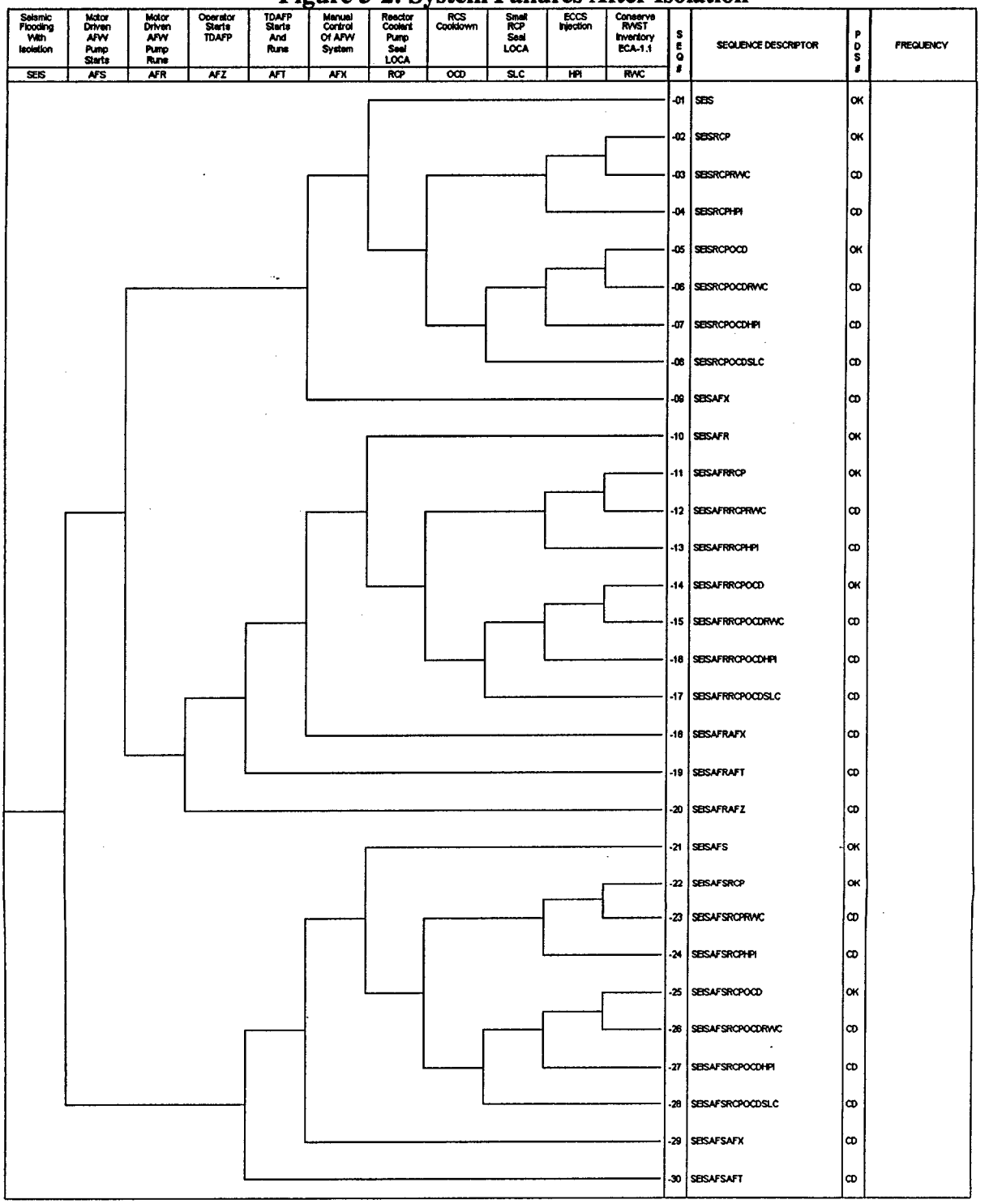
- ISOL: Isolation of Break
  Success of this event indicates that the operators have isolated the break(s). The time for isolation depends on the number of breaks, the flow from each broken piping segment, and any other seismic failures, such as the RMSTs. The operator actions, timing, and other factors are discussed below, and described in detail in Attachment 1. Since the timing varies from one sequence to another, the operator actions were grouped, and the minimum time of each group was used for the evaluation. That is, the individual piping segment may have 86 minutes for action, but it is grouped in with the other piping failures that have 57 minutes for action. The grouping was always conservative.

Figure 5-1: Seismic Event Tree



J:\Appdata\winnupra\New SDNET\SEFL.EVT 10/27/2005 17:12:08 WinNUPRA 3.0 Production
Quantification Date: TOTAL CMF = 0.00E+000
Licensed to: Kewaunee

Figure 5-2: System Failures After Isolation



J:\AppData\winnupra\New SD\ET\SEIS.EVT 10/27/2005 17:13:12 WinNUPRA 3.0 Production
Quantification Date: TOTAL CMF = 0.00E+000
Licensed to: Kewaunee

5.3 Nodal Equations

To quantify the seismic flooding event tree, nodal equations were developed for each branch of the event tree. Note that both success and failure equations were developed for each branch as appropriate. Table 5-1 provides a description of each sequence of the seismic flooding event tree, the successes and failures, and provides the grouping of the operator isolation actions used for that sequence. The isolation grouping time is shown in parentheses. Note that a "\" represents a success. In the "Status" column, TRN represents a transfer to the flooding mitigation event tree, and CD represents core damage.

Table 5-1 Seismic Flooding Sequences and Nodal Equations

Seq #	Successes and Failures	Status	Description	Isolation Times (min)
1	no significant failures	OK		
2	\RMST * \FP335 * \SW * \ISOL	TRN	Successful isolation of FP piping failure, with CST available. Transfer to flooding mitigation event tree to ensure no large SL, successful AFW and primary cooldown. Alignment of AFW to SW NOT required.	3000gpm: 86m (*ISOL-FP-57*) 6000gpm: 43m (*ISOL-FP-40*)
3	\RMST * \FP335 * \SW * ISOL	CD	Failure of operators to isolate FP piping failure, resulting in flood failing electric power.	
4	\RMST * \FP335 * SW * \ISOL	TRN	Successful isolation of SW piping failure, with CST available. Transfer to flooding mitigation event tree to ensure no large SL, successful AFW and primary cooldown. Alignment of AFW to SW NOT required.	3000gpm: 86m 6000gpm: 43m 10,000gpm: 26m (*ISOL-SW-26*)
5	\RMST * \FP335 * ISOL	CD	Failure of operators to isolate SW piping failure, resulting in flood failing electric power.	
6	\RMST * FP335 * \SW * \FP * \ISOL	TRN	Successful isolation of FP335 piping failure, with CST available. Transfer to flooding mitigation event tree to ensure no large SL, successful AFW and primary cooldown. Alignment of AFW to SW NOT required.	1336gpm: 194m (*ISOL-FP-57*)
7	\RMST * FP335 * \SW * \FP * ISOL	CD	Failure of operators to isolate FP335 piping failure, resulting in flood failing electric power.	
8	\RMST * FP335 * \SW * FP * \ISOL	TRN	Successful isolation of FP piping failure, with CST available. In addition to FP335, multiple FP lines may fail, but max flow is limited to 6000gpm. Transfer to flooding mitigation event tree to ensure no large SL, successful AFW and primary cooldown. Alignment of AFW to SW NOT required.	4500gpm: 57m (*ISOL-FP-57*) 6000gpm: 43m (*ISOL-FP-40*)
9	\RMST * FP335 * \SW * ISOL	CD	Failure of operators to isolate FP piping failure, resulting in flood failing electric power.	

Seq #	Successes and Failures	Status	Description	Isolation Times (min)
10	\RMST * FP335 * SW * \ISOL	TRN	Successful isolation of both FP335 and SW piping failure, with CST4500gpm: 57m available. In addition to FP335, multiple SW lines may fail. (*ISOL-SF-57*) Transfer to flooding mitigation event tree to ensure no large SL,7500gpm: 34m successful AFW and primary cooldown. Alignment of AFW to SW(*ISOL-SF-34*) NOT required.	
11	\RMST * FP335 * ISOL	CD	Failure of operators to isolate FP or SW piping failure, resulting in flood failing electric power.	
12	\RMST * FP335 * SW * FP * \ISOL	TRN	Successful isolation of both FP and SW piping failure, with CST4500gpm: 57m available. In addition to FP335, multiple SW and\or FP lines may(*ISOL-SF-57*) fail. Transfer to flooding mitigation event tree to ensure no large7500gpm: 34m SL, successful AFW and primary cooldown. Alignment of AFW to(*ISOL-SF-34*) SW NOT required.	
13	\RMST * FP335 * ISOL	CD	Failure of operators to isolate FP or SW piping failure, resulting in flood failing electric power.	
14	\CST * RMST	OK	CST does not fail. 80,000 gal from RMSTs will cause only minor flooding with no significant losses.	
15	\CST * RMST * \FP335 * \SW * FP * \ISOL	TRN	Successful isolation of FP piping failure, with CST available. 80,000 gal + Transfer to flooding mitigation event tree to ensure no large SL,3000gpm: 60m successful AFW and primary cooldown. Alignment of AFW to SW(*ISOL-FP-57*) NOT required. 6000gpm: 30m	
16	\CST * RMST * \FP335 * \SW * ISOL	CD	Failure of operators to isolate FP piping failure, resulting in flood(*ISOL-FP-30*) failing electric power.	
17	\CST * RMST * \FP335 * SW * \ISOL	TRN	Successful isolation of SW piping failure, with CST available. 80,000 gal + Transfer to flooding mitigation event tree to ensure no large SL,6000gpm: 30m successful AFW and primary cooldown. Alignment of AFW to SW(*ISOL-SW-26*) NOT required.	
18	\CST * RMST * \FP335 * ISOL	CD	Failure of operators to isolate SW piping failure, resulting in flood failing electric power.	

Seq #	Successes and Failures	Status	Description	Isolation Times (min)
19	\CST * RMST * FP335 * \SW *TRN \FP * \ISOL		Successful isolation of FP335 piping failure, with CST available. Transfer to flooding mitigation event tree to ensure no large SL, successful AFW and primary cooldown. Alignment of AFW to SW NOT required.	80,000 gal + 1336gpm: 134m (*ISOL-FP-57*)
20	\CST * RMST * FP335 * \SW *CD \FP * ISOL		Failure of operators to isolate FP335 piping failure, resulting in flood failing electric power.	
21	\CST * RMST * FP335 * \SW * FPTRN * \ISOL		Successful isolation of FP piping failure, with CST available. Transfer to flooding mitigation event tree to ensure no large SL, successful AFW and primary cooldown. Alignment of AFW to SW NOT required.	80,000 gal + 4500gpm: 40m (*ISOL-FP-40*) 6000gpm: 30m
22	\CST * RMST * FP335 * \SW *CD ISOL		Failure of operators to isolate FP piping failure, resulting in flood failing electric power.	(*ISOL-FP-30*)
23	\CST * RMST * FP335 * SW *TRN \ISOL		Successful isolation of FP335 and SW piping failure, with CST available. Transfer to flooding mitigation event tree to ensure no large SL, successful AFW and primary cooldown. Alignment of AFW to SW NOT required.	80,000 gal + 4500gpm: 40m (*ISOL-SF-40*)
24	\CST * RMST * FP335 * ISOL	CD	Failure of operators to isolate FP335 or SW piping failure, resulting in flood failing electric power.	
25	CST	CD	CST fails, and RMST conservatively assumed to fail as well, dumping 220,000 gal into Turbine Building. Since AFW pumps were not automatically stopped in these CST failure scenarios, they are assumed to fail. Feed and bleed is assumed to fail at recirculation switchover, resulting in core damage.	not applicable
26	HCE	CD	Conservatively assumed failure of high seismic capacity components (that is, main condenser, condensate pump expansion joints, or SGBT Hold-up and Monitor Tanks) would also fail CSTs and RMSTs, and directly result in core damage.	not applicable

Table 5-2 Seismic Flooding Event Tree Nodal Equations

Node	Description	Equation	Notes
HCE	High Seismic Capacity Equipment	MAIN-COND + COND-PP-EJ + SGBT-HMT	
CST	Condensate Storage Tanks	CST	
RMST	Reactor Make-up Water Storage Tank	RMST	
FP335	Fire Protection Piping 335	FP335	
SW	Service Water Piping	SW2800 + SW2820 + SW2810 + SW2900 + SW2200 + SW2501AB + SW1801AB + SW2500	Multiple failures only required in sequences 9 and 13, based on calculation of frequency.
FP	Fire Protection Piping	FP320 + FP276 + FP341-123 + FP370 + FP331 + FP201 + FP280 + FP250 + FP275 + FP275-1 + FP270 + FP380A + FP345 + FP321-1 + MSR	Multiple failures only required in sequences 11 and 13, based on calculation of frequency.
ISOL	Isolation of Piping		
	Seq 3	FP320 * ISOL-FP-57 + FP276 * ISOL-FP-40 + FP341-123 * ISOL-FP-57 + FP370 * ISOL-FP-57 + FP331 * ISOL-FP-57 + FP201 * ISOL-FP-40 + FP280 * ISOL-FP-57 + FP250 * ISOL-FP-57 + FP275 * ISOL-FP-40 + FP275-1 * ISOL-FP-40 + FP270 * ISOL-FP-57 + FP380A * ISOL-FP-40 + FP345 * ISOL-FP-40 + FP321-1 * ISOL-FP-57 + MSR * ISOL-FP-40	Since ISOL equation includes FP piping failures, remove FP equation from 3. Use this ISOL equation failure for Seq 3.
	Seq 5	SW2800 * ISOL-SW-26 + SW2820 * ISOL-SW-26 + SW2810 * ISOL-SW-26 + SW2900 * ISOL-SW-26 + SW2200 * ISOL-SW-26 + SW2501AB * ISOL-SW-26 + SW1801AB * ISOL-SW-26 + SW2500 * ISOL-SW-26	Since ISOL equation includes SW piping failures, remove SW equation from Seq 5. Use this ISOL equation failure for Seq 5.
	Seq 7, 20	ISOL-FP-57	Conservatively used for all FP isolations with times 57 minutes or greater.

Node	Description	Equation	Notes
Seq 9		FP320 * ISOL-FP-57 + FP276 * ISOL-FP-40 + FP341-123 * ISOL-FP-57 + FP370 * ISOL-FP-57 + FP331 * ISOL-FP-57 + FP201 * ISOL-FP-40 + FP280 * ISOL-FP-57 + FP250 * ISOL-FP-57 + FP275 * ISOL-FP-40 + FP275-1 * ISOL-FP-40 + FP270 * ISOL-FP-57 + FP380A * ISOL-FP-40 + FP345 * ISOL-FP-40 + FP321-1 * ISOL-FP-57 + MSR * ISOL-FP-40 + FP320 * ISOL-FP-40 * FP341-123 + FP370 * ISOL-FP-40 * FP341-123 + FP331 * ISOL-FP-40 * FP341-123 + FP280 * ISOL-FP-40 * FP341-123 + FP250 * ISOL-FP-40 * FP341-123 + FP270 * ISOL-FP-40 * FP341-123 + FP321-1 * ISOL-FP-40 * FP341-123 + FP320 * ISOL-FP-40 * FP370 + FP331 * ISOL-FP-40 * FP370 + FP280 * ISOL-FP-40 * FP370 + FP250 * ISOL-FP-40 * FP370 + FP270 * ISOL-FP-40 * FP370 + FP321-1 * ISOL-FP-40 * FP370 + FP320 * ISOL-FP-40 * FP331 + FP280 * ISOL-FP-40 * FP331 + FP250 * ISOL-FP-40 * FP331 + FP270 * ISOL-FP-40 * FP331 + FP321-1 * ISOL-FP-40 * FP331 + FP280 * ISOL-FP-40 * FP320 + FP250 * ISOL-FP-40 * FP320 + FP270 * ISOL-FP-40 * FP320 + FP321-1 * ISOL-FP-40 * FP320	Since ISOL equation includes FP piping failures, remove FP equation from Seq 9. Use this ISOL equation failure for Seq 9. This equation includes multiple FP piping failures. Combinations with two components greater than 1.5g are screened out, since they are not significant to CDF. Also, combinations with one component delivering runout flow (6000gpm) are screened out, since the flow with the one component was already maximum. Also, combinations with one component downstream of another are screened out, since the flow would not be increased by the second failure.
Seq 11		SW2800 * ISOL-SF-57 + SW2820 * ISOL-SF-57 + SW2810 * ISOL-SF-57 + SW2900 * ISOL-SF-34 + SW2200 * ISOL-SF-57 + SW2501AB * ISOL-SF-57 + SW1801AB + SW2500 * ISOL-SF-57 + SW2900 * SW2820 + SW2200 * ISOL-SF-34 * SW2820 + SW2501AB * ISOL-SF-34 * SW2820 + SW2500 * ISOL-SF-34 * SW2820 + SW2900 * SW2810 + SW2200 * ISOL-SF-34 * SW2810 + SW2501AB * ISOL-SF-34 * SW2810 + SW2500 * ISOL-SF-34 * SW2810 + SW2800 * SW2900 + SW2200 * SW2900 + SW2501AB * SW2900 + SW2500 * SW2900 + SW2800 * ISOL-SF-34 * SW2200 + SW2501AB * ISOL-SF-34 * SW2200 + SW2500 * ISOL-SF-34 * SW2200 + SW2501AB * ISOL-SF-34 * SW2800 + SW2500 * ISOL-SF-34 * SW2800	Since ISOL equation includes SW piping failures, remove SW equation from Seq 11. Use this ISOL equation failure for Seq 11. This equation includes multiple SW piping failures. Combinations with two components greater than 1.5g are screened out, since they are not significant to CDF. Also, if individual piping failures cannot be isolated in the time available (ie, SW1801AB), then further combinations with this piping failure are screened out since they would be non-minimal.

Node	Description	Equation	Notes
Seq 13		SW2800 * ISOL-SF-34 * FP320 + SW2820 * ISOL-SF-34 * FP320 + SW2810 * ISOL-SF-34 * FP320 + SW2900 * FP320 + SW2200 * ISOL-SF-34 * FP320 + SW2501AB * ISOL-SF-34 * FP320 + SW2500 * ISOL-SF-34 * FP320 + SW2800 * FP276 + SW2820 * FP276 + SW2810 * FP276 + SW2900 * FP276 + SW2200 * ISOL-SF-34 * FP276 + SW2501AB * FP276 + SW2500 * FP276 + SW2800 * ISOL-SF-34 * FP341-123 + SW2820 * ISOL-SF-34 * FP341-123 + SW2810 * ISOL-SF-34 * FP341-123 + SW2900 * FP341-123 + SW2200 * ISOL-SF-57 * FP341-123 + SW2501AB * ISOL-SF-34 * FP341-123 + SW2500 * ISOL-SF-34 * FP341-123 + SW2800 * ISOL-SF-34 * FP370 + SW2820 * ISOL-SF-34 * FP370 + SW2810 * ISOL-SF-34 * FP370 + SW2900 * FP370 + SW2200 * ISOL-SF-57 * FP370 + SW2501AB * ISOL-SF-34 * FP370 + SW2500 * ISOL-SF-34 * FP370 + SW2800 * ISOL-SF-34 * FP331 + SW2820 * ISOL-SF-34 * FP331 + SW2810 * ISOL-SF-34 * FP331 + SW2900 * FP331 + SW2200 * ISOL-SF-57 * FP331 + SW2501AB * ISOL-SF-34 * FP331 + SW2500 * ISOL-SF-34 * FP331 + SW2800 * FP201 + SW2820 * FP201 + SW2810 * FP201 + SW2900 * FP201 + SW2200 * ISOL-SF-34 * FP201 + SW2501AB * FP201 + SW2500 * FP201 + SW2800 * ISOL-SF-34 * FP280 + SW2820 * ISOL-SF-34 * FP280 + SW2810 * ISOL-SF-34 * FP280 + SW2900 * FP280 + SW2200 * ISOL-SF-57 * FP280 + SW2800 * ISOL-SF-34 * FP250 + SW2820 * ISOL-SF-34 * FP250 + SW2810 * ISOL-SF-34 * FP250 + SW2900 * FP250 + SW2200 * ISOL-SF-57 * FP250 + SW2800 * FP275 + SW2820 * FP275 + SW2810 * FP275 + SW2900 * FP275 + SW2200 * ISOL-SF-34 * FP275 + SW2800 * FP275-1 + SW2820 * FP275-1 + SW2810 * FP275-1 + SW2900 * FP275-1 + SW2200 * ISOL-SF-34 * FP275-1 + SW2800 * ISOL-SF-34 * FP270 + SW2820 * ISOL-SF-34 * FP270 + SW2810 * ISOL-SF-34 * FP270 + SW2900 * FP270 + SW2200 * ISOL-SF-57 * FP270 + SW2800 * FP380A + SW2820 * FP380A + SW2810 * FP380A + SW2900 * FP380A + SW2200 * ISOL-SF-34 * FP380A + SW2800 * FP345 + SW2820 * FP345 + SW2810 * FP345 + SW2900 * FP345 + SW2200 * ISOL-SF-34 * FP345 + SW2800 * ISOL-SF-34 * FP321-1 + SW2820 * ISOL-SF-34 * FP321-1 + SW2810 * ISOL-SF-34 * FP321-1 + SW2900 * FP321-1 + SW2200 * ISOL-SF-34 * FP321-1 + SW2800 * MSR + SW2820 * MSR + SW2810 * MSR + SW2900 * MSR + SW2200 * ISOL-SF-34 * MSR	Since ISOL equation includes SW and FP piping failures, remove SW and FP equations from Seq 13. Use this ISOL equation failure for Seq 13. This equation consists of combinations of SW and FP piping failures. Combinations with two components greater than 1.5g are screened out, since they are not significant to CDF. Also, if individual piping failures cannot be isolated in the time available (ie, SW1801AB), then further combinations with this piping failure are screened out since they would be non-minimal.
Seq 16		FP320 * ISOL-FP-57 + FP276 * ISOL-FP-30 + FP341-123 * ISOL-FP-57 + FP370 * ISOL-FP-57 + FP331 * ISOL-FP-57 + FP201 * ISOL-FP-30 + FP280 * ISOL-FP-57 + FP250 * ISOL-FP-57 + FP275 * ISOL-FP-30 + FP275-1 * ISOL-FP-30 + FP270 * ISOL-FP-57 + FP380A * ISOL-FP-30 + FP345 * ISOL-FP-30 + FP321-1 * ISOL-FP-57 + MSR * ISOL-FP-30	Since ISOL equation includes FP piping failures, remove FP equation from Seq 16. Use this ISOL equation failure for Seq 16.
Seq 18		SW2800 * ISOL-SW-26 + SW2820 * ISOL-SW-26 + SW2810 * ISOL-SW-26 + SW2900 * ISOL-SW-26 + SW2200 * ISOL-SW-26 + SW2501AB * ISOL-SW-26 + SW1801AB + SW2500 * ISOL-SW-26	Since ISOL equation includes SW piping failures, remove SW equation from Seq 17 and 18. Use this ISOL equation failure for Seq 18. Change ISOL terms to success for Seq 17.
Seq 22		FP320 * ISOL-FP-40 + FP276 * ISOL-FP-30 + FP341-123 * ISOL-FP-40 + FP370 * ISOL-FP-40 + FP331 * ISOL-FP-40 + FP201 * ISOL-FP-30 + FP280 * ISOL-FP-40 + FP250 * ISOL-FP-40 + FP275 * ISOL-FP-30 + FP275-1 * ISOL-FP-30 + FP270 * ISOL-FP-40 + FP380A * ISOL-FP-30 + FP345 * ISOL-FP-30 + FP321-1 * ISOL-FP-40 + MSR * ISOL-FP-30	Since ISOL equation includes FP piping failures, remove FP equation from Seq 22. Use this ISOL equation failure for Seq 22.
Seq 24		SW2800 * ISOL-SF-40 + SW2820 * ISOL-SF-40 + SW2810 * ISOL-SF-40 + SW2900 + SW2200 * ISOL-SF-40 + SW2501AB * ISOL-SF-40 + SW1801AB + SW2500 * ISOL-SF-40	Since ISOL equation includes SW piping failures, remove SW equation from Seq 24. Use this ISOL equation failure for Seq 24.

The nodal equations are given in Table 5-2. If there is inadequate time for operator action in a cut set, then the "ISOL" action does not appear in the nodal equation. A side calculation was performed to determine the potential impact of independent multiple failures of piping segments. It was determined that the impact to most sequences would be less than 1E-08/y. However, there was some potential for independent multiple piping segment failures to impact sequences 9, 11, and 13, so the nodal equations for these sequences include multiple piping failures. Correlated piping failures were included in the basic events in all sequences.

Success nodal equations were directly developed by the quantification software, SHIP (Benjamin, 1996). However, in the case of the ISOL success, a separate calculation was made to determine the exact average value of isolation success for each sequence. These separate SHIP calculations are included in Attachment 4.

The second event tree, used only when flooding is successfully isolated before reaching the 260,000 gal limit, describes the potential random success and failures of equipment and operator actions that are used to prevent core damage after the flooding. Figure 5-2 provides this flooding mitigation event tree. The structure and event tree headings are directly taken from the internal turbine building flooding analysis (KPS, 2005), which provides a detailed discussion of the events. However, the operator actions used for this event tree are revised to reflect the stress from a seismic event.

5.4 Human Reliability

The human error probabilities (HEPs) for the operator actions were calculated to specifically include the stress from a seismic event. Table 5-3 lists the operator actions included in the seismic flooding analysis. These actions are discussed in detail in Attachment 1.

Table 5-3 Human Error Probabilities

Event ID	Description	Probability
08-FPISO57-F-HE	Operator fails to isolate FP within 57 minutes	3.10E-02
08-FPISO40-F-HE	Operator fails to isolate FP within 40 minutes	5.90E-02
08-FPISO30-F-HE	Operator fails to isolate FP within 30 minutes	4.90E-01
02-SW4A-B--FSHE	Operator fails to isolate SW within 26 minutes	2.50E-02
SX-SWFP-57-F-HE	Operator fails to isolate SW and FP within 57 minutes	5.60E-02
SX-SWFP-40-F-HE	Operator fails to isolate SW and FP within 40 minutes	1.50E-01
SX-SWFP-34-F-HE	Operator fails to isolate SW and FP within 34 minutes	3.00E-01
27A-ORR----FSHE	Limit SI and Refill RWST (no cooldown) – Seismic Flood	1.00E-02

The isolation actions for the FP system are taken in the pump house. After the seismic event, the crew in the control room will have three cues to identify the Turbine Building flooding. First, the operator will have indication that the FP pumps have started, but no indication of a fire, and the aux operator will be sent to determine the status. Second, the procedures for a seismic event

(KPS, 2004) direct the crew to check all of the safety systems. Again, the aux operator will be sent to safeguards alley to verify proper start and operation of the equipment. Third, the crew will be in a loss of offsite power event, and will send the aux operator to the DG rooms to check their proper operation. The aux operator must determine that the flooding is due to the FP system, and contact the main control room for further instructions. The control room must send the aux operator to the pump house to isolate two manual valves. It was conservatively assumed that this operator action outside the control room would not be successful if there was less than 30 minutes after the seismic event.

Isolation of the SW piping can be completed in the control room, since power and air are available. The two valves that isolate the non-essential turbine building SW are air-operated, with air accumulators, and fail as is. Although a large SW break may give an alarm, this was not credited. Instead, the cues of the seismic event and the LOSP discussed above will guide the aux operator to identify the SW flooding as he checks the safety equipment. The control room would then initiate the SW isolation. Although more time may be available, a time of 26 minutes was used as the minimum time necessary to identify and isolate a SW break.

If both SW and FP piping breaks occurred, then both had to be successfully isolated.

The other operator actions are similar to those described for the internal flooding events (Attachment 3 of Appendix C)

6.0 QUANTIFICATION

The seismic risk is analyzed with the Seismic Hazard Integration Package (SHIP, Benjamin, 1996) computer code. This code integrates the seismic hazard curve for the site with the success and failure nodal equations for each seismic flooding event tree sequence (Figure 5-1). The following SHIP evaluations were performed, and are included in Attachment 4:

- Seiflood.BAS: This is the quantification of the 24 event tree sequences for the seismic flooding event tree, using the EPRI seismic hazard curve discussed in section 3.
- Seiflsuc.BAS: This side quantification was used in the calculation to determine the exact success probabilities for \ISOL.

The nodal equations in cut set form are also given in Attachment 4.

The seismic flood mitigation event tree (Figure 5-2) is quantified, and used for each of the transferred event tree sequences that have successful isolation of the piping break. Since the events in the mitigation event tree are independent of the seismic flooding event tree, it is only quantified once.

The resulting CDF for all seismic flooding sequences is 6.6E-06/year. Table 6-1 lists each of the flooding sequences, and their CDF contribution. As can be seen, sequence 25 (SEIFLD25) is the dominant sequence, contributing about 4.0E-6/y to seismic flooding CDF. This sequence is failure of the CSTs, with assumed failure of the AFW pumps, assumed failure of feed and bleed, and eventual core damage. This sequence represents about 60% of the seismic flooding CDF.

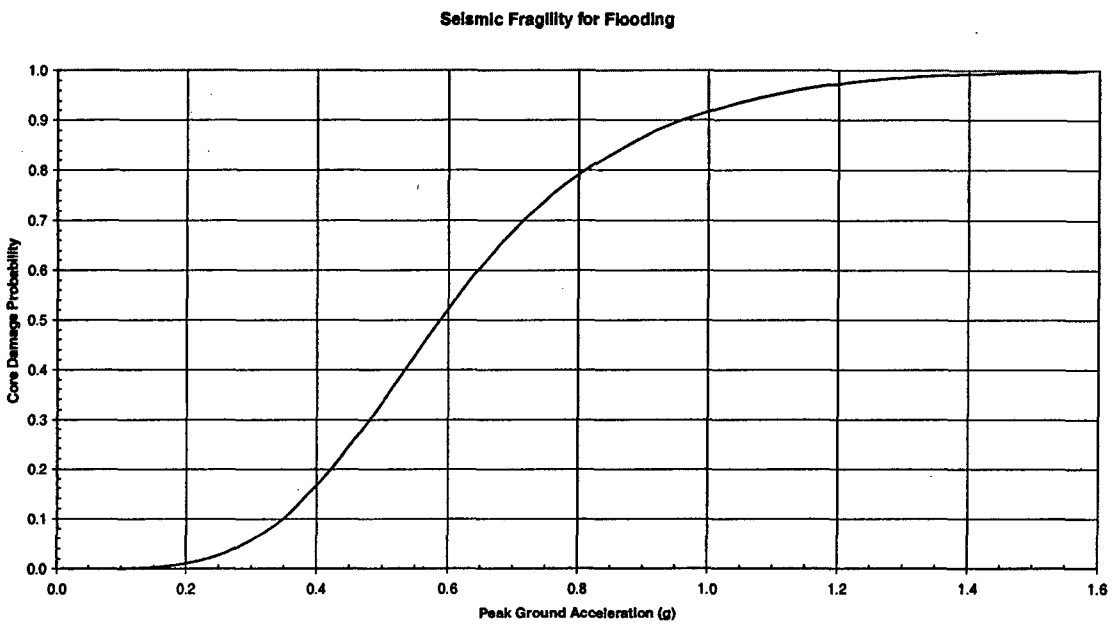
Table 6-1 Seismic Flooding Sequences and CDF

No.	Sequence Name	Sequence Risk	% of Total
1	SEIFLD25	3.97E-06	60.35
2	SEIFLD06	8.36E-07	12.71
3	SEIFLD26	4.90E-07	7.44
4	SEIFLD07	2.80E-07	4.26
5	SEIFLD19	1.37E-07	2.09
6	SEIFLD24	1.23E-07	1.88
7	SEIFLD13	1.10E-07	1.68
8	SEIFLD22	7.98E-08	1.21
9	SEIFLD11	6.94E-08	1.06
10	SEIFLD23	6.67E-08	1.01
11	SEIFLD04	6.62E-08	1.01
12	SEIFLD10	4.71E-08	.72
13	SEIFLD20	4.60E-08	.70
14	SEIFLD02	4.28E-08	.65
15	SEIFLD08	4.16E-08	.63
16	SEIFLD16	3.14E-08	.48
17	SEIFLD17	2.83E-08	.43
18	SEIFLD21	2.72E-08	.41
19	SEIFLD09	1.99E-08	.30
20	SEIFLD03	1.83E-08	.28
21	SEIFLD05	1.78E-08	.27
22	SEIFLD15	1.38E-08	.21
23	SEIFLD18	7.62E-09	.12
24	SEIFLD12	7.08E-09	.11
	Sum:	6.58E-06	100.00

The second most important contributor is sequence 6 (SEIFLD06), contributing about 8.4E-7/y to seismic flooding CDF. This sequence is failure of FP335 piping segment, success of all other equipment and piping segments, and success of isolation. However, the mitigation fails, resulting in core damage. This sequence contributes about 13% of the seismic flooding CDF.
The only other sequence contributing more than 5% to the seismic flooding CDF is the failure of one of the high seismic capacity equipment items. The dominant contributor is failure of the SGBT hold-up and monitor tanks, with assumed failure of the CSTs and RMSTs.

Figure 6-1 shows the seismic fragility of the plant, i.e., the conditional probability of core damage due to seismic flooding as a function of peak ground acceleration. For instance, given a seismic event of 0.588 g pga, there is a 0.5 probability that core damage would occur due to seismic flooding. Although not directly shown on the plant fragility plot, there would have been a very low probability of core damage due to a design basis earthquake and flooding.

Figure 6-1 Plant Seismic Flooding Fragility



7.0 SENSITIVITY ANALYSES

Three sensitivity analyses were performed for the seismic flooding evaluation:

- Using LLNL seismic hazard curve (NUREG-1488, 1994) (SeifLLNL.BAS)
- Increasing operator isolation that must occur in less than 60 minutes by a factor of 2 (HEP30.BAS)
- Increasing skill-of-the-craft operator actions by a factor of 2 (HEPSOC.BAS)

Each of these sensitivity studies is discussed below. The SHIP output files (in parentheses above) are in Attachment 5.

7.1 Seismic Flooding Using the LLNL Seismic Hazard Curve

For this sensitivity study, the LLNL hazard estimate from NUREG-1488 was substituted for the baseline EPRI seismic hazard curve. The LLNL curve was extended, by log-linear extrapolation, to 1.6g so the range of pga values considered would be consistent with the base case. The models and fragility parameters (median capacities, composite variabilities) for equipment, tanks and pipe segments remain the same as the baseline. It should be noted that the fragility calculations have used the EPRI seismic ground and floor response spectrum information as described in section 4.2; the LLNL spectral shape is somewhat higher. Use of the same fragility parameters is considered acceptable for this sensitivity study.

The results demonstrated that there is little difference whether the LLNL or EPRI hazard curve is used, since they are very similar. The total seismic flooding CDF with the LLNL hazard curve is 7.3E-06/year. The ranking and contribution of the individual sequences was very similar.

7.2 Sensitivity of Operator Action HEPs

Table 7-1 presents a comparison of the seismic flooding baseline CDF, and the results of increasing the HEPs by a factor of 2 for the three sensitivity cases described above.

Table 7-1 Comparison of Sensitivity Studies

Case	Description	CDF
Baseline	Seismic flooding baseline (section 6)	6.58E-06/y
LLNL	LLNL Seismic Hazard Curve Used	7.32E-06/y
<30 min	Increase HEPs with less than 60 minutes for performance by factor of 2	6.60E-06/y
SOC	Increase HEPs using skill-of-the-craft for performance by factor of 2	7.20E-06/y

As can be seen, there is very little increase in seismic flooding CDF due to increased operator action HEPs. For the skill-of-the-craft actions (which are all of the FP piping isolations), there is about a 9% increase above the baseline CDF.

REFERENCES

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(KPS, 2004) Wisconsin Public Service Corporation, Kewaunee Nuclear Power Plant, Operating Procedure, E-0-05, Rev K, Response to Natural Events, Apr 06, 2004.

(Stevenson & Associates, 2005) Seismic Fragilities for Turbine Building Piping, Stevenson & Associates, Report No. 05C4514-REP-001 Rev. 1, September 2005.

(ANS, 2003) American Nuclear Society, "External Events PRA Methodology Standard," ANSI/ANS 58.21 2003.

(NRC, 1991) NUREG-1407, Procedural and Submittal Guidance for the IPEEE for Severe Accident Vulnerabilities, June 1991.

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(EPRI, 1991) EPRI-NP-6041-SL, A Methodology for Assessment of Nuclear Power Plant Seismic Margin, Rev 1, August 1991.

(Blume, 1971) Kewaunee Nuclear Power Plant – Earthquake Analysis of the Reactor-Auxiliary-Turbine Building, John A. Blume & Associates, Engineers, JAB-PS-01, February 1971.

(MPR, 2005) MPR Calculation 064-0515-LYS-01, "Evaluation of Flooding Levels for Various PRA Cases," Revision 0.

(Benjamin, 1996) SHIP, Seismic Hazard Integration Package, Jack R. Benjamin and Associates, Inc., Version 1.02, 7/2/96.

Appendix F

Seismic Analysis

Attachment 1 – HEPs

HEPs

Prepared by: _____ Signature George E Baldwin Print Name

10/26/05
Date

Reviewed by: _____ Signature JEFFREY T. STAFFORD Print Name

10-28-05
Date

HEP	02-SW4AB22-F-HE	HEP Description	Close SW-4A & SW-4B During Flood/Seismic Event - 22 min.
Revision Date	10/20/2005	Evaluator	GE Baldwin
Operation Reviewer		Reviewer	
Operations Input	I / S: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03		
Scenario	A Service Water pipe fails down stream of SW-4A/B causing a low Service Water header pressure.		
Event Description	A Service Water pipe fails down stream of SW-4A/B causing a low Service Water header pressure. Operators enter A-SW-02 and determine a rupture in Turbine Building header. The operators isolate the affected header		
Assumptions for the Event	The following assumptions are made: • All automatic actions occur except as noted. • Seismic event was initiating event.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. Most times in this analysis is based on the A-SW-02 interview conducted 10/14/02 however some time was adjusted using the average response time. Based on these times it is estimated the operator will close SW-4A(B) in approximately 12 minutes. The allowed time is 22 minutes.		
Success Criteria	Affected SW header is isolated.		
References Used	A-SW-02		
Cognitive Assumption	It is assumed proper place keeping is used.		
Cognitive Recovery Assumptions	It is assumed STAR self-checking is used.		
Execution Assumptions	None		
Execution Recovery Assumptions	Operator will review the procedure when pressure does not return to >86 psig.		

02-SW4AB22-F-HE, Close SW-4A & SW-4B During Flood/Seismic Event - 22 min.

Basic Event Summary

Analyst:	G Baldwin
Rev. Date:	10/20/05
Cognitive Method:	HCR/ORE/THERP

Table 1: 02-SW4AB22-F-HE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	N/A	4.2e-02
P_{exe}	8.7e-03	8.7e-03
Total HEP		5.0e-02
Error Factor		5

HFE Scenario Description:
A Service Water pipe fails down stream of SW-4A/B causing a low Service Water header pressure.

Related Human Interactions:
None

Performance Shaping Factors:
Extreme stress due to plant conditions during seismic event.

Procedure and step governing HI:
A-SW-02, Steps 1-6

Training:

- None
X - Classroom Frequency:
X - Simulator Frequency:

Degree of Clarity of Cues & Indications:

X - Very Good
- Average
- Poor

Human-Machine Interface:

X - Control Room Panels
- Local Control Panels
- Local Equipment

Special Requirements:

Tools	Parts	Clothing

Required Adequate Available	Required Adequate Available	Required Adequate Available

Type of Response:

- Skills
X - Rule
- Knowledge

Complexity of Response

Cognitive	Execution
X - Complex	- Complex
- Simple	X - Simple

Environment:

Lighting	Heat/Humidity
X - Normal	X - Normal
- Emergency	- Hot / Humid
- Portable	- Cold
Radiation	**Atmosphere**
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

	Location	Accessibility
X	- Control Room Front Panels	Accessible
	- Control Room Back Panels	
	- Hot Shutdown Panels	
	- Auxiliary Building	
	- Electrical Building	
	- Containment	
	- Pump house	
	- Switchyard	

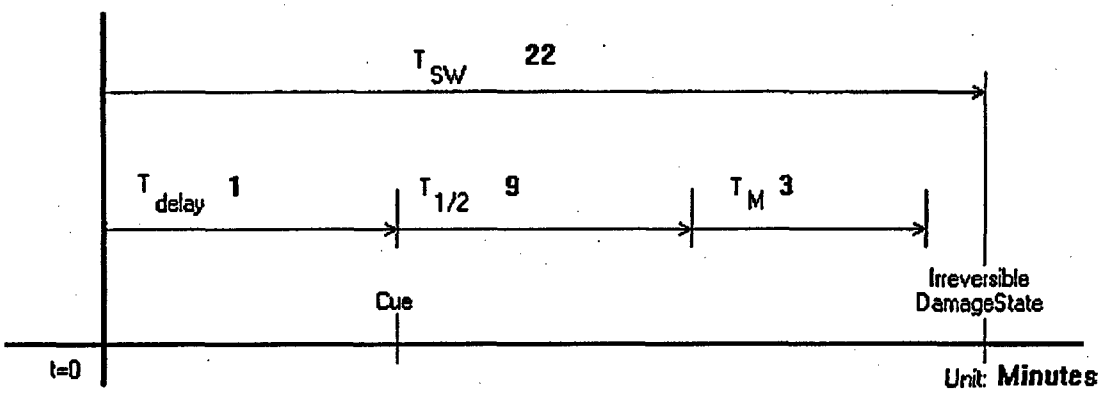
Stress:

- Optimum (Low)
- Moderate
X - Extreme (High)

Cognitive

02-SW4AB22-F-HE

Cue:
47033-P, Miscellaneous Sump Level High,and 47023-K, Seismic Trouble, alarms
Additional SW Alarms based on event



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Operator interview

Duration of time window available for action (TW): 9.00 Minutes

Sigma Decision Tree

	Skill vs. Rule		Procedures		Training		Stress
	Skill	X	Yes	X	Yes		Low
X	Rule		No		No	X	High

Sigma: 4.0e-01

HEP: 4.2e-02

Execution Unrecovered

02-SW4AB22-F-HE

Table 2: 02-SW4AB22-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
Step 6 RNO 2.c	4.3E-4	20-7b	1	E	5	1.3E-3	20-12	3	E	5		8.7e-03
Actions: Position Turb Bldg SW Header switch to ISOL						Comments:						

Execution Recovery

02-SW4AB22-F-HE

Table 3: 02-SW4AB22-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
Step 6 RNO 2.c		Position Turb Bldg SW Header switch to ISOL	8.7e-03				
		Total Unrecovered:	8.7e-03			Total Recovered:	8.7e-03

HEP	08-FPISO30-F-HE	HEP Description	Isol Fire Pump during Seismic Flood Event -30 minutes
Revision Date	10/18/2005	Evaluator	GE Baldwin
Operations Review		Reviewer	
Operations Input	I / S: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03. Addition plant walk downs conducted in April, 2005 and simulator observation 9/29/05.		
Scenario	Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing.		
Event Description	Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing. The NAO is directed to isolate the Fire Pumps.		
Assumptions for the Event	The following assumptions are made: • No major obstacles present to prevent close to normal transits. • Operator has used alternate path to Safeguard Alley • Fire header break has occurred requiring isolation in 30 minutes.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. At approximately 5-9 minutes into the event (after immediate actions for Reactor trip) the Shift Manager (SM) will divide crew to deal with the two events – Plant trip and Seismic event. The SM would dispatch the NAO to evaluate the plant conditions and approximately 4 minutes later the NAO would report fire header rupture. The SM would identify the isolation and direct the isolation of the fire header in approximately 5 minutes. The NAO would complete the isolation in approximately 11 minutes. The total time would be 29 minutes of the allowed 30 minutes.		
Success Criteria	Rupture isolated in time to prevent a loss of TD AFW pump.		
References Used	ARP 47033-P, ARP 47054-L, ARP 47023-K, E-0-05		
Cognitive Assumption	It is assumed proper place keeping is used.		
Cognitive Recovery Assumptions	It is assumed STAR self-checking is used.		
Execution Assumptions	None		

Execution Recovery Assumptions	None

08-FPISO30-F-HE, Isol Fire Pump during Seismic Flood Event -30 minutes

Basic Event Summary

Analyst:	GE Baldwin
Rev. Date:	10/20/05
Cognitive Method:	HCR/ORE/THERP

Table 4: 08-FPISO30-F-HE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	N/A	4.6e-01
P_{exe}	2.6e-02	2.6e-02
Total HEP		4.9e-01
Error Factor		1

HFE Scenario Description:
Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing.

Related Human Interactions:
None

Performance Shaping Factors:
Moderate due to single failure with potential subsequent damage. Limited by lack of knowledge of full consequence of flood event.

Procedure and step governing HI:
ARP 47033-P, Miscellaneous Sump Level High
ARP 47054-L, Fire Pump Abnormal
ARP 47023-K, Seismic Trouble
E-0-05, Response To Natural Events

Training:

- None
- Classroom
X - Simulator Frequency: .5

Degree of Clarity of Cues & Indications:

- Very Good
X - Average
- Poor

Human-Machine Interface:

- Control Room Panels
- Local Control Panels
X - Local Equipment

Special Requirements:

Tools	Parts	Clothing
Required	Required	Required
Adequate	Adequate	Adequate
Available	Available	Available

Type of Response:

- Skills
X - Rule
- Knowledge

Complexity of Response

Cognitive	Execution
X - Complex	- Complex
- Simple	X - Simple

Environment:

Lighting	Heat/Humidity
X - Normal	X - Normal
- Emergency	- Hot / Humid
- Portable	- Cold

Radiation	Atmosphere
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

Location	Accessibility
- Control Room Front Panels	
- Control Room Back Panels	
- Hot Shutdown Panels	
- Auxiliary Building	
- Electrical Building	
- Containment	
X - Pump house	Accessible
- Switchyard	

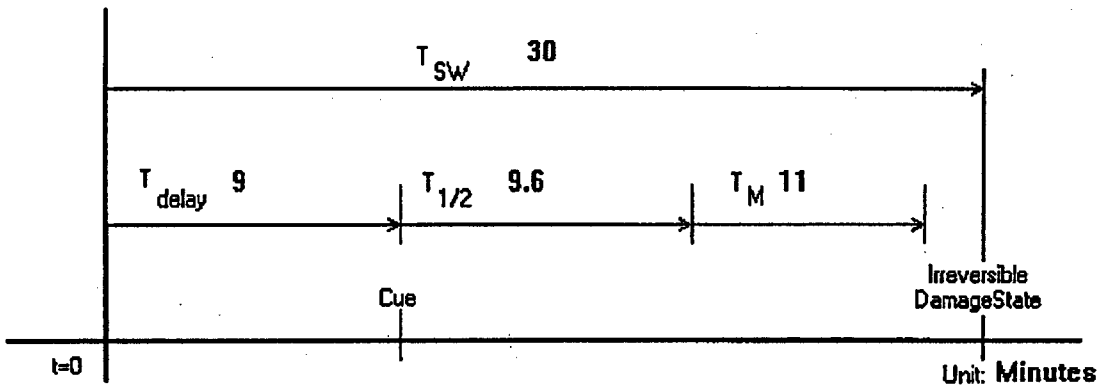
Stress:

- Optimum (Low)
- Moderate
X - Extreme (High)

Cognitive

08-FPISO30-F-HE

Cue:
Actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Operator interviews and Simulator observation

Duration of time window available for action (TW): 0.40 Minutes

Sigma Decision Tree

	Skill vs. Rule		Procedures		Training		Stress
	Skill	X	Yes	X	Yes		Low
X	Rule		No		No	X	High

Sigma: 4.0e-01

HEP: 4.6e-01

Execution Unrecovered

08-FPISO30-F-HE

Table 5: 08-FPISO30-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
1	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2A						Comments:						
2	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2B						Comments:						

Execution Recovery

08-FPISO30-F-HE

Table 6: 08-FPISO30-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
1		Close FP-2A	1.3e-02				
2		Close FP-2B	1.3e-02				
		Total Unrecovered:	2.6e-02			Total Recovered:	2.6e-02

HEP	08-FPISO40-F-HE	HEP Description	Isol Fire Pump during Seismic Flood Event - 40 minutes
Revision Date	10/18/2005	Evaluator	GE Baldwin
Operations Review		Reviewer	
Operations Input	I / S: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03. Addition plant walk downs conducted in April, 2005 and simulator observation 9/29/05.		
Scenario	Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing.		
Event Description	Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing. The NAO is directed to isolate the Fire Pumps.		
Assumptions for the Event	The following assumptions are made: • No major obstacles present to prevent close to normal transits. • Operator has used alternate path to Safeguard Alley • Fire header break has occurred requiring isolation in 40 minutes.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. At approximately 5-9 minutes into the event (after immediate actions for Reactor trip) the Shift Manager (SM) will divide crew to deal with the two events – Plant trip and Seismic event. The SM would dispatch the NAO to evaluate the plant conditions and approximately 4 minutes later the NAO would report fire header rupture. The SM would identify the isolation and direct the isolation of the fire header in approximately 5 minutes. The NAO would complete the isolation in approximately 11 minutes. The total time would be 29 minutes of the allowed 40 minutes.		
Success Criteria	Rupture isolated in time to prevent a loss of TD AFW pump.		
References Used	ARP 47033-P, ARP 47054-L, ARP 47023-K, E-0-05		
Cognitive Assumption	It is assumed proper place keeping is used.		
Cognitive Recovery Assumptions	It is assumed STAR self-checking is used.		
Execution Assumptions	None		

Execution Recovery Assumptions	None

08-FPISO40-F-HE, Isol Fire Pump during Seismic Flood Event -40 minutes

Basic Event Summary

Analyst:	GE Baldwin
Rev. Date:	10/20/05
Cognitive Method:	HCR/ORE/THERP

Table 7: 08-FPISO40-F-HE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	N/A	3.3e-02
P_{exe}	2.6e-02	2.6e-02
Total HEP		5.9e-02
Error Factor		5

HFE Scenario Description:
Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing.

Related Human Interactions:
None

Performance Shaping Factors:
Moderate due to single failure with potential subsequent damage. Limited by lack of knowledge of full consequence of flood event.

Procedure and step governing HI:
ARP 47033-P, Miscellaneous Sump Level High
ARP 47054-L, Fire Pump Abnormal
ARP 47023-K, Seismic Trouble
E-0-05, Response To Natural Events

Training:

- None
- Classroom
X - Simulator Frequency: .5

Degree of Clarity of Cues & Indications:

- Very Good
X - Average
- Poor

Human-Machine Interface:

- Control Room Panels
- Local Control Panels
X - Local Equipment

Special Requirements:

Tools	Parts	Clothing
Required	Required	Required
Adequate	Adequate	Adequate
Available	Available	Available

Type of Response:

- Skills
X - Rule
- Knowledge

Complexity of Response

Cognitive	Execution
X - Complex	- Complex
- Simple	X - Simple

Environment:

Lighting	Heat/Humidity
X - Normal	X - Normal
- Emergency	- Hot / Humid
- Portable	- Cold

Radiation	Atmosphere
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

Location	Accessibility
- Control Room Front Panels	
- Control Room Back Panels	
- Hot Shutdown Panels	
- Auxiliary Building	
- Electrical Building	
- Containment	
X - Pump house	Accessible
- Switchyard	

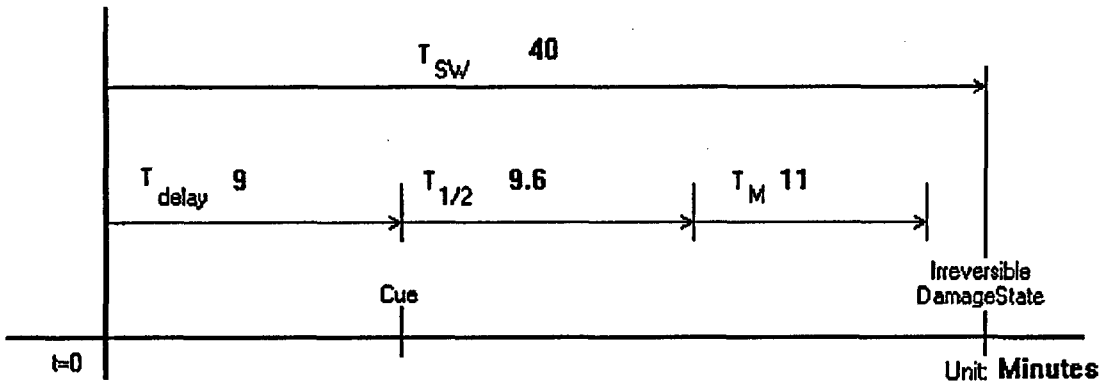
Stress:

- Optimum (Low)
- Moderate
X - Extreme (High)

Cognitive

08-FPISO40-F-HE

Cue:
Actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Operator interviews and Simulator observation

Duration of time window available for action (TW): 10.40 Minutes

Sigma Decision Tree

	Skill vs. Rule		Procedures		Training		Stress
	Skill	X	Yes	X	Yes		Low
X	Rule		No		No	X	High

Sigma: 4.0e-01

HEP: 3.3e-02

Execution Unrecovered

08-FPISO40-F-HE

Table 8: 08-FPISO40-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
1	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2A						Comments:						
2	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2B						Comments:						

Execution Recovery

08-FPISO40-F-HE

Table 9: 08-FPISO40-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
1		Close FP-2A	1.3e-02				
2		Close FP-2B	1.3e-02				
		Total Unrecovered:	2.6e-02			Total Recovered:	2.6e-02

HEP	08-FPISO57-F-HE	HEP Description	Isol Fire Pump during Seismic Flood Event -57 minutes
Revision Date	10/18/2005	Evaluator	GE Baldwin
Operations Review		Reviewer	
Operations Input	I / S: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03. Addition plant walk downs conducted in April, 2005 and simulator observation 9/29/05.		
Scenario	Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing.		
Event Description	Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing. The NAO is directed to isolate the Fire Pumps.		
Assumptions for the Event	The following assumptions are made: • No major obstacles present to prevent close to normal transits. • Operator has used alternate path to Safeguard Alley • Fire header break has occurred requiring isolation in 57 minutes.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. At approximately 5-9 minutes into the event (after immediate actions for Reactor trip) the Shift Manager (SM) will divide crew to deal with the two events – Plant trip and Seismic event. The SM would dispatch the NAO to evaluate the plant conditions and approximately 4 minutes later the NAO would report fire header rupture. The SM would identify the isolation and direct the isolation of the fire header in approximately 5 minutes. The NAO would complete the isolation in approximately 11 minutes. The total time would be 29 minutes of the allowed 57 minutes.		
Success Criteria	Rupture isolated in time to prevent a loss of TD AFW pump.		
References Used	ARP 47033-P, ARP 47054-L, ARP 47023-K, E-0-05		
Cognitive Assumption	It is assumed proper place keeping is used.		
Cognitive Recovery Assumptions	It is assumed STAR self-checking is used.		
Execution Assumptions	None		

Execution Recovery Assumptions	None

08-FPISO57-F-HE, Isol Fire Pump during Seismic Flood Event -57 minutes

Basic Event Summary

Analyst:	GE Baldwin
Rev. Date:	10/20/05
Cognitive Method:	CDBTM/THERP

Table 10: 08-FPISO57-F-HE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	6.0e-03	4.5e-03
P_{exe}	2.6e-02	2.6e-02
Total HEP		3.1e-02
Error Factor		5

HFE Scenario Description:
A seismic event occurs. Fire Header ruptures flooding the Turbine Building Basement causing 47054-L, Fire Pump Abnormal, and 47033-P, Miscellaneous Sump Level High to actuate. The NAO proceeds to the Turbine Building Basement to investigate and discovers water levels increasing.

Related Human Interactions:
None

Performance Shaping Factors:
Extreme due to seismic event with damage and potential subsequent damage.

Procedure and step governing HI:
ARP 47033-P, Miscellaneous Sump Level High
ARP 47054-L, Fire Pump Abnormal
ARP 47023-K, Seismic Trouble
E-0-05, Response To Natural Events

Training:

- **None**
- **Classroom**
- X **Simulator** Frequency: .5

Degree of Clarity of Cues & Indications:

- **Very Good**
- X **Average**
- **Poor**

Human-Machine Interface:

- **Control Room Panels**

- Local Control Panels
X - Local Equipment

Special Requirements:

Tools	Parts	Clothing
Required	Required	Required
Adequate	Adequate	Adequate
Available	Available	Available

Type of Response:

- Skills
X - Rule
- Knowledge

Complexity of Response

Cognitive	Execution
X - Complex	- Complex
- Simple	X - Simple

Environment:

Lighting	Heat/Humidity
X - Normal	X - Normal
- Emergency	- Hot / Humid
- Portable	- Cold

Radiation	Atmosphere
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

Location	Accessibility
- Control Room Front Panels	
- Control Room Back Panels	
- Hot Shutdown Panels	
- Auxiliary Building	
- Electrical Building	
- Containment	
X - Pump house	With Difficulty
- Switchyard	

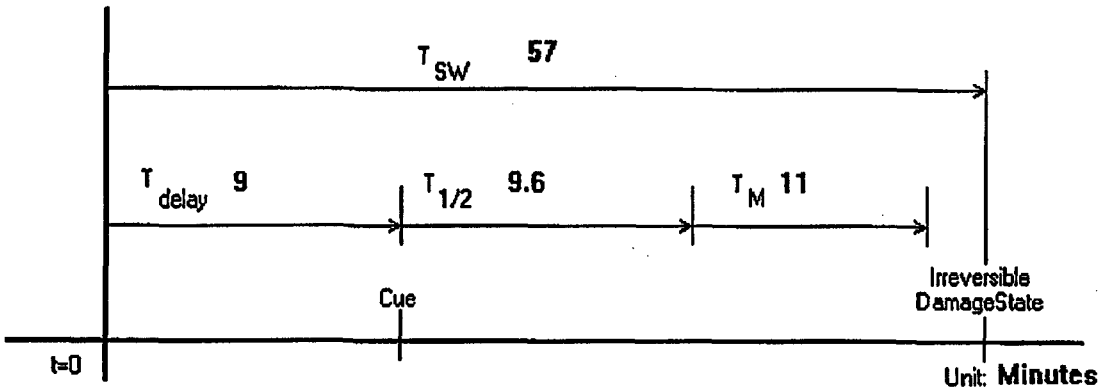
Stress:

- Optimum (Low)
- Moderate
X - Extreme (High)

Cognitive Unrecovered

08-FPISO57-F-HE

Cue:
Actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Operator interviews and Simulator observation

Duration of time window available for action (TW): 27.40 Minutes

Table 11: 08-FPISO57-F-HE COGNITIVE UNRECOVERED

Pc Failure Mechanism	Branch	HEP
Pc_a: Availability of Information	b	neg.
Pc_b: Failure of Attention	h	neg.
Pc_c: Misread/miscommunicate data	a	neg.
Pc_d: Information misleading	a	neg.
Pc_e: Skip a step in procedure	c	3.0e-03
Pc_f: Misinterpret instruction	b	3.0e-03
Pc_g: Misinterpret decision logic	i	neg.
Pc_h: Deliberate violation	a	neg.
Sum of Pc_a through Pc_h = Initial Pc =		6.0e-03

Cognitive Recovery

08-FPISO57-F-HE

Table 12: 08-FPISO57-F-HE COGNITIVE RECOVERY

	Initial HEP	Self-Review	Extra Crew	STA Review	Shift Change	ERF Review	Recovery Matrix	DF	Multiply HEP By	Override Value	Final Value
Pc_a:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_b:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_c:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_d:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_e:	3.0e-03	X	-	-	-	-	1.0e-01	HD	5.0e-01		1.5e-03
Pc_f:	3.0e-03	-	-	-	-	-	NC	-	1.0		3.0e-03
Pc_g:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_h:	neg.	-	-	-	-	-	NC	-	1.0		
									Sum of Pc_a through Pc_h = Initial Pc =		4.5e-03

Recovery Factors identified:
Star process is iused.

Execution Unrecovered

08-FPISO57-F-HE

Table 13: 08-FPISO57-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
1	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2A						Comments:						
2	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2B						Comments:						

Execution Recovery

08-FPISO57-F-HE

Table 14: 08-FPISO57-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
1		Close FP-2A	1.3e-02				
2		Close FP-2B	1.3e-02				
		Total Unrecovered:	2.6e-02			Total Recovered:	2.6e-02

HEP	SX-SWFP-22-F-HE	HEP Description	Isolate SW and Fire Water Rupture -22 minutes
Revision Date	10/21/2005	Evaluator	GE Baldwin
Operations Reviewer		Review	
Operations Input	I: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03. S: Operator walk down on 4/28/05		
Scenario	Seismic event occurs- Fire Water and Service Water Rupture		
Event Description	Seismic event occurs- Fire Water and Service Water Rupture. The NAO is directed to investigate/monitor equipment after the actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms. The Operator take appropriate actions via procedure.		
Assumptions for the Event	The following assumptions are made: • All automatic actions occur except as noted. • NAO is in the Turbine Building.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. At approximately 5-9 minutes into the event (after immediate actions for Reactor trip) the Shift Manager (SM) will divide crew to deal with the two events – Plant trip and Seismic event. The SM would dispatch the NAO to evaluate the plant conditions and approximately 4 minutes later the NAO would report Fire and Service Water header ruptures. The SM would identify the isolation and direct the isolation of the fire header in approximately 5 minutes. The control room operators would isolate Turbine Building Service Water Header simultaneously thus the Fire Header timing is dominant. The NAO would complete the isolation in approximately 11 minutes. The total time would be 29 minutes of the allowed 22 minutes. This action is unsuccessful.		
Success Criteria	Flooding is stopped in 22 minutes.		
References Used	E-0-05		
Cognitive Assumption	Assumes operators will immediately isolate identified rupture.		
Cognitive Recovery Assumptions	None		
Execution Assumptions	None		

Execution Recovery Assumptions	None

SX-SWFP-22-F-HE, Isolate SW and Fire Water Rupture -22 minutes

Basic Event Summary

Analyst:	GE Baldwin
Rev. Date:	10/20/05
Cognitive Method:	HCR/ORE/THERP

Table 15: SX-SWFP-22-F-HE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	N/A	1.0e+00
P_{exe}	3.9e-02	3.9e-02
Total HEP		1.0e+00
Error Factor		1

HFE Scenario Description:
Seismic event occurs- Fire Water and Service Water Rupture

Related Human Interactions:
none

Performance Shaping Factors:
High Stress due to multiple failures and a seismic event

Procedure and step governing HI:
E-0-05, Response To Natural Events, steps 2-7

Training:

- None
- Classroom
X - Simulator Frequency:

Degree of Clarity of Cues & Indications:

- Very Good
X - Average
- Poor

Human-Machine Interface:

X - Control Room Panels
X - Local Control Panels
- Local Equipment

Special Requirements:

Tools	**Parts**	**Clothing**

Required Adequate Available	Required Adequate Available	Required Adequate Available

Type of Response:

- **Skills**
X - **Rule**
- **Knowledge**

Complexity of Response

Cognitive	Execution
X - Complex	X - Complex
- Simple	- Simple

Environment:

Lighting	Heat/Humidity
X - Normal	- Normal
- Emergency	- Hot / Humid
- Portable	X - Cold
Radiation	**Atmosphere**
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

	Location	Accessibility
X	- **Control Room Front Panels**	Accessible
	- **Control Room Back Panels**	
	- **Hot Shutdown Panels**	
	- **Auxiliary Building**	
	- **Electrical Building**	
	- **Containment**	
X	- **Pump house**	Accessible
	- **Switchyard**	

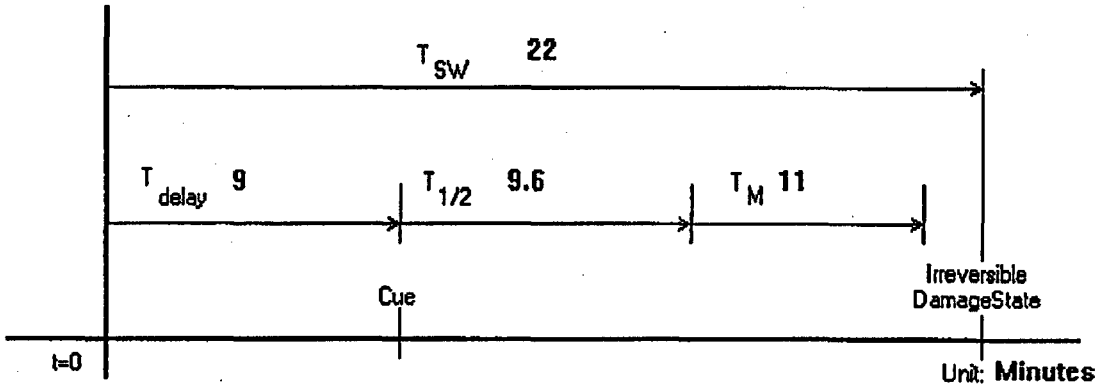
Stress:

- **Optimum (Low)**
- **Moderate**
X - **Extreme (High)**

Cognitive

SX-SWFP-22-F-HE

Cue:
Actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Simulator observation, interviews and plant walkdowns.

Duration of time window available for action (TW): -7.60 Minutes

Sigma Decision Tree

	Skill vs. Rule		Procedures		Training		Stress
	Skill	X	Yes		Yes		Low
X	Rule		No	X	No	X	High

Sigma: 6.0e-01

HEP: 1.0e+00

Execution Unrecovered

SX-SWFP-22-F-HE

Table 16: SX-SWFP-22-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
1	1.3E-3	20-7	1	E	5	1.3E-3	20-12	3	E	5		1.3e-02
Actions: Isolate Turbine Header						Comments:						
2	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2A						Comments:						
3	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2B						Comments:						

Execution Recovery

SX-SWFP-22-F-HE

Table 17: SX-SWFP-22-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
1		Isolate Turbine Header	1.3e-02				
2		Close FP-2A	1.3e-02				
3		Close FP-2B	1.3e-02				
		Total Unrecovered:	3.9e-02			Total Recovered:	3.9e-02

HEP	SX-SWFP-34-F-HE	HEP Description	Isolate SW and Fire Water Rupture -34 minutes
Revision Date	10/21/2005	Evaluator	GE Baldwin
Operations Reviewer		Review	
Operations Input	I / S: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03. Operator walk down on 4/28/05		
Scenario	Seismic event occurs- Fire Water and Service Water Rupture		
Event Description	Seismic event occurs- Fire Water and Service Water Rupture. The NAO is directed to investigate/monitor equipment after the actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms. The Operator take appropriate actions via procedure.		
Assumptions for the Event	The following assumptions are made: • All automatic actions occur except as noted. • NAO is in the Turbine Building.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. At approximately 5-9 minutes into the event (after immediate actions for Reactor trip) the Shift Manager (SM) will divide crew to deal with the two events – Plant trip and Seismic event. The SM would dispatch the NAO to evaluate the plant conditions and approximately 4 minutes later the NAO would report Fire and Service Water header ruptures. The SM would identify the isolation and direct the isolation of the fire header in approximately 5 minutes. The control room operators would isolate Turbine Building Service Water Header simultaneously thus the Fire Header timing is dominant. The NAO would complete the isolation in approximately 11 minutes. The total time would be 29 minutes of the allowed 34 minutes.		
Success Criteria	Flooding is stopped in 34 minutes.		
References Used	E-0-05		
Cognitive Assumption	Assumes operators will immediately isolate identified rupture.		
Cognitive Recovery Assumptions	None		
Execution Assumptions	None		

Execution Recovery Assumptions	None

SX-SWFP-34-F-HE, Isolate SW and Fire Water Rupture -34 minutes

Basic Event Summary

Analyst:	GE Baldwin
Rev. Date:	10/20/05
Cognitive Method:	HCR/ORE/THERP

Table 18: SX-SWFP-34-F-HE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	N/A	2.6e-01
P_{exe}	3.9e-02	3.9e-02
Total HEP		3.0e-01
Error Factor		1

HFE Scenario Description:
Seismic event occurs- Fire Water and Service Water Rupture

Related Human Interactions:
none

Performance Shaping Factors:
High Stress due to multiple failures and a seismic event

Procedure and step governing HI:
E-0-05, Response To Natural Events, steps 2-7

Training:

- None
- Classroom
X - Simulator Frequency:

Degree of Clarity of Cues & Indications:

- Very Good
X - Average
- Poor

Human-Machine Interface:

X - Control Room Panels
X - Local Control Panels
- Local Equipment

Special Requirements:

Tools	Parts	Clothing

Required Adequate Available	Required Adequate Available	Required Adequate Available

Type of Response:

- Skills
X - Rule
- Knowledge

Complexity of Response

Cognitive	Execution
X - Complex	X - Complex
- Simple	- Simple

Environment:

Lighting	Heat/Humidity
X - Normal	- Normal
- Emergency	- Hot / Humid
- Portable	X - Cold
Radiation	**Atmosphere**
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

	Location	Accessibility
X	- Control Room Front Panels	Accessible
	- Control Room Back Panels	
	- Hot Shutdown Panels	
	- Auxiliary Building	
	- Electrical Building	
	- Containment	
X	- Pump house	Accessible
	- Switchyard	

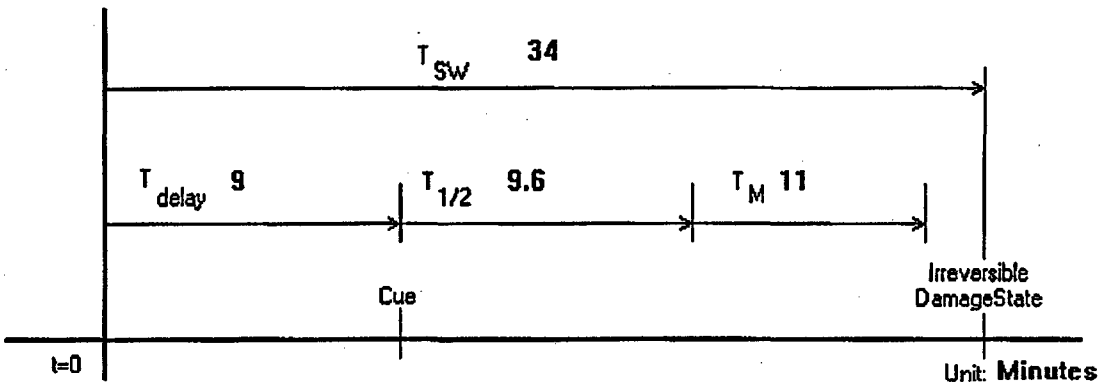
Stress:

- Optimum (Low)
- Moderate
X - Extreme (High)

Cognitive

SX-SWFP-34-F-HE

Cue:
Actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: *Simulator observation, interviews and plant walkdowns.*

Duration of time window available for action (TW): 4.40 Minutes

Sigma Decision Tree

	Skill vs. Rule		Procedures		Training		Stress
	Skill	X	Yes		Yes		Low
X	Rule		No	X	No	X	High

Sigma: 6.0e-01

HEP: 2.6e-01

Execution Unrecovered

SX-SWFP-34-F-HE

Table 19: SX-SWFP-34-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
1	1.3E-3	20-7	1	E	5	1.3E-3	20-12	3	E	5		1.3e-02
Actions: Isolate Turbine Header						Comments:						
2	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2A						Comments:						
3	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2B						Comments:						

Execution Recovery

SX-SWFP-34-F-HE

Table 20: SX-SWFP-34-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
1		Isolate Turbine Header	1.3e-02				
2		Close FP-2A	1.3e-02				
3		Close FP-2B	1.3e-02				
		Total Unrecovered:	3.9e-02			Total Recovered:	3.9e-02

HEP	SX-SWFP-40-F-HE	HEP Description	Isolate SW and Fire Water Rupture - 40 minutes
Revision Date	10/21/2005	Evaluator	GE Baldwin
Operations Reviewer		Review	
Operations Input	I: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03. S: Operator walk down on 4/28/05		
Scenario	Seismic event occurs- Fire Water and Service Water Rupture		
Event Description	Seismic event occurs- Fire Water and Service Water Rupture. The NAO is directed to investigate/monitor equipment after the actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms. The Operator take appropriate actions via procedure.		
Assumptions for the Event	The following assumptions are made: • All automatic actions occur except as noted. • NAO is in the Turbine Building.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. At approximately 5-9 minutes into the event (after immediate actions for Reactor trip) the Shift Manager (SM) will divide crew to deal with the two events – Plant trip and Seismic event. The SM would dispatch the NAO to evaluate the plant conditions and approximately 4 minutes later the NAO would report Fire and Service Water header ruptures. The SM would identify the isolation and direct the isolation of the fire header in approximately 5 minutes. The control room operators would isolate Turbine Building Service Water Header simultaneously thus the Fire Header timing is dominant. The NAO would complete the isolation in approximately 11 minutes. The total time would be 29 minutes of the allowed 40 minutes.		
Success Criteria	Flooding is stopped in 40 minutes.		
References Used	E-0-05		
Cognitive Assumption	Assumes operators will immediately isolate identified rupture.		
Cognitive Recovery Assumptions	None		
Execution Assumptions	None		

Execution Recovery Assumptions	None

SX-SWFP-40-F-HE, Isolate SW and Fire Water Rupture -40 minutes

Basic Event Summary

Analyst:	GE Baldwin
Rev. Date:	10/20/05
Cognitive Method:	HCR/ORE/THERP

Table 21: SX-SWFP-40-F-HE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	N/A	1.1e-01
P_{exe}	3.9e-02	3.9e-02
Total HEP		1.5e-01
Error Factor		1

HFE Scenario Description:
Seismic event occurs - Fire Water and Service Water Rupture

Related Human Interactions:
none

Performance Shaping Factors:
High Stress due to multiple failures and a seismic event

Procedure and step governing HI:
E-0-05, Response To Natural Events, steps 2-7

Training:

- None
- Classroom
X - Simulator Frequency:

Degree of Clarity of Cues & Indications:

- Very Good
X - Average
- Poor

Human-Machine Interface:

X - Control Room Panels
X - Local Control Panels
- Local Equipment

Special Requirements:

Tools	**Parts**	**Clothing**

Required Adequate Available	Required Adequate Available	Required Adequate Available

Type of Response:

- **Skills**
X - **Rule**
- **Knowledge**

Complexity of Response

Cognitive	Execution
X - Complex	X - Complex
- Simple	- Simple

Environment:

Lighting	Heat/Humidity
X - Normal	- Normal
- Emergency	- Hot / Humid
- Portable	X - Cold
Radiation	**Atmosphere**
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

	Location	Accessibility
X	- **Control Room Front Panels**	Accessible
	- **Control Room Back Panels**	
	- **Hot Shutdown Panels**	
	- **Auxiliary Building**	
	- **Electrical Building**	
	- **Containment**	
X	- **Pump house**	Accessible
	- **Switchyard**	

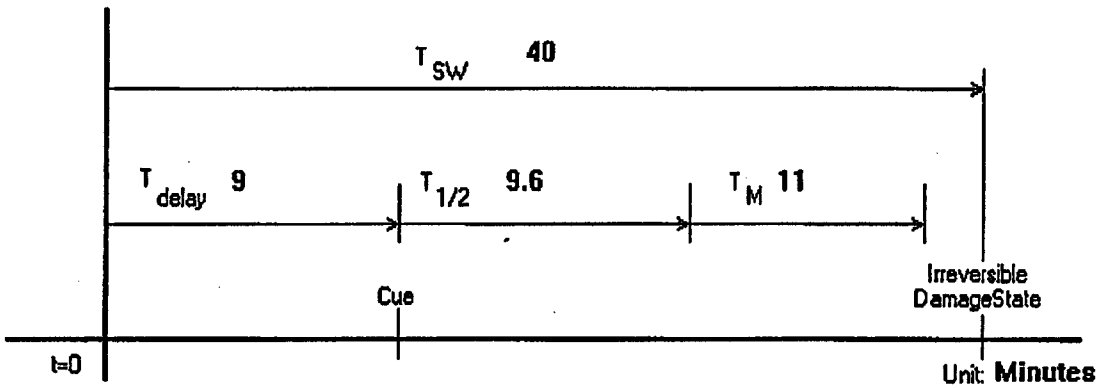
Stress:

- **Optimum (Low)**
- **Moderate**
X - **Extreme (High)**

Cognitive

SX-SWFP-40-F-HE

Cue:
Actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Simulator observation, interviews and plant walkdowns.

Duration of time window available for action (TW): 10.40 Minutes

Sigma Decision Tree

	Skill vs. Rule		Procedures		Training		Stress
	Skill	X	Yes		Yes		Low
X	Rule		No	X	No	X	High

Sigma: 6.0e-01

HEP: 1.1e-01

Execution Unrecovered

SX-SWFP-40-F-HE

Table 22: SX-SWFP-40-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
1	1.3E-3	20-7	1	E	5	1.3E-3	20-12	3	E	5		1.3e-02
Actions: Isolate Turbine Header						Comments:						
2	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2A						Comments:						
3	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2B						Comments:						

Execution Recovery

SX-SWFP-40-F-HE

Table 23: SX-SWFP-40-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
1		Isolate Turbine Header	1.3e-02				
2		Close FP-2A	1.3e-02				
3		Close FP-2B	1.3e-02				
		Total Unrecovered:	3.9e-02			Total Recovered:	3.9e-02

HEP	SX-SWFP-57-F-HE	HEP Description	Isolate SW and Fire Water Rupture -57 minutes
Revision Date	10/21/2005	Evaluator	GE Baldwin
Operations Reviewer		Review	
Operations Input	I / S: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03. Operator walk down on 4/28/05		
Scenario	Seismic event occurs- Fire Water and Service Water Rupture		
Event Description	Seismic event occurs- Fire Water and Service Water Rupture. The NAO is directed to investigate/monitor equipment after the actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms. The Operator take appropriate actions via procedure.		
Assumptions for the Event	The following assumptions are made: • All automatic actions occur except as noted. • NAO is in the Turbine Building.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. At approximately 5-9 minutes into the event (after immediate actions for Reactor trip) the Shift Manager (SM) will divide crew to deal with the two events – Plant trip and Seismic event. The SM would dispatch the NAO to evaluate the plant conditions and approximately 4 minutes later the NAO would report Fire and Service Water header ruptures. The SM would identify the isolation and direct the isolation of the fire header in approximately 5 minutes. The control room operators would isolate Turbine Building Service Water Header simultaneously thus the Fire Header timing is dominant. The NAO would complete the isolation in approximately 11 minutes. The total time would be 29 minutes of the allowed 57 minutes.		
Success Criteria	Flooding is stopped in 57 minutes.		
References Used	E-0-05		
Cognitive Assumption	Assumes operators will immediately isolate identified rupture.		
Cognitive Recovery Assumptions	None		
Execution Assumptions	None		

Execution Recovery Assumptions	None

SX-SWFP-57-F-HE, Isolate SW and Fire Water Rupture -57 minutes

Basic Event Summary

Analyst:	GE Baldwin
Rev. Date:	10/20/05
Cognitive Method:	CDBTM/THERP

Table 24: SX-SWFP-57-F-HE SUMMARY

Analysis Results:	without Recovery	with Recovery
P_{cog}	1.7e-02	1.7e-02
P_{exe}	3.9e-02	3.9e-02
Total HEP		5.6e-02
Error Factor		5

HFE Scenario Description:
Seismic event occurs- Fire Water and Service Water Rupture

Related Human Interactions:
none

Performance Shaping Factors:
High Stress due to multiple failures and a seismic event

Procedure and step governing HI:
E-0-05, Response To Natural Events, steps 2-7

Training:

- None
- Classroom
X - Simulator Frequency:

Degree of Clarity of Cues & Indications:

- Very Good
X - Average
- Poor

Human-Machine Interface:

X - Control Room Panels
X - Local Control Panels
- Local Equipment

Special Requirements:

Tools	Parts	Clothing

Required Adequate Available	Required Adequate Available	Required Adequate Available

Type of Response:

- **Skills**
X - **Rule**
- **Knowledge**

Complexity of Response

Cognitive	Execution
X - Complex	X - Complex
- Simple	- Simple

Environment:

Lighting	Heat/Humidity
X - Normal	- Normal
- Emergency	- Hot / Humid
- Portable	X - Cold
Radiation	**Atmosphere**
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

	Location	Accessibility
X	- **Control Room Front Panels**	Accessible
	- **Control Room Back Panels**	
	- **Hot Shutdown Panels**	
	- **Auxiliary Building**	
	- **Electrical Building**	
	- **Containment**	
X	- **Pump house**	Accessible
	- **Switchyard**	

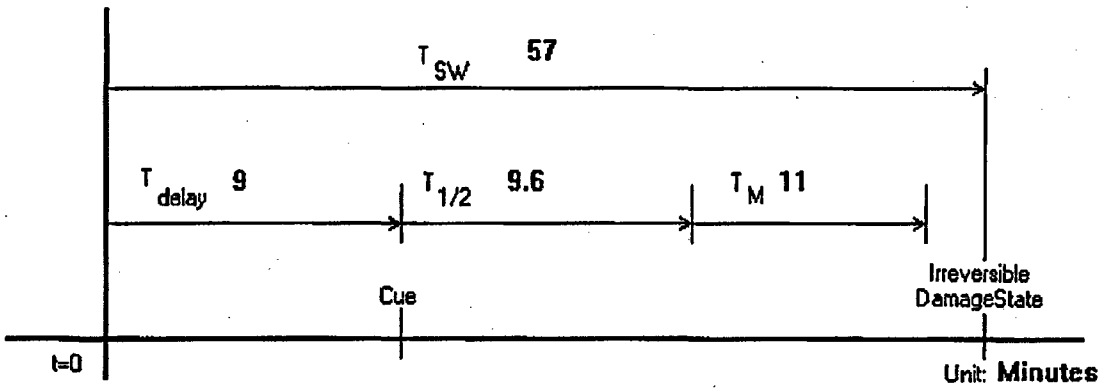
Stress:

- **Optimum (Low)**
- **Moderate**
X - **Extreme (High)**

Cognitive Unrecovered

SX-SWFP-57-F-HE

Cue:
Actuation of 47054-L, Fire Pump Abnormal, 47033-P, Miscellaneous Sump Level High and 47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Simulator observation, interviews and plant walkdowns.

Duration of time window available for action (TW): 27.40 Minutes

Table 25: SX-SWFP-57-F-HE COGNITIVE UNRECOVERED

Pc Failure Mechanism	Branch	HEP
Pc_a: Availability of Information	b	neg.
Pc_b: Failure of Attention	h	neg.
Pc_c: Misread/miscommunicate data	a	neg.
Pc_d: Information misleading	c	1.0e-02
Pc_e: Skip a step in procedure	c	3.0e-03
Pc_f: Misinterpret instruction	b	3.0e-03
Pc_g: Misinterpret decision logic	j	1.0e-03
Pc_h: Deliberate violation	a	neg.
Sum of Pc_a through Pc_h = Initial Pc =		1.7e-02

Cognitive Recovery

SX-SWFP-57-F-HE

Table 26: SX-SWFP-57-F-HE COGNITIVE RECOVERY

	Initial HEP	Self-Review	Extra Crew	STA Review	Shift Change	ERF Review	Recovery Matrix	DF	Multiply HEP By	Override Value	Final Value
Pc_a:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_b:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_c:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_d:	1.0e-02	-	-	-	-	-	NC	-	1.0		1.0e-02
Pc_e:	3.0e-03	-	-	-	-	-	NC	-	1.0		3.0e-03
Pc_f:	3.0e-03	-	-	-	-	-	NC	-	1.0		3.0e-03
Pc_g:	1.0e-03	-	-	-	-	-	NC	-	1.0		1.0e-03
Pc_h:	neg.	-	-	-	-	-	NC	-	1.0		
										Sum of Pc_a through Pc_h = Initial Pc =	1.7e-02

Recovery Factors identified:

Execution Unrecovered

SX-SWFP-57-F-HE

Table 27: SX-SWFP-57-F-HE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
1	1.3E-3	20-7	1	E	5	1.3E-3	20-12	3	E	5		1.3e-02
Actions: Isolate Turbine Header						Comments:						
2	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2A						Comments:						
3	1.3E-3	20-7	1	E	5	1.3E-3	20-13	1	E	5		1.3e-02
Actions: Close FP-2B						Comments:						

Execution Recovery

SX-SWFP-57-F-HE

Table 28: SX-SWFP-57-F-HE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
1		Isolate Turbine Header	1.3e-02				
2		Close FP-2A	1.3e-02				
3		Close FP-2B	1.3e-02				
		Total Unrecovered:	3.9e-02			Total Recovered:	3.9e-02

HEP	02-SW4A-B--FSHE	HEP Description	Operator Fails to Close SW-4A & SW-4B During Flood/Seismic Event
Revision Date	10/20/2005	Evaluator	GE Baldwin
Operation Reviewer		Reviewer	
Operations Input	I / S	Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03	
Scenario	A Service Water pipe falls down stream of SW-4A/B causing a low Service Water header pressure.		
Event Description	A Service Water pipe falls down stream of SW-4A/B causing a low Service Water header pressure. Operators enter A-SW-02 and determine a rupture in Turbine Building header. The operators isolate the affected header		
Assumptions for the Event	The following assumptions are made: • All automatic actions occur except as noted. • Seismic event was initiating event.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. Most times in this analysis is based on the A-SW-02 interview conducted 10/14/02 however some time was adjusted using the average response time. Based on these times it is estimated the operator will close SW-4A(B) in approximately 12 minutes. The allowed time is 29 minutes.		
Success Criteria	Affected SW header is isolated.		
References Used	A-SW-02		
Cognitive Assumption	It is assumed proper place keeping is used.		
Cognitive Recovery Assumptions	It is assumed STAR self-checking is used.		
Execution Assumptions	None		
Execution Recovery Assumptions	Operator will review the procedure when pressure does not return to >86 psig.		

02-SW4A-B--FSHE, Close SW-4A & SW-4B During Flood/Seismic Event

Basic Event Summary

Analyst:	G Baldwin
Rev. Date:	10/20/05
Cognitive Method:	CDBTM/THERP

Table 29: 02-SW4A-B--FSHE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	1.6e-02	1.6e-02
P_{exe}	8.7e-03	8.7e-03
Total HEP		2.5e-02
Error Factor		5

HFE Scenario Description:
A Service Water pipe fails down stream of SW-4A/B causing a low Service Water header pressure.

Related Human Interactions:
None

Performance Shaping Factors:
Extreme stress due to plant conditions during seismic event.

Procedure and step governing HI:
A-SW-02, Steps 1-6

Training:

- None
X - ***Classroom*** Frequency:
X - **Simulator** Frequency:

Degree of Clarity of Cues & Indications:

X - **Very Good**
- **Average**
- **Poor**

Human-Machine Interface:

X - **Control Room Panels**
- **Local Control Panels**
- **Local Equipment**

Special Requirements:

Tools	**Parts**	**Clothing**

Required Adequate Available	Required Adequate Available	Required Adequate Available

Type of Response:

- Skills
X - Rule
- Knowledge

Complexity of Response

Cognitive	Execution
X - Complex	- Complex
- Simple	X - Simple

Environment:

Lighting	Heat/Humidity
X - Normal	X - Normal
- Emergency	- Hot / Humid
- Portable	- Cold
Radiation	**Atmosphere**
X - Background	X - Normal
- Green	- Steam
- Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

	Location	Accessibility
X	- Control Room Front Panels	Accessible
	- Control Room Back Panels	
	- Hot Shutdown Panels	
	- Auxiliary Building	
	- Electrical Building	
	- Containment	
	- Pump house	
	- Switchyard	

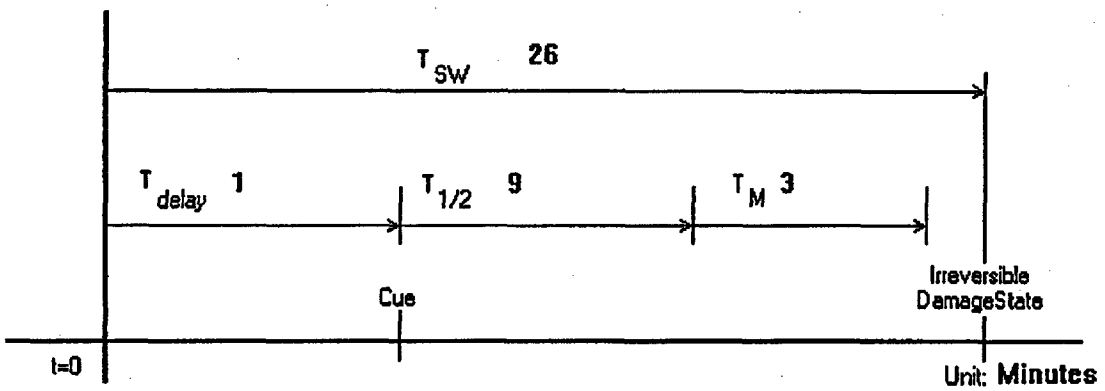
Stress:

- Optimum (Low)
- Moderate
X - Extreme (High)

Cognitive Unrecovered

02-SW4A-B--FSHE

Cue:
47033-P, Miscellaneous Sump Level High, and 47023-K, Seismic Trouble, alarms
Additional SW Alarms based on event



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Operator interview

Duration of time window available for action (TW): 13.00 Minutes

Table 30: 02-SW4A-B--FSHE COGNITIVE UNRECOVERED

Pc Failure Mechanism	Branch	HEP
Pc_a: Availability of Information	a	neg.
Pc_b: Failure of Attention	h	neg.
Pc_c: Misread/miscommunicate data	a	neg.
Pc_d: Information misleading	c	1.0e-02
Pc_e: Skip a step in procedure	c	3.0e-03
Pc_f: Misinterpret instruction	b	3.0e-03
Pc_g: Misinterpret decision logic	i	3.0e-04
Pc_h: Deliberate violation	a	neg.
Sum of Pc_a through Pc_h = Initial Pc =		1.6e-02

Cognitive Recovery

02-SW4A-B--FSHE

Table 31: 02-SW4A-B--FSHE COGNITIVE RECOVERY

	Initial HEP	Self-Review	Extra Crew	STA Review	Shift Change	ERF Review	Recovery Matrix	DF	Multiply HEP By	Override Value	Final Value
Pc_a:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_b:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_c:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_d:	1.0e-02	-	-	-	-	-	NC	-	1.0		1.0e-02
Pc_e:	3.0e-03	-	-	-	-	-	NC	-	1.0		3.0e-03
Pc_f:	3.0e-03	-	-	-	-	-	NC	-	1.0		3.0e-03
Pc_g:	3.0e-04	-	-	-	-	-	NC	-	1.0		3.0e-04
Pc_h:	neg.	-	-	-	-	-	NC	-	1.0		
										Sum of Pc_a through Pc_h = Initial Pc =	1.6e-02

Recovery Factors identified:
STAR process is assumed.

Execution Unrecovered

02-SW4A-B--FSHE

Table 32: 02-SW4A-B--FSHE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
Step 6 RNO 2.c	4.3E-4	20-7b	1	E	5	1.3E-3	20-12	3	E	5		8.7e-03
Actions: Position Turb Bldg SW Header switch to ISOL						Comments:						

Execution Recovery

02-SW4A-B--FSHE

Table 33: 02-SW4A-B--FSHE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
Step 6 RNO 2.c		Position Turb Bldg SW Header switch to ISOL	8.7e-03				
		Total Unrecovered:	8.7e-03			Total Recovered:	8.7e-03

HEP	27A-ORR----FSHE	HEP Description	Limit SI flow and Refill RWST (No Cooldown) - Flood/Seismic
Revision Date	7/2/2005	Evaluator	GE Baldwin
Operations Reviewer		Reviewer	E. Coen
Operations Input	I / S: Simulator observation and operator interviews conducted from 9/25/02 to 6/3/03		
Scenario	The operator is unable to establish emergency coolant recirculation capability from containment sump B due to loss of 480V safeguard buses. The operator then transfers to ECA-1.1, Loss of Emergency Coolant Recirculation, and takes action to extend the time RWST is available by reducing SI flow.		
Event Description	The operator is unable to establish emergency coolant recirculation capability from containment sump B due to loss of 480V safeguard buses. The operator then transfers to ECA-1.1, Loss of Emergency Coolant Recirculation, and takes action to extend the time RWST is available by reducing SI flow. The Operator will direct the throttling of SI-7B to reduce SI flow to the minimum allowed.		
Assumptions for the Event	The following assumptions are made: • Subcooling was lost and not regained prior to entry into ECA-1.1 due to RXCP Seal Leak • A loss of Component Cooling caused the operators to secure the RXCPs • SI Pump B is operating; RHR is not injecting/running; and ICS has not initiated. • Only Bus 6 has power from offsite or Diesel Generator B. • Communications between Control Room and NAO is via PCS phone.		
Timing Analysis	Based on simulator observation and operator interviews conducted from 9/25/02 to 6/3/03, it was determined the average time to perform a control room operator action was 0.8 minutes. This time does not include plant response time for the operator-performed action such as RCS temperature response after initiation of a cooldown. Additionally Simulator observation of 11/4/02 was used to assist in the time line. It is assumed that the operators proceeded in ECA-1.1 at step 17 of E-1 when recirculation capabilities are discovered to be not available. Step 17 of E-1 is reached in approximately 45. The NAO will be dispatched to throttle approximately 2.4 minutes later to throttle SI-7B. It is estimated that it will take the operators approximately 5 minutes to start throttling SI flow and have it positioned in 10 minutes.		
Success Criteria	SI flow is throttled to minimum flow.		
References Used	ECA-1.1		
Cognitive Assumption	It is assumed proper place keeping is used.		
Cognitive Recovery Assumptions	STAR self checking process is used by the operators.		

Execution Assumptions	Stress level remains extreme late into the event due to seismic event.
Execution Recovery Assumptions	None

27A-ORR----FSHE, Limit SI flow and Refill RWST (No Cooldown) - Flood/Seismic

Basic Event Summary

Analyst:	GEB
Rev. Date:	10/20/05
Cognitive Method:	CDBTM/THERP

Table 34: 27A-ORR----FSHE SUMMARY

Analysis Results:	**without Recovery**	**with Recovery**
P_{cog}	3.0e-03	1.5e-03
P_{exe}	8.7e-03	8.7e-03
Total HEP		1.0e-02
Error Factor		5

HFE Scenario Description:
The operator is unable to establish emergency coolant recirculation capability from containment sump B due to loss of 480V safeguard buses. The operator then transfers to ECA-1.1, Loss of Emergency Coolant Recirculation, and takes action to extend the time RWST is available by reducing SI flow.

Related Human Interactions:
None

Performance Shaping Factors:
High stress, ECA procedure is entered with extreme conditions.

Procedure and step governing HI:
ECA-1.1, Steps 14

Training:

- None
- Classroom
X - Simulator Frequency: .5

Degree of Clarity of Cues & Indications:

X - Very Good
- Average
- Poor

Human-Machine Interface:

X - Control Room Panels
- Local Control Panels
X - Local Equipment

Special Requirements:

Tools	Parts	Clothing
Required	Required	Required
Adequate	Adequate	Adequate
Available	Available	Available

Type of Response:

- Skills
X - Rule
- Knowledge

Complexity of Response

Cognitive	Execution
X - Complex	X - Complex
- Simple	- Simple

Environment:

Lighting	Heat/Humidity
X - Normal	X - Normal
- Emergency	- Hot / Humid
- Portable	- Cold
Radiation	**Atmosphere**
- Background	X - Normal
- Green	- Steam
X - Yellow	- Smoke
- Red	- Respirator required

Equipment Accessibility:

	Location	Accessibility
X	- Control Room Front Panels	Accessible
	- Control Room Back Panels	
	- Hot Shutdown Panels	
X	- Auxiliary Building	Accessible
	- Electrical Building	
	- Containment	
	- Pump house	
	- Switchyard	

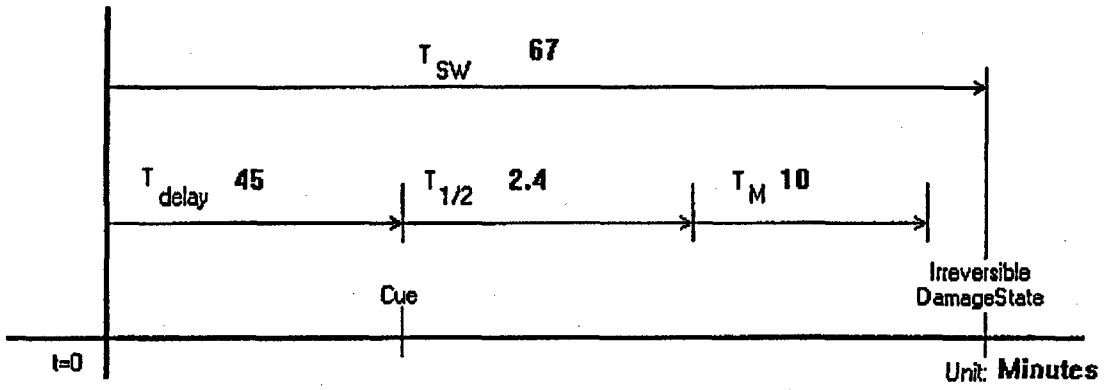
Stress:

- Optimum (Low)
- Moderate
X - Extreme (High)

Cognitive Unrecovered

27A-ORR----FSHE

Cue:
Unable to establish recirculation criteria in step 17 of E-1
47023-K, Seismic Trouble, alarms



Reference for System Time: Seismic Analysis

Reference for Manipulation Time: Simulator observation and interviews from 9/02 to 6/03

Duration of time window available for action (TW): 9.60 Minutes

Table 35: 27A-ORR----FSHE COGNITIVE UNRECOVERED

Pc Failure Mechanism	Branch	HEP
Pc_a: Availability of Information	a	neg.
Pc_b: Failure of Attention	h	neg.
Pc_c: Misread/miscommunicate data	a	neg.
Pc_d: Information misleading	a	neg.
Pc_e: Skip a step in procedure	c	3.0e-03
Pc_f: Misinterpret instruction	a	neg.
Pc_g: Misinterpret decision logic	k	neg.
Pc_h: Deliberate violation	a	neg.
Sum of Pc_a through Pc_h = Initial Pc =		3.0e-03

Cognitive Recovery

27A-ORR—FSHE

Table 36: 27A-ORR—FSHE COGNITIVE RECOVERY

	Initial HEP	Self-Review	Extra Crew	STA Review	Shift Change	ERF Review	Recovery Matrix	DF	Multiply HEP By	Override Value	Final Value
Pc_a:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_b:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_c:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_d:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_e:	3.0e-03	X	-	-	-	-	1.0e-01	HD	5.0e-01		1.5e-03
Pc_f:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_g:	neg.	-	-	-	-	-	NC	-	1.0		
Pc_h:	neg.	-	-	-	-	-	NC	-	1.0		
									Sum of Pc_a through Pc_h = Initial Pc =		1.5e-03

Recovery Factors identified:
Trained to perform self review of step prior to transition to next procedure

Execution Unrecovered

27A-ORR—FSHE

Table 37: 27A-ORR—FSHE EXECUTION UNRECOVERED

Step	Omission					Commission					Total	
		Table	Item	Stress	Stress		Table	Item	Stress	Stress	Over	Per
Step No.	HEP	Ref.	Ref.	E/M/O	Value	HEP	Ref.	Ref.	E/M/O	Value	Ride	Step
Step 14.a RNO b.3	4.3E-4	20-7b	1	E	5	1.3E-3	20-13	1	E	5		8.7e-03
Actions: Locally throttle SI-7A(B)						Comments:						

Execution Recovery

27A-ORR---FSHE

Table 38: 27A-ORR---FSHE EXECUTION RECOVERY

Critical Step No.	Recovery Step No.	Action	HEP (Crit)	HEP (Rec)	Dep.	Cond. HEP (Rec)	Total for Step
Step 14.a RNO b.3		Locally throttle SI-7A(B)	8.7e-03				
		Total Unrecovered:	8.7e-03			Total Recovered:	8.7e-03

Appendix F

Seismic Analysis

Attachment 2 - Components Determined Not to be Significant to the Seismic Flooding Model

Components Determined Not to be Significant to the Seismic Flooding Model

Prepared by: Edward D. Coen — Edward D. Coen
Signature — Print Name

10/26/05
Date

Reviewed by: for D.L. Moore via telecon ESC — David L. Moore
Signature — Print Name

10/27/05
Date

Attachment 2 to Appendix F

As discussed in Appendix F, Section 4, some equipment and piping segments had seismic fragilities that were below the screening criterion of 1E-07/year, but were determined to have an insignificant impact on seismic flooding core damage frequency. These components are listed in Table 1 below, and include the justification for not including the components in the seismic flooding models. For example, the piping segment may have insignificant (or no) flow due to its small size, or due to the loss of offsite power (LOSP).

Several of the components are small tanks, with volumes that are insignificant compared to other flooding sources. The volumes of these tanks are documented in Attachment 6 of Appendix F.

System pressure for piping in the Fire Protection system is given in the System Description SD 08, Rev 2, Fire Protection System (FP), 5/23/2002; for the Service Water system in SD 02, Rev 3, Service Water System (SW), 3/10/2004. Flow for the deep well pumps is given in SD 26, Rev 1, Potable Water System (PW), 11/26/03.

All fragilities and descriptions for the components are documented in the fragilities report (Stevenson & Associates, 2005).

Table 1 Components Determined Not to be Significant to the Seismic Flooding Model

	Tanks and Equipment	Am (g)	Bc	Volume (gal)	Flow (gpm)	Reason to Exclude From Model	Flow Diag	1st Valve	Pres (psi)	Dia (in)	Density	Flow Calc
1	Sulfuric Acid Day Tank	1.35	0.4	300	0	Insignificant volume No flow with LOSP						
2	Caustic Tank	1.64	0.4	5,000	0	Relatively high seismic capacity, with small volume.						
3	Brine Tank	1.5	0.4	564	0	Insignificant volume 200gal liquid (between 50-100% salt)						
4	Hot Water Heater	1.68	0.4	865	140	Small volume Flow based on deep well pump capacity of 140gpm						
5	SG A/B Boric Acid Tanks & Feed Pumps	1.87	0.4	1000	0	Insignificant volume No flow with LOSP, 2 tanks @ 500g usable each						
6	SWPT Coagulant Aid Feed Tank	1.5	0.4	400	0	Insignificant Volume No flow with LOSP						
7	SWPT Coagulant Feed Tank	1.5	0.4	400	0	Insignificant volume No flow with LOSP						
	Piping											
8	Disch from EHC Oil Coolers	1.1	0.5	0	336	correlated 2 lines Flow is not significant even in worst case with CST and RMST failed, since the frequency of this scenario is 9E-8, and there are still 119min for isolation of SW from the control room. Therefore, the contribution to CDF would be less than 1E-8, which is not significant.	OPERM-202-3	SW2002A,B	100	0.8	62.22	336
9	Htr drain pump SW supply lines	1.86	0.5	0	597	correlated 2 lines Flow is not significant even in worst case with CST and RMST failed, since the frequency of this scenario is less than 1E-7, and there are still 67min for isolation of SW from the control room. Therefore, the contribution to CDF would be less than 1E-8, which is not significant.	OPERM-202-3	SW1900A,B	100	1	62.22	597

	Tanks and Equipment	Am (g)	Bc	Volume (gal)	Flow (gpm)	Reason to Exclude From Model	Flow Diag	1st Valve	Pres (psi)	Dia (in)	Density	Flow Calc
10	Disch from Heater Drain Pumps	1.54	0.5	0	597	correlated lines, max of 2 x 1" Flow is not significant even in worst case with CST and RMST failed, since the frequency of this scenario is less than 1E-7, and there are still 67min for isolation of SW from the control room. Therefore, the contribution to CDF would be less than 1E-8, which is not significant.	OPERM-202-3	SW1911,1921,1931A,B	100	1	62.22	597
11	MD10 drain from hogging jet & gland steam condenser	0.73	0.5	0	0	no flow due to LOSP	OPERM-204, M-212	MD10	0	3	62.22	0
12	Sample connection	0.25	0.5	0	0	no flow due to LOSP	OPERM-204	C500	0	0.5	62.22	0
13	Sample connection	0.25	0.5	0	0	no flow due to LOSP	OPERM-204	C900	0	0.5	62.22	0
14	Filtered water dump from SWPT	0.5	0.5	0	0	no flow from SWPT since upstream NC valves have 1.31g capacity, and no flow from SWPT Filter Feed Pumps due to LOSP	OPERM-204	SW(T)210	0	2	62.22	0
15	3/4" sample connections	0.46	0.5	0	130	correlated 2 lines insign flow from CST (32' head) would not contribute to CST failure scenarios	OPERM-204	MU40A,B	15	0.8	62.22	130
16	1" from 8" header to CD pumps gland seal supply	0.8	0.5	0	140	insign flow from CST (50' head * 0.446psi/ft = 22psi) would not contribute to CST failure scenarios	OPERM-204	MU500	22	1	62.22	140
17	Vent line	0.25	0.5	0	35	insign flow from CST (50'head * 0.446psi/ft = 22psi) would not contribute to CST failure scenarios	OPERM-204	MU500-1	22	0.5	62.22	35
18	Instrumentation in HD system	varies	0.5	0	0	these breaks in 0.5 to 0.75 tubing would release small amounts of steam or water, but would not set off sprinklers, or contribute to water inventory	OPERM-207	various				
19	Piping in HD system	1.87	0.5	0	0	these piping systems are only failed by the moisture separator reheaters, or the main condenser, which are directly included in the model. The heater drain tank is screened based on high capacity.	OPERM-207	various				

	Tanks and Equipment	Am (g)	Bc	Volume (gal)	Flow (gpm)	Reason to Exclude From Model	Flow Diag	1st Valve	Pres (psi)	Dia (in)	Density	Flow Calc
20	Hydrogen cooler wet sprinkler system	2.2	0.5	0	0	This branch is downstream of a 0.42 capacity branch, so would be subsumed by FP335 failure	OPERM-208					
21	Wet system in CST room	2.2	0.5	0	334	High capacity, low flow: insignificant contributor	OPERM-208	FP311-3	125	1	62.22	334
22	6" supply line to Admin Building	0.98	0.5	0		This branch is in the hallway to the pump station, and would drain down to the pump station. There would not be significant water in any of the safeguards alley rooms to damage equipment.	OPERM-208	FP230				
23	Make-up Water piping (OPERM 209-1, -2)					These systems will have no flow due to LOSP. Supply from SWPT will also have no flow. Therefore, only tank contents can contribute. In many cases, closed valves prevent loss of tank contents. Most piping has high capacity > 1.9g. Exceptions are discussed below.	OPERM-209-1, -2					
24	S/G boric acid tanks supply	1.1	0.5	0	0	piping assumed failed by E. Chem tank block wall no flow, and tanks will not drain since piping enters high on tank wall	OPERM-209-2	MU640-3				
25	header to two bed acid dilution	0.25	0.5	0	0	glass flow indicator in piping no flow in piping	OPERM-209-1					
26	Potable water system piping		0.5	0	140	This system is fed by the 2 deep well pumps. Only one pump is fed by the TSC DG, with the other on offsite power. It has maximum flow of 140gpm, which is not significant. All piping has capacity >1.5g, except for a level gauge on the hydropneumatic tank, which is insignificant flow.	OPERM-209-3					

	Tanks and Equipment	Am (g)	Bc	Volume (gal)	Flow (gpm)	Reason to Exclude From Model	Flow Diag	1st Valve	Pres (psi)	Dia (in)	Density	Flow Calc
27	CW fan coil piping	0.77-1.77	0.5	0	0	From a walkdown, this piping comes from the bottom of the waterboxes to the strainer and pump on the floor of the TB, and then up high to the overhead, and back down to the fan coolers. The two weakest points are after the piping in the overhead, in the crossover (0.77g) and the discharge to the standpipe (0.99g). In addition, most of the circ water will be drained out of the main CW discharge. Therefore, although there could be some discharge of CW in a break, it will not be significant.	OPERM-215					
28	Secondary sampling system piping		0.5	0		All piping is 4.6g, except for 3/4" and 3/8" tubing from sample coolers to Analytical Instrumentation Panel Cooler rack, which has 0.05g based on interactions. There is insignificant flow from these lines.	OPERM-219	MU221-3, MU241-2				
29	SG Blowdown Treatment	varies	0.5	0		All of the piping has high capacity. Only the SGBT hold up and monitor tanks have non-screened capacity, and are included directly in the model.	OPERM-368					
30	To CW pumps, 4" supply from SWPT cartridge filters, Crossover	1.31	0.5	0		This piping is downstream from 3 other pipe segments of the same or larger size that have lower capacity (1.07), so it is very low probability that the others would be successful, and this piping fail.	OPERM-394	SW(T)202, SW(T)226, SW(T)205				

	Tanks and Equipment	Am (g)	Bc	Volume (gal)	Flow (gpm)	Reason to Exclude From Model	Flow Diag	1st Valve	Pres (psi)	Dia (in)	Density	Flow Calc
31	Various SW(T) piping that has no or low flow, and would drain only small tanks	varies	0.5		0	The following lines would have insignificant flows or tank drainage: CI2405, SW2822-1, SW2822, SW(T)100A-E, SW(T)225, SW(T)105A-E,SW(T)105F&G, SW(T)106F-G, SW(T)50F&G, SW(T)340/330, SW(T)315, SW(T)325, CI2100, CI2101, CI2000A/B, CI2001A, CI2000B, SW(T)306A/B, SW(T)44, sample lines, SW(T)40A-E, SW(T)104A-E, SW(T)41, SW(T)104F&G, SW(T)120, SW(T)45, SW(T)402A/B, SW(T)402A/B, TB sump to settling basin, SW(T)11A/B, SW(T)101, SW(T)103, SW(T)10A/B/C, SW(T)20	OPERM-394					
32	Flocculator piping	varies	0.5		0	These lines are usually isolated by MOV SW2811, which is a timed valve open 10 min every 8 hours for cleaning the waste sludge pumps (see Attachment 7). Given the low probability of an open MOV (0.02), and since these are downstream of SW(T)2810 and a flow limiting orifice, the potential for flow in these lines is not significant.	OPERM-394	SW(T)400A-C, SW(T)490, SW(T)410SW(T)411, SW(T)412,				
33	Line from potable water break tank to standpipe	0.01	0.5		0	glass flow indicator limited to 140gpm from deep well pump	OPERM-394					
34	Steam Generator Blowdown	high	0.5		0	screened high capacity except for main condenser, which is in the model.	OPERM-436					
35	Water treatment (MUP) piping		0.5		0	Piping has high capacity except 3/8" plastic tubing, which has insignificant flow.	OPERM-444, OPERM-1274	SW(T)131				

	Tanks and Equipment	Am (g)	Bc	Volume (gal)	Flow (gpm)	Reason to Exclude From Model	Flow Diag	1st Valve	Pres (psi)	Dia (in)	Density	Flow Calc
36	SW fan coil discharge piping interaction	1.76	0.5		0	The following fan coil discharge lines could be damaged by failure of the FP275 piping. However, the flows would be limited to 195gpm, which is not significant compared to the 6000gpm of the FP275 piping. SW1858 (10gpm), SW722/711B (60gpm), SW653 (25gpm), SW721B (20gpm), SW712A (60gpm), SW722A (20gpm). Flows are from System Description SD 16, Rev 2, Turbine Building and Screenhouse Ventilation System (TAV), 11/17/2002.	OPERM-606					

Appendix F

Seismic Analysis

Attachment 3 – Hotwell and Main Condenser Volumes

Hotwell and Main Condenser Volumes

Prepared by: for D L Moore
Via Phone EDC
Signature

David L Moore
Print Name

10/27/05
Date

Reviewed by: Edward D Coen
Signature

Edward. D Coen
Print Name

10/27/05
Date

21 October 2005 DLMC-05-33

TO: Kewaunee Seismic Flooding File

FROM: David Moore

SUBJECT: Calculation of Spill Volumes of Main Condenser Hotwell and CW Tubes

1. Hotwells: Dimensions of the hotwell were taken rom A-203 General Arrangement, Turbine and Administration Building Basement Floor, Rev AW

28' 4" (N-S dimension) x 38' (E-W dimension)

From System Description SD 03, Condensate System (CD), Rev 3, 7/1/02:

9.75" = 14%, and normal level = 69%

[9.75" / (12"/ft)] * [69 / 14] = 4.0' is equivalent to normal level

28.33' * 38' * 4' * 2 condensers * 7.48 gal/f^3 = 64,420gal

However, the main condenser hotwell is recessed into the TB basement floor about 1' (based on walkdown measurement), so only 3' of the hotwell would contribute to the flood.

Therefore, (64,420g * 3) / 4 = **48,320 gal**

2. Circ Water in Condenser Tubes: System Description SD 04, Circulating Water(CW), Rev 4, 8/12/04:

401,200gpm CW flow; 6.38fps CW velocity through tubes; 40' overall tube length; 1" diameter tubes; 26,232 + 664 + 1904 tubes

40' / 6.38fps = 6.27 s for the flow to go from start to end of CW tube

(401,200gpm * 6.27s) / (60s/min) = **41,920gal**

Appendix F

Seismic Analysis

Attachment 4 – SHIP Output Files - Baseline

SHIP Output Files - Baseline

Prepared by: Edward D. Coen — Edward D. Coen
Signature — Print Name

10/28/05
Date

Reviewed by: for David Moore by telephone [illegible] — David L Moore
Signature — Print Name

10/28/05
Date

Flooding SDP
Date: 10/28/2005
Time: 09:27:07.60

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*****************************************************************************
*                                                                           *
*                                                                           *
*                                  SHIP                                     *
*                     Seismic Hazard Integration Package                    *
*                                                                           *
*                                Developed by                               *
*                   Jack R. Benjamin and Associates, Inc.                   *
*                          Menlo Park, California                           *
*                                                                           *
*                              Copyright 1996                               *
*                               Version 1.02                                *
*                            Release Date: 07/02/96                         *
*                                                                           *
*  Code: SHIP                                          Code No. : S001-102  *
*                                                 Serial No. : S001-102-006Q *
*                                                                           *
*              This code has been QA verified and complies with             *
*              the requirements of 10 CFR 50 Appendix B                     *
*                                                                           *
*****************************************************************************
```

Problem : Kewaunee Power Station
Case : Seismic PRA
Flooding SDP

Analysis Parameters

No. of Lognormal Fragilities	(NCOMPS)	:	29
No. of Non-Lognormal Fragilities	(NCMPNLN)	:	0
No. of Supercomponents	(NSUPCMP)	:	0
No. of Random Failures	(NR)	:	14
Ground Motion Measure (units)	(AHEAD)	:	pga(units:g)
Minimum Ground Motion Level	(AMIN)	:	.050
Maximum Ground Motion Level	(AMAX)	:	1.590
Increment on Ground Motion	(ADELT)	:	.020

Analysis Options Selected

Best Estimate Analysis	===>	IBEST = 1
Sequences Analyzed	===>	NSEQ = 24
Integration of Hazard and Fragility Curves done	===>	IINTGRT = 1

Input Files

File Description		Filename
Names File	:	seiflood.nam
Basic Input	:	Seiflood.inp
Component Fragilities	:	Seiflood.cmp
System Model	:	Seiflood.stm
Accident Sequences	:	Seiflood.seq
Seismic Hazard	:	EPRI89.haz

Summary of Output Files

File Description	Write to Disk?	Filename
SHIP Basic Output	Y	Seiflood.BAS
Error Messages	Y	Seiflood.ERR
Component Fragilities	Y	Seiflood.CFC
System Fragilities	Y	Seiflood.SYC
Sequence Fragilities	Y	Seiflood.SFC
Percent Contribution of each Ground Motion Level to the Mean Risk	Y	Seiflood.APC

Summary of Plot Files

File Description	Write to Disk?	Filename
Hazard Curve(s)	Y	Seiflood.HZP
Fragility Curves for Sequences and Damage States	Y	Seiflood.SQP
System Fragility Curves	Y	Seiflood.SYP

Seismic Hazard Data
(Hazard Curves Defined at 15 Points)

Curve No.	Probability Weight	pga(units:g) .011	.027	.110	.142	.221	.265	.327	.499
1	1.000	2.100E-03	1.304E-03	1.100E-04	8.120E-05	3.800E-05	2.837E-05	1.874E-05	5.900E-06

Curve No.	Probability Weight	pga(units:g) .555	.633	.846	.931	1.121	1.276	1.590
1	1.000	4.408E-06	2.936E-06	9.600E-07	6.500E-07	2.700E-07	1.660E-07	6.200E-08

Seismic Lognormal Fragility Parameters

Median Capacity Defined in Terms of pga(units:g)

Number	Component Name	Median	Beta-R	Beta-U	Beta-C	HCLPF	Cutoff
1	S-PP-CDPSP---FA	2.200	.500	.000	.500	.964	.000
2	S-PP-FP201---FA	1.380	.500	.000	.500	.605	.000
3	S-PP-FP250---FA	1.710	.500	.000	.500	.749	.000
4	S-PP-FP270---FA	1.970	.500	.000	.500	.863	.000
5	S-PP-FP275---FA	1.760	.500	.000	.500	.771	.000
6	S-PP-FP275-1-FA	1.930	.500	.000	.500	.846	.000
7	S-PP-FP276---FA	1.280	.500	.000	.500	.561	.000
8	S-PP-FP280---FA	1.670	.500	.000	.500	.732	.000
9	S-PP-FP320---FA	1.080	.500	.000	.500	.473	.000
10	S-PP-FP321-1-FA	2.200	.500	.000	.500	.964	.000
11	S-PP-FP331---FA	1.310	.500	.000	.500	.574	.000
12	S-PP-FP335---FA	.420	.500	.000	.500	.184	.000
13	S-PP-FP345---FA	2.030	.500	.000	.500	.890	.000
14	S-PP-FP370---FA	1.310	.500	.000	.500	.574	.000
15	S-PP-FP380A--FA	2.020	.500	.000	.500	.885	.000
16	S-PP-SW1801ABFA	1.800	.500	.000	.500	.789	.000
17	S-PP-SW2200--FA	1.370	.500	.000	.500	.600	.000
18	S-PP-SW2500--FA	1.800	.500	.000	.500	.789	.000
19	S-PP-SW2501ABFA	1.530	.500	.000	.500	.670	.000
20	S-PP-SW2800--FA	1.070	.500	.000	.500	.469	.000
21	S-PP-SW2810--FA	1.070	.500	.000	.500	.469	.000
22	S-PP-SW2820--FA	1.070	.500	.000	.500	.469	.000
23	S-PP-SW2900--FA	1.260	.500	.000	.500	.552	.000
24	S-PPFP341-123FA	1.310	.500	.000	.500	.574	.000
25	S-TK-CNDSR---FA	1.870	.400	.000	.400	.967	.000
26	S-TK-CST-----FA	.670	.400	.000	.400	.346	.000
27	S-TK-MSR-----FA	1.870	.400	.000	.400	.967	.000
28	S-TK-RMST----FA	.540	.400	.000	.400	.279	.000
29	S-TK-SGBT----FA	1.410	.400	.000	.400	.729	.000

Random Failures

No.	Component Name	Mean Failure Rate
1	02-SW4A-B--FSHE	2.50E-02
2	08-FPISO30-F-HE	4.90E-01
3	08-FPISO40-F-HE	5.90E-02
4	08-FPISO57-F-HE	3.10E-02
5	ISOL-FP-S15-SUC	8.22E-01
6	ISOL-FP-S2-SUC	9.61E-01
7	ISOL-FP-S8-SUC	9.56E-01
8	ISOL-FPSW-S10-SC	8.61E-01
9	ISOL-FPSW-S12-SC	4.02E-01
10	ISOL-FPSW-S21-SC	7.81E-01
11	S-SYS-FAIL---FA	9.54E-02
12	SX-SWFP-34-F-HE	3.00E-01
13	SX-SWFP-40-F-HE	1.50E-01
14	SX-SWFP-57-F-HE	5.60E-02

Seismic Systems Analysis

	Computed	Available On File	Total
No. of Systems:	22	0	22
No. of Sequences:	24	0	24
No. of Damage States:	1	-	1

Systems Summary

No.	System Name	Available on disk? Y/N	Filename	To be analyzed? Y/N	To be stored? Y/N	Filename
1	CST	N	-	Y	Y	CST.FRG
2	FP	N	-	Y	Y	FP.FRG
3	FP335	N	-	Y	Y	FP335.FRG
4	HCE	N	-	Y	Y	HCE.FRG
5	ISOFPS15	N	-	Y	Y	ISOFPS15.FRG
6	ISOFPS16	N	-	Y	Y	ISOFPS16.FRG
7	ISOLFP57	N	-	Y	Y	ISOLFP57.FRG
8	ISOLFPS2	N	-	Y	Y	ISOLFPS2.FRG
9	ISOLFPS3	N	-	Y	Y	ISOLFPS3.FRG
10	ISOLFPS8	N	-	Y	Y	ISOLFPS8.FRG
11	ISOLFPS9	N	-	Y	Y	ISOLFPS9.FRG
12	ISOLSW	N	-	Y	Y	ISOLSW.FRG
13	ISOSFS12	N	-	Y	Y	ISOSFS12.FRG
14	ISOSFS13	N	-	Y	Y	ISOSFS13.FRG
15	ISOSFS21	N	-	Y	Y	ISOSFS21.FRG
16	ISOSFS22	N	-	Y	Y	ISOSFS22.FRG
17	ISOSWM10	N	-	Y	Y	ISOSWM10.FRG
18	ISOSWM11	N	-	Y	Y	ISOSWM11.FRG
19	ISOSWS24	N	-	Y	Y	ISOSWS24.FRG
20	RMST	N	-	Y	Y	RMST.FRG
21	SW	N	-	Y	Y	SW.FRG
22	SYSFLRS	N	-	Y	Y	SYSFLRS.FRG

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
1	SEIFLD02	Y	SEIFLD02.FRG	8	\HCE \FP335 ISOLFPS2	\CST \SW SYSFLRS	\RMST FP
2	SEIFLD03	Y	SEIFLD03.FRG	6	\HCE \FP335	\CST \SW	\RMST ISOLFPS3
3	SEIFLD04	Y	SEIFLD04.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	\RMST \ISOLSW
4	SEIFLD05	Y	SEIFLD05.FRG	6	\HCE \FP335	\CST SW	\RMST ISOLSW
5	SEIFLD06	Y	SEIFLD06.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	\RMST \FP
6	SEIFLD07	Y	SEIFLD07.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	\RMST \FP
	SEIFLD08	Y	SEIFLD08.FRG	8	\HCE FP335 ISOLFPS8	\CST \SW SYSFLRS	\RMST FP
8	SEIFLD09	Y	SEIFLD09.FRG	6	\HCE FP335	\CST \SW	\RMST ISOLFPS9
9	SEIFLD10	Y	SEIFLD10.FRG	8	\HCE FP335 ISOSWM10	\CST SW SYSFLRS	\RMST \FP
10	SEIFLD11	Y	SEIFLD11.FRG	6	\HCE FP335	\CST \FP	\RMST ISOSWM11

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
11	SEIFLD12	Y	SEIFLD12.FRG	8	\HCE FP335 ISOSFS12	\CST SW SYSFLRS	\RMST FP
12	SEIFLD13	Y	SEIFLD13.FRG	5	\HCE FP335	\CST ISOSFS13	\RMST
13	SEIFLD15	Y	SEIFLD15.FRG	8	\HCE \FP335 ISOFPS15	\CST \SW SYSFLRS	RMST FP
14	SEIFLD16	Y	SEIFLD16.FRG	6	\HCE \FP335	\CST \SW	RMST ISOFPS16
15	SEIFLD17	Y	SEIFLD17.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	RMST \ISOLSW
16	SEIFLD18	Y	SEIFLD18.FRG	6	\HCE \FP335	\CST SW	RMST ISOLSW
17	SEIFLD19	Y	SEIFLD19.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	RMST \FP
18	SEIFLD20	Y	SEIFLD20.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	RMST \FP
19	SEIFLD21	Y	SEIFLD21.FRG	8	\HCE FP335 ISOSFS21	\CST \SW SYSFLRS	RMST FP
20	SEIFLD22	Y	SEIFLD22.FRG	6	\HCE FP335	\CST \SW	RMST ISOSFS22

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
21	SEIFLD23	Y	SEIFLD23.FRG	7	\HCE FP335 SYSFLRS	\CST SW	RMST \ISOSWS24
22	SEIFLD24	Y	SEIFLD24.FRG	6	\HCE FP335	\CST SW	RMST ISOSWS24
23	SEIFLD25	Y	SEIFLD25.FRG	2	\HCE	CST	
24	SEIFLD26	Y	SEIFLD26.FRG	1	HCE		

Damage State Summary

No.	Damage State Name	To be stored? Y/N	Filename	No. of Sequences	Sequence Names		
1	ALL	Y	ALL.FRG	24	SEIFLD02	SEIFLD03	SEIFLD04
					SEIFLD05	SEIFLD06	SEIFLD07
					SEIFLD08	SEIFLD09	SEIFLD10
					SEIFLD11	SEIFLD12	SEIFLD13
					SEIFLD15	SEIFLD16	SEIFLD17
					SEIFLD18	SEIFLD19	SEIFLD20
					SEIFLD21	SEIFLD22	SEIFLD23
					SEIFLD24	SEIFLD25	SEIFLD26

Best Estimate of Sequence Frequencies

No.	Sequence	Annual Frequency
1	SEIFLD02	4.28E-08
2	SEIFLD03	1.83E-08
3	SEIFLD04	6.62E-08
4	SEIFLD05	1.78E-08
5	SEIFLD06	8.36E-07
6	SEIFLD07	2.80E-07
7	SEIFLD08	4.16E-08
8	SEIFLD09	1.99E-08
9	SEIFLD10	4.71E-08
10	SEIFLD11	6.94E-08
11	SEIFLD12	7.08E-09
12	SEIFLD13	1.10E-07
13	SEIFLD15	1.38E-08
14	SEIFLD16	3.14E-08
15	SEIFLD17	2.83E-08
16	SEIFLD18	7.62E-09
17	SEIFLD19	1.37E-07
18	SEIFLD20	4.60E-08
19	SEIFLD21	2.72E-08
20	SEIFLD22	7.98E-08
21	SEIFLD23	6.67E-08
22	SEIFLD24	1.23E-07
23	SEIFLD25	3.97E-06
24	SEIFLD26	4.90E-07

Best Estimate of Damage State Frequencies

No.	Damage State	Annual Frequency
1	ALL	6.58E-06

No.	Damage State Name	Damage State Risk	No. of Sequences	Contributing Sequence Risks (in decreasing order of importance)			
1	ALL	6.58E-06	24	No.	Sequence Name	Sequence Risk	% of Total
				1	SEIFLD25	3.97E-06	60.35
				2	SEIFLD06	8.36E-07	12.71
				3	SEIFLD26	4.90E-07	7.44
				4	SEIFLD07	2.80E-07	4.26
				5	SEIFLD19	1.37E-07	2.09
				6	SEIFLD24	1.23E-07	1.88
				7	SEIFLD13	1.10E-07	1.68
				8	SEIFLD22	7.98E-08	1.21
				9	SEIFLD11	6.94E-08	1.06
				10	SEIFLD23	6.67E-08	1.01
				11	SEIFLD04	6.62E-08	1.01
				12	SEIFLD10	4.71E-08	.72
				13	SEIFLD20	4.60E-08	.70
				14	SEIFLD02	4.28E-08	.65
				15	SEIFLD08	4.16E-08	.63
				16	SEIFLD16	3.14E-08	.48
				17	SEIFLD17	2.83E-08	.43
				18	SEIFLD21	2.72E-08	.41
				19	SEIFLD09	1.99E-08	.30
				20	SEIFLD03	1.83E-08	.28
				21	SEIFLD05	1.78E-08	.27
				22	SEIFLD15	1.38E-08	.21
				23	SEIFLD18	7.62E-09	.12
				24	SEIFLD12	7.08E-09	.11
					Sum:	6.58E-06	100.00

Summary of Plant Level Fragility

Conditional Probability of Failure	pga(units:g)
.050	.292
.150	.389
.250	.453
.500	.588
.750	.758
.850	.874
.950	1.095
HCLPF (See note)	.203

Note: Best Estimate Case HCLPF

HCLPF = Ground motion level for which there is a high confidence of a low probability of failure

= Amed * exp(-2.3 * Beta)
(Assuming the plant fragility is Lognormally distributed, the HCLPF corresponds to a 1.072% probability of failure)

Flooding Sucess Test
Date: 10/28/2005
Time: 09:27:49.76

```
*****************************************************************************
*                                                                           *
*                                                                           *
*                                  SHIP                                     *
*                     Seismic Hazard Integration Package                    *
*                                                                           *
*                                Developed by                               *
*                  Jack R. Benjamin and Associates, Inc.                    *
*                          Menlo Park, California                           *
*                                                                           *
*                              Copyright 1996                               *
*                               Version 1.02                                *
*                           Release Date: 07/02/96                          *
*                                                                           *
*  Code: SHIP                                          Code No. : S001-102  *
*                                                 Serial No. : S001-102-006Q *
*                                                                           *
*              This code has been QA verified and complies with             *
*              the requirements of 10 CFR 50 Appendix B                     *
*                                                                           *
*****************************************************************************
```

Problem : Kewaunee Power Station
Case : Seismic PRA
Flooding Sucess Test

Analysis Parameters

No. of Lognormal Fragilities	(NCOMPS)	:	29
No. of Non-Lognormal Fragilities	(NCMPNLN)	:	0
No. of Supercomponents	(NSUPCMP)	:	0
No. of Random Failures	(NR)	:	14
Ground Motion Measure (units)	(AHEAD)	:	pga(units:g)
Minimum Ground Motion Level	(AMIN)	:	.050
Maximum Ground Motion Level	(AMAX)	:	1.590
Increment on Ground Motion	(ADELT)	:	.020

Analysis Options Selected

Best Estimate Analysis	===>	IBEST = 1
Sequences Analyzed	===>	NSEQ = 12
Integration of Hazard and Fragility Curves done	===>	IINTGRT = 1

Input Files

File Description		Filename
Names File	:	seiflsuc.nam
Basic Input	:	Seiflsuc.inp
Component Fragilities	:	Seiflood.cmp
System Model	:	Seiflood.stm
Accident Sequences	:	Seiflsuc.seq
Seismic Hazard	:	EPRI89.haz

Summary of Output Files

File Description	Write to Disk?	Filename
SHIP Basic Output	Y	Seiflsuc.BAS
Error Messages	Y	Seiflsuc.ERR
Component Fragilities	Y	Seiflsuc.CFC
System Fragilities	Y	Seiflsuc.SYC
Sequence Fragilities	Y	Seiflsuc.SFC
Percent Contribution of each Ground Motion Level to the Mean Risk	Y	Seiflsuc.APC

Summary of Plot Files

File Description	Write to Disk?	Filename
Hazard Curve(s)	Y	Seiflsuc.HZP
Fragility Curves for Sequences and Damage States	Y	Seiflsuc.SQP
System Fragility Curves	Y	Seiflsuc.SYP

Seismic Hazard Data
(Hazard Curves Defined at 15 Points)

Curve No.	Probability Weight	pga(units:g) .011	.027	.110	.142	.221	.265	.327	.499
1	1.000	2.100E-03	1.304E-03	1.100E-04	8.120E-05	3.800E-05	2.837E-05	1.874E-05	5.900E-06

Curve No.	Probability Weight	pga(units:g) .555	.633	.846	.931	1.121	1.276	1.590
1	1.000	4.408E-06	2.936E-06	9.600E-07	6.500E-07	2.700E-07	1.660E-07	6.200E-08

Seismic Lognormal Fragility Parameters

Median Capacity Defined in Terms of pga(units:g)

Number	Component Name	Median	Beta-R	Beta-U	Beta-C	HCLPF	Cutoff
1	S-PP-CDPSP---FA	2.200	.500	.000	.500	.964	.000
2	S-PP-FP201---FA	1.380	.500	.000	.500	.605	.000
3	S-PP-FP250---FA	1.710	.500	.000	.500	.749	.000
4	S-PP-FP270---FA	1.970	.500	.000	.500	.863	.000
5	S-PP-FP275---FA	1.760	.500	.000	.500	.771	.000
6	S-PP-FP275-1-FA	1.930	.500	.000	.500	.846	.000
7	S-PP-FP276---FA	1.280	.500	.000	.500	.561	.000
8	S-PP-FP280---FA	1.670	.500	.000	.500	.732	.000
9	S-PP-FP320---FA	1.080	.500	.000	.500	.473	.000
10	S-PP-FP321-1-FA	2.200	.500	.000	.500	.964	.000
11	S-PP-FP331---FA	1.310	.500	.000	.500	.574	.000
12	S-PP-FP335---FA	.420	.500	.000	.500	.184	.000
13	S-PP-FP345---FA	2.030	.500	.000	.500	.890	.000
14	S-PP-FP370---FA	1.310	.500	.000	.500	.574	.000
15	S-PP-FP380A--FA	2.020	.500	.000	.500	.885	.000
16	S-PP-SW1801ABFA	1.800	.500	.000	.500	.789	.000
17	S-PP-SW2200--FA	1.370	.500	.000	.500	.600	.000
18	S-PP-SW2500--FA	1.800	.500	.000	.500	.789	.000
19	S-PP-SW2501ABFA	1.530	.500	.000	.500	.670	.000
20	S-PP-SW2800--FA	1.070	.500	.000	.500	.469	.000
21	S-PP-SW2810--FA	1.070	.500	.000	.500	.469	.000
22	S-PP-SW2820--FA	1.070	.500	.000	.500	.469	.000
23	S-PP-SW2900--FA	1.260	.500	.000	.500	.552	.000
24	S-PPFP341-123FA	1.310	.500	.000	.500	.574	.000
25	S-TK-CNDSR---FA	1.870	.400	.000	.400	.967	.000
26	S-TK-CST-----FA	.670	.400	.000	.400	.346	.000
27	S-TK-MSR-----FA	1.870	.400	.000	.400	.967	.000
28	S-TK-RMST----FA	.540	.400	.000	.400	.279	.000
29	S-TK-SGBT----FA	1.410	.400	.000	.400	.729	.000

Random Failures

No.	Component Name	Mean Failure Rate
1	02-SW4A-B--FSHE	2.50E-02
2	08-FPISO30-F-HE	4.90E-01
3	08-FPISO40-F-HE	5.90E-02
4	08-FPISO57-F-HE	3.10E-02
5	ISOL-FP-S15-SUC	8.22E-01
6	ISOL-FP-S2-SUC	9.61E-01
7	ISOL-FP-S8-SUC	9.56E-01
8	ISOL-FPSW-S10-SC	8.61E-01
9	ISOL-FPSW-S12-SC	4.02E-01
10	ISOL-FPSW-S21-SC	7.81E-01
11	S-SYS-FAIL---FA	9.54E-02
12	SX-SWFP-34-F-HE	3.00E-01
13	SX-SWFP-40-F-HE	1.50E-01
14	SX-SWFP-57-F-HE	5.60E-02

Seismic Systems Analysis

	Computed	Available On File	Total
No. of Systems:	22	0	22
No. of Sequences:	12	0	12
No. of Damage States:	0	-	0

Systems Summary

No.	System Name	Available on disk? Y/N	Filename	To be analyzed? Y/N	To be stored? Y/N	Filename
1	CST	N	-	Y	Y	CST.FRG
2	FP	N	-	Y	Y	FP.FRG
3	FP335	N	-	Y	Y	FP335.FRG
4	HCE	N	-	Y	Y	HCE.FRG
5	ISOFPS15	N	-	Y	Y	ISOFPS15.FRG
6	ISOFPS16	N	-	Y	Y	ISOFPS16.FRG
7	ISOLFP57	N	-	Y	Y	ISOLFP57.FRG
8	ISOLFPS2	N	-	Y	Y	ISOLFPS2.FRG
9	ISOLFPS3	N	-	Y	Y	ISOLFPS3.FRG
10	ISOLFPS8	N	-	Y	Y	ISOLFPS8.FRG
11	ISOLFPS9	N	-	Y	Y	ISOLFPS9.FRG
12	ISOLSW	N	-	Y	Y	ISOLSW.FRG
13	ISOSFS12	N	-	Y	Y	ISOSFS12.FRG
14	ISOSFS13	N	-	Y	Y	ISOSFS13.FRG
15	ISOSFS21	N	-	Y	Y	ISOSFS21.FRG
16	ISOSFS22	N	-	Y	Y	ISOSFS22.FRG
17	ISOSWM10	N	-	Y	Y	ISOSWM10.FRG
18	ISOSWM11	N	-	Y	Y	ISOSWM11.FRG
19	ISOSWS24	N	-	Y	Y	ISOSWS24.FRG
20	RMST	N	-	Y	Y	RMST.FRG
21	SW	N	-	Y	Y	SW.FRG
22	SYSFLRS	N	-	Y	Y	SYSFLRS.FRG

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
1	SEIFLD2	Y	SEIFLD2.FRG	6	\HCE \FP335	\CST \SW	\RMST FP
2	SEIFLD2F	Y	SEIFLD2F.FRG	6	\HCE \FP335	\CST \SW	\RMST ISOLFPS3
3	SEIFLD8	Y	SEIFLD8.FRG	6	\HCE FP335	\CST \SW	\RMST FP
4	SEIFLD8F	Y	SEIFLD8F.FRG	6	\HCE FP335	\CST \SW	\RMST ISOLFPS9
5	SEIFL10	Y	SEIFL10.FRG	5	\HCE FP335	\CST SW	\RMST
6	SEIFL10F	Y	SEIFL10F.FRG	5	\HCE FP335	\CST ISOSWM11	\RMST
7	SEIFLD12	Y	SEIFLD12.FRG	6	\HCE FP335	\CST SW	\RMST FP
8	SEIFLD12F	Y	SEIFLD12.FRG	5	\HCE FP335	\CST ISOSFS13	\RMST
9	SEIFL15	Y	SEIFL15.FRG	6	\HCE \FP335	\CST \SW	RMST FP
10	SEIFL15F	Y	SEIFL15F.FRG	6	\HCE \FP335	\CST \SW	RMST ISOFPS16
11	SEIFL21	Y	SEIFL21.FRG	6	\HCE FP335	\CST \SW	RMST FP
12	SEIFL21F	Y	SEIFL21F.FRG	6	\HCE FP335	\CST \SW	RMST ISOSFS22

Best Estimate of Sequence Frequencies

No.	Sequence	Annual Frequency
1	SEIFLD2	4.66E-07
2	SEIFLD2F	1.83E-08
3	SEIFLD8	4.56E-07
4	SEIFLD8F	1.99E-08
5	SEIFL10	7.58E-07
6	SEIFL10F	1.05E-07
7	SEIFLD12	1.84E-07
8	SEIFLD12F	1.10E-07
9	SEIFL15	1.76E-07
10	SEIFL15F	3.14E-08
11	SEIFL21	3.65E-07
12	SEIFL21F	7.98E-08

Appendix F

Seismic Analysis

Attachment 5 – SHIP Output Files - Sensitivity

SHIP Output Files - Sensitivity

Prepared by: Edward D. Coen — Edward D. Coen
Signature — Print Name

10/28/05
Date

Reviewed by: Earl David L Moore by phone — David L. Moore
Signature — Print Name

10/28/05
Date

HEPS with < 30% Time
Date: 10/28/2005
Time: 09:28:01.37

```
*******************************************************************************
*                                                                             *
*                                                                             *
*                                  SHIP                                       *
*                     Seismic Hazard Integration Package                      *
*                                                                             *
*                                Developed by                                 *
*                   Jack R. Benjamin and Associates, Inc.                     *
*                           Menlo Park, California                            *
*                                                                             *
*                              Copyright 1996                                 *
*                                Version 1.02                                 *
*                           Release Date: 07/02/96                            *
*                                                                             *
*  Code: SHIP                                          Code No. : S001-102    *
*                                                 Serial No. : S001-102-006Q  *
*                                                                             *
*              This code has been QA verified and complies with               *
*              the requirements of 10 CFR 50 Appendix B                       *
*                                                                             *
*******************************************************************************
```

Problem : Kewaunee Power Station
Case : Seismic PRA
HEPS with < 30% Time

Analysis Parameters

No. of Lognormal Fragilities	(NCOMPS)	:	29
No. of Non-Lognormal Fragilities	(NCMPNLN)	:	0
No. of Supercomponents	(NSUPCMP)	:	0
No. of Random Failures	(NR)	:	14
Ground Motion Measure (units)	(AHEAD)	:	pga(units:g)
Minimum Ground Motion Level	(AMIN)	:	.050
Maximum Ground Motion Level	(AMAX)	:	1.590
Increment on Ground Motion	(ADELT)	:	.020

Analysis Options Selected

Best Estimate Analysis	===>	IBEST = 1
Sequences Analyzed	===>	NSEQ = 24
Integration of Hazard and Fragility Curves done	===>	IINTGRT = 1

Input Files

File Description		Filename
Names File	:	hep30.nam
Basic Input	:	HEP30.inp
Component Fragilities	:	HEP30.cmp
System Model	:	Seiflood.stm
Accident Sequences	:	Seiflood.seq
Seismic Hazard	:	EPRI89.haz

Summary of Output Files

File Description	Write to Disk?	Filename
SHIP Basic Output	Y	HEP30.BAS
Error Messages	Y	HEP30.ERR
Component Fragilities	Y	HEP30.CFC
System Fragilities	Y	HEP30.SYC
Sequence Fragilities	Y	HEP30.SFC
Percent Contribution of each Ground Motion Level to the Mean Risk	Y	HEP30.APC

Summary of Plot Files

File Description	Write to Disk?	Filename
Hazard Curve(s)	Y	HEP30.HZP
Fragility Curves for Sequences and Damage States	Y	HEP30.SQP
System Fragility Curves	Y	HEP30.SYP

Seismic Hazard Data
(Hazard Curves Defined at 15 Points)

Curve No.	Probability Weight	pga(units:g) .011	.027	.110	.142	.221	.265	.327	.499
1	1.000	2.100E-03	1.304E-03	1.100E-04	8.120E-05	3.800E-05	2.837E-05	1.874E-05	5.900E-06

Curve No.	Probability Weight	pga(units:g) .555	.633	.846	.931	1.121	1.276	1.590
1	1.000	4.408E-06	2.936E-06	9.600E-07	6.500E-07	2.700E-07	1.660E-07	6.200E-08

Seismic Lognormal Fragility Parameters

Median Capacity Defined in Terms of pga(units:g)

Number	Component Name	Median	Beta-R	Beta-U	Beta-C	HCLPF	Cutoff
1	S-PP-CDPSP---FA	2.200	.500	.000	.500	.964	.000
2	S-PP-FP201---FA	1.380	.500	.000	.500	.605	.000
3	S-PP-FP250---FA	1.710	.500	.000	.500	.749	.000
4	S-PP-FP270---FA	1.970	.500	.000	.500	.863	.000
5	S-PP-FP275---FA	1.760	.500	.000	.500	.771	.000
6	S-PP-FP275-1-FA	1.930	.500	.000	.500	.846	.000
7	S-PP-FP276---FA	1.280	.500	.000	.500	.561	.000
8	S-PP-FP280---FA	1.670	.500	.000	.500	.732	.000
9	S-PP-FP320---FA	1.080	.500	.000	.500	.473	.000
10	S-PP-FP321-1-FA	2.200	.500	.000	.500	.964	.000
11	S-PP-FP331---FA	1.310	.500	.000	.500	.574	.000
12	S-PP-FP335---FA	.420	.500	.000	.500	.184	.000
13	S-PP-FP345---FA	2.030	.500	.000	.500	.890	.000
14	S-PP-FP370---FA	1.310	.500	.000	.500	.574	.000
15	S-PP-FP380A--FA	2.020	.500	.000	.500	.885	.000
16	S-PP-SW1801ABFA	1.800	.500	.000	.500	.789	.000
17	S-PP-SW2200--FA	1.370	.500	.000	.500	.600	.000
18	S-PP-SW2500--FA	1.800	.500	.000	.500	.789	.000
19	S-PP-SW2501ABFA	1.530	.500	.000	.500	.670	.000
20	S-PP-SW2800--FA	1.070	.500	.000	.500	.469	.000
21	S-PP-SW2810--FA	1.070	.500	.000	.500	.469	.000
22	S-PP-SW2820--FA	1.070	.500	.000	.500	.469	.000
23	S-PP-SW2900--FA	1.260	.500	.000	.500	.552	.000
24	S-PPFP341-123FA	1.310	.500	.000	.500	.574	.000
25	S-TK-CNDSR---FA	1.870	.400	.000	.400	.967	.000
26	S-TK-CST-----FA	.670	.400	.000	.400	.346	.000
27	S-TK-MSR-----FA	1.870	.400	.000	.400	.967	.000
28	S-TK-RMST----FA	.540	.400	.000	.400	.279	.000
29	S-TK-SGBT----FA	1.410	.400	.000	.400	.729	.000

Random Failures

No.	Component Name	Mean Failure Rate
1	02-SW4A-B--FSHE	5.00E-02
2	08-FPISO30-F-HE	4.90E-01
3	08-FPISO40-F-HE	5.90E-02
4	08-FPISO57-F-HE	3.10E-02
5	ISOL-FP-S15-SUC	7.91E-01
6	ISOL-FP-S2-SUC	9.61E-01
7	ISOL-FP-S8-SUC	9.59E-01
8	ISOL-FPSW-S10-SC	8.61E-01
9	ISOL-FPSW-S12-SC	4.02E-01
10	ISOL-FPSW-S21-SC	7.81E-01
11	S-SYS-FAIL---FA	9.54E-02
12	SX-SWFP-34-F-HE	3.00E-01
13	SX-SWFP-40-F-HE	1.50E-01
14	SX-SWFP-57-F-HE	5.60E-02

Seismic Systems Analysis

	Computed	Available On File	Total
No. of Systems:	22	0	22
No. of Sequences:	24	0	24
No. of Damage States:	1	-	1

Systems Summary

No.	System Name	Available on disk? Y/N	Filename	To be analyzed? Y/N	To be stored? Y/N	Filename
1	CST	N	-	Y	Y	CST.FRG
2	FP	N	-	Y	Y	FP.FRG
3	FP335	N	-	Y	Y	FP335.FRG
4	HCE	N	-	Y	Y	HCE.FRG
5	ISOFPS15	N	-	Y	Y	ISOFPS15.FRG
6	ISOFPS16	N	-	Y	Y	ISOFPS16.FRG
7	ISOLFP57	N	-	Y	Y	ISOLFP57.FRG
8	ISOLFPS2	N	-	Y	Y	ISOLFPS2.FRG
9	ISOLFPS3	N	-	Y	Y	ISOLFPS3.FRG
10	ISOLFPS8	N	-	Y	Y	ISOLFPS8.FRG
11	ISOLFPS9	N	-	Y	Y	ISOLFPS9.FRG
12	ISOLSW	N	-	Y	Y	ISOLSW.FRG
13	ISOSFS12	N	-	Y	Y	ISOSFS12.FRG
14	ISOSFS13	N	-	Y	Y	ISOSFS13.FRG
15	ISOSFS21	N	-	Y	Y	ISOSFS21.FRG
16	ISOSFS22	N	-	Y	Y	ISOSFS22.FRG
17	ISOSWM10	N	-	Y	Y	ISOSWM10.FRG
18	ISOSWM11	N	-	Y	Y	ISOSWM11.FRG
19	ISOSWS24	N	-	Y	Y	ISOSWS24.FRG
20	RMST	N	-	Y	Y	RMST.FRG
21	SW	N	-	Y	Y	SW.FRG
22	SYSFLRS	N	-	Y	Y	SYSFLRS.FRG

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
1	SEIFLD02	Y	SEIFLD02.FRG	8	\HCE \FP335 ISOLFPS2	\CST \SW SYSFLRS	\RMST FP
2	SEIFLD03	Y	SEIFLD03.FRG	6	\HCE \FP335	\CST \SW	\RMST ISOLFPS3
3	SEIFLD04	Y	SEIFLD04.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	\RMST \ISOLSW
4	SEIFLD05	Y	SEIFLD05.FRG	6	\HCE \FP335	\CST SW	\RMST ISOLSW
5	SEIFLD06	Y	SEIFLD06.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	\RMST \FP
6	SEIFLD07	Y	SEIFLD07.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	\RMST \FP
	SEIFLD08	Y	SEIFLD08.FRG	8	\HCE FP335 ISOLFPS8	\CST \SW SYSFLRS	\RMST FP
8	SEIFLD09	Y	SEIFLD09.FRG	6	\HCE FP335	\CST \SW	\RMST ISOLFPS9
9	SEIFLD10	Y	SEIFLD10.FRG	8	\HCE FP335 ISOSWM10	\CST SW SYSFLRS	\RMST \FP
10	SEIFLD11	Y	SEIFLD11.FRG	6	\HCE FP335	\CST \FP	\RMST ISOSWM11

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
11	SEIFLD12	Y	SEIFLD12.FRG	8	\HCE FP335 ISOSFS12	\CST SW SYSFLRS	\RMST FP
12	SEIFLD13	Y	SEIFLD13.FRG	5	\HCE FP335	\CST ISOSFS13	\RMST
13	SEIFLD15	Y	SEIFLD15.FRG	8	\HCE \FP335 ISOFPS15	\CST \SW SYSFLRS	RMST FP
14	SEIFLD16	Y	SEIFLD16.FRG	6	\HCE \FP335	\CST \SW	RMST ISOFPS16
15	SEIFLD17	Y	SEIFLD17.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	RMST \ISOLSW
16	SEIFLD18	Y	SEIFLD18.FRG	6	\HCE \FP335	\CST SW	RMST ISOLSW
17	SEIFLD19	Y	SEIFLD19.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	RMST \FP
18	SEIFLD20	Y	SEIFLD20.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	RMST \FP
19	SEIFLD21	Y	SEIFLD21.FRG	8	\HCE FP335 ISOSFS21	\CST \SW SYSFLRS	RMST FP
20	SEIFLD22	Y	SEIFLD22.FRG	6	\HCE FP335	\CST \SW	RMST ISOSFS22

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
21	SEIFLD23	Y	SEIFLD23.FRG	7	\HCE FP335 SYSFLRS	\CST SW	RMST \ISOSWS24
22	SEIFLD24	Y	SEIFLD24.FRG	6	\HCE FP335	\CST SW	RMST ISOSWS24
23	SEIFLD25	Y	SEIFLD25.FRG	2	\HCE	CST	
24	SEIFLD26	Y	SEIFLD26.FRG	1	HCE		

Damage State Summary

No.	Damage State Name	To be stored? Y/N	Filename	No. of Sequences	Sequence Names		
1	ALL	Y	ALL.FRG	24	SEIFLD02	SEIFLD03	SEIFLD04
					SEIFLD05	SEIFLD06	SEIFLD07
					SEIFLD08	SEIFLD09	SEIFLD10
					SEIFLD11	SEIFLD12	SEIFLD13
					SEIFLD15	SEIFLD16	SEIFLD17
					SEIFLD18	SEIFLD19	SEIFLD20
					SEIFLD21	SEIFLD22	SEIFLD23
					SEIFLD24	SEIFLD25	SEIFLD26

Best Estimate of Sequence Frequencies

No.	Sequence	Annual Frequency
1	SEIFLD02	4.28E-08
2	SEIFLD03	1.83E-08
3	SEIFLD04	6.45E-08
4	SEIFLD05	3.56E-08
5	SEIFLD06	8.36E-07
6	SEIFLD07	2.80E-07
7	SEIFLD08	4.17E-08
8	SEIFLD09	1.99E-08
9	SEIFLD10	4.71E-08
10	SEIFLD11	6.94E-08
11	SEIFLD12	7.08E-09
12	SEIFLD13	1.10E-07
13	SEIFLD15	1.33E-08
14	SEIFLD16	3.14E-08
15	SEIFLD17	2.76E-08
16	SEIFLD18	1.52E-08
17	SEIFLD19	1.37E-07
18	SEIFLD20	4.60E-08
19	SEIFLD21	2.72E-08
20	SEIFLD22	7.98E-08
21	SEIFLD23	6.67E-08
22	SEIFLD24	1.23E-07
23	SEIFLD25	3.97E-06
24	SEIFLD26	4.90E-07

Best Estimate of Damage State Frequencies

No.	Damage State	Annual Frequency
1	ALL	6.60E-06

No.	Damage State Name	Damage State Risk	No. of Sequences	Contributing Sequence Risks (in decreasing order of importance)			
1	ALL	6.60E-06	24	No.	Sequence Name	Sequence Risk	% of Total
				1	SEIFLD25	3.97E-06	60.14
				2	SEIFLD06	8.36E-07	12.67
				3	SEIFLD26	4.90E-07	7.42
				4	SEIFLD07	2.80E-07	4.25
				5	SEIFLD19	1.37E-07	2.08
				6	SEIFLD24	1.23E-07	1.87
				7	SEIFLD13	1.10E-07	1.67
				8	SEIFLD22	7.98E-08	1.21
				9	SEIFLD11	6.94E-08	1.05
				10	SEIFLD23	6.67E-08	1.01
				11	SEIFLD04	6.45E-08	.98
				12	SEIFLD10	4.71E-08	.71
				13	SEIFLD20	4.60E-08	.70
				14	SEIFLD02	4.28E-08	.65
				15	SEIFLD08	4.17E-08	.63
				16	SEIFLD05	3.56E-08	.54
				17	SEIFLD16	3.14E-08	.48
				18	SEIFLD17	2.76E-08	.42
				19	SEIFLD21	2.72E-08	.41
				20	SEIFLD09	1.99E-08	.30
				21	SEIFLD03	1.83E-08	.28
				22	SEIFLD18	1.52E-08	.23
				23	SEIFLD15	1.33E-08	.20
				24	SEIFLD12	7.08E-09	.11
					Sum:	6.60E-06	100.00

Summary of Plant Level Fragility

Conditional Probability of Failure	pga(units:g)
.050	.291
.150	.388
.250	.453
.500	.587
.750	.758
.850	.874
.950	1.095
HCLPF (See note)	.203

Note: Best Estimate Case HCLPF

HCLPF = Ground motion level for which there is a high confidence of a low probability of failure

= Amed * exp(-2.3 * Beta)
(Assuming the plant fragility is Lognormally distributed, the HCLPF corresponds to a 1.072% probability of failure)

Skill of Craft HEPS
Date: 10/28/2005
Time: 09:28:15.64

```
*****************************************************************************
*                                                                           *
*                                                                           *
*                                SHIP                                       *
*                    Seismic Hazard Integration Package                     *
*                                                                           *
*                              Developed by                                 *
*                  Jack R. Benjamin and Associates, Inc.                    *
*                          Menlo Park, California                           *
*                                                                           *
*                             Copyright 1996                                *
*                              Version 1.02                                 *
*                           Release Date: 07/02/96                          *
*                                                                           *
*  Code: SHIP                                          Code No. : S001-102  *
*                                                 Serial No. : S001-102-006Q *
*                                                                           *
*              This code has been QA verified and complies with             *
*              the requirements of 10 CFR 50 Appendix B                     *
*                                                                           *
*****************************************************************************
```

Problem : Kewaunee Power Station
Case : Seismic PRA
Skill of Craft HEPS

Analysis Parameters

No. of Lognormal Fragilities	(NCOMPS)	:	29
No. of Non-Lognormal Fragilities	(NCMPNLN)	:	0
No. of Supercomponents	(NSUPCMP)	:	0
No. of Random Failures	(NR)	:	14
Ground Motion Measure (units)	(AHEAD)	:	pga(units:g)
Minimum Ground Motion Level	(AMIN)	:	.050
Maximum Ground Motion Level	(AMAX)	:	1.590
Increment on Ground Motion	(ADELT)	:	.020

Analysis Options Selected

Best Estimate Analysis	===>	IBEST = 1
Sequences Analyzed	===>	NSEQ = 24
Integration of Hazard and Fragility Curves done	===>	IINTGRT = 1

Input Files

File Description		Filename
Names File	:	hepsoc.nam
Basic Input	:	HEPSOC.inp
Component Fragilities	:	HEPSOC.cmp
System Model	:	Seiflood.stm
Accident Sequences	:	Seiflood.seq
Seismic Hazard	:	EPRI89.haz

Summary of Output Files

File Description	Write to Disk?	Filename
SHIP Basic Output	Y	HEPSOC.BAS
Error Messages	Y	HEPSOC.ERR
Component Fragilities	Y	HEPSOC.CFC
System Fragilities	Y	HEPSOC.SYC
Sequence Fragilities	Y	HEPSOC.SFC
Percent Contribution of each Ground Motion Level to the Mean Risk	Y	HEPSOC.APC

Summary of Plot Files

File Description	Write to Disk?	Filename
Hazard Curve(s)	Y	HEPSOC.HZP
Fragility Curves for Sequences and Damage States	Y	HEPSOC.SQP
System Fragility Curves	Y	HEPSOC.SYP

Seismic Hazard Data
(Hazard Curves Defined at 15 Points)

Curve No.	Probability Weight	pga(units:g) .011	.027	.110	.142	.221	.265	.327	.499
1	1.000	2.100E-03	1.304E-03	1.100E-04	8.120E-05	3.800E-05	2.837E-05	1.874E-05	5.900E-06

Curve No.	Probability Weight	pga(units:g) .555	.633	.846	.931	1.121	1.276	1.590
1	1.000	4.408E-06	2.936E-06	9.600E-07	6.500E-07	2.700E-07	1.660E-07	6.200E-08

Seismic Lognormal Fragility Parameters

Median Capacity Defined in Terms of pga(units:g)

Number	Component Name	Median	Beta-R	Beta-U	Beta-C	HCLPF	Cutoff
1	S-PP-CDPSP---FA	2.200	.500	.000	.500	.964	.000
2	S-PP-FP201---FA	1.380	.500	.000	.500	.605	.000
3	S-PP-FP250---FA	1.710	.500	.000	.500	.749	.000
4	S-PP-FP270---FA	1.970	.500	.000	.500	.863	.000
5	S-PP-FP275---FA	1.760	.500	.000	.500	.771	.000
6	S-PP-FP275-1-FA	1.930	.500	.000	.500	.846	.000
7	S-PP-FP276---FA	1.280	.500	.000	.500	.561	.000
8	S-PP-FP280---FA	1.670	.500	.000	.500	.732	.000
9	S-PP-FP320---FA	1.080	.500	.000	.500	.473	.000
10	S-PP-FP321-1-FA	2.200	.500	.000	.500	.964	.000
11	S-PP-FP331---FA	1.310	.500	.000	.500	.574	.000
12	S-PP-FP335---FA	.420	.500	.000	.500	.184	.000
13	S-PP-FP345---FA	2.030	.500	.000	.500	.890	.000
14	S-PP-FP370---FA	1.310	.500	.000	.500	.574	.000
15	S-PP-FP380A--FA	2.020	.500	.000	.500	.885	.000
16	S-PP-SW1801ABFA	1.800	.500	.000	.500	.789	.000
17	S-PP-SW2200--FA	1.370	.500	.000	.500	.600	.000
18	S-PP-SW2500--FA	1.800	.500	.000	.500	.789	.000
19	S-PP-SW2501ABFA	1.530	.500	.000	.500	.670	.000
20	S-PP-SW2800--FA	1.070	.500	.000	.500	.469	.000
21	S-PP-SW2810--FA	1.070	.500	.000	.500	.469	.000
22	S-PP-SW2820--FA	1.070	.500	.000	.500	.469	.000
23	S-PP-SW2900--FA	1.260	.500	.000	.500	.552	.000
24	S-PPFP341-123FA	1.310	.500	.000	.500	.574	.000
25	S-TK-CNDSR---FA	1.870	.400	.000	.400	.967	.000
26	S-TK-CST-----FA	.670	.400	.000	.400	.346	.000
27	S-TK-MSR-----FA	1.870	.400	.000	.400	.967	.000
28	S-TK-RMST----FA	.540	.400	.000	.400	.279	.000
29	S-TK-SGBT----FA	1.410	.400	.000	.400	.729	.000

Random Failures

No.	Component Name	Mean Failure Rate
1	02-SW4A-B--FSHE	2.50E-02
2	08-FPISO30-F-HE	9.80E-01
3	08-FPISO40-F-HE	1.18E-01
4	08-FPISO57-F-HE	6.20E-02
5	ISOL-FP-S15-SUC	7.91E-01
6	ISOL-FP-S2-SUC	9.61E-01
7	ISOL-FP-S8-SUC	9.59E-01
8	ISOL-FPSW-S10-SC	8.61E-01
9	ISOL-FPSW-S12-SC	4.02E-01
10	ISOL-FPSW-S21-SC	7.81E-01
11	S-SYS-FAIL---FA	9.54E-02
12	SX-SWFP-34-F-HE	6.00E-01
13	SX-SWFP-40-F-HE	3.00E-01
14	SX-SWFP-57-F-HE	1.12E-01

Seismic Systems Analysis

	Computed	Available On File	Total
No. of Systems:	22	0	22
No. of Sequences:	24	0	24
No. of Damage States:	1	-	1

Systems Summary

No.	System Name	Available on disk? Y/N	Filename	To be analyzed? Y/N	To be stored? Y/N	Filename
1	CST	N	-	Y	Y	CST.FRG
2	FP	N	-	Y	Y	FP.FRG
3	FP335	N	-	Y	Y	FP335.FRG
4	HCE	N	-	Y	Y	HCE.FRG
5	ISOFPS15	N	-	Y	Y	ISOFPS15.FRG
6	ISOFPS16	N	-	Y	Y	ISOFPS16.FRG
7	ISOLFP57	N	-	Y	Y	ISOLFP57.FRG
8	ISOLFPS2	N	-	Y	Y	ISOLFPS2.FRG
9	ISOLFPS3	N	-	Y	Y	ISOLFPS3.FRG
10	ISOLFPS8	N	-	Y	Y	ISOLFPS8.FRG
11	ISOLFPS9	N	-	Y	Y	ISOLFPS9.FRG
12	ISOLSW	N	-	Y	Y	ISOLSW.FRG
13	ISOSFS12	N	-	Y	Y	ISOSFS12.FRG
14	ISOSFS13	N	-	Y	Y	ISOSFS13.FRG
15	ISOSFS21	N	-	Y	Y	ISOSFS21.FRG
16	ISOSFS22	N	-	Y	Y	ISOSFS22.FRG
17	ISOSWM10	N	-	Y	Y	ISOSWM10.FRG
18	ISOSWM11	N	-	Y	Y	ISOSWM11.FRG
19	ISOSWS24	N	-	Y	Y	ISOSWS24.FRG
20	RMST	N	-	Y	Y	RMST.FRG
21	SW	N	-	Y	Y	SW.FRG
22	SYSFLRS	N	-	Y	Y	SYSFLRS.FRG

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
1	SEIFLD02	Y	SEIFLD02.FRG	8	\HCE \FP335 ISOLFPS2	\CST \SW SYSFLRS	\RMST FP
2	SEIFLD03	Y	SEIFLD03.FRG	6	\HCE \FP335	\CST \SW	\RMST ISOLFPS3
3	SEIFLD04	Y	SEIFLD04.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	\RMST \ISOLSW
4	SEIFLD05	Y	SEIFLD05.FRG	6	\HCE \FP335	\CST SW	\RMST ISOLSW
5	SEIFLD06	Y	SEIFLD06.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	\RMST \FP
6	SEIFLD07	Y	SEIFLD07.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	\RMST \FP
	SEIFLD08	Y	SEIFLD08.FRG	8	\HCE FP335 ISOLFPS8	\CST \SW SYSFLRS	\RMST FP
8	SEIFLD09	Y	SEIFLD09.FRG	6	\HCE FP335	\CST \SW	\RMST ISOLFPS9
9	SEIFLD10	Y	SEIFLD10.FRG	8	\HCE FP335 ISOSWM10	\CST SW SYSFLRS	\RMST \FP
10	SEIFLD11	Y	SEIFLD11.FRG	6	\HCE FP335	\CST \FP	\RMST ISOSWM11

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
11	SEIFLD12	Y	SEIFLD12.FRG	8	\HCE FP335 ISOSFS12	\CST SW SYSFLRS	\RMST FP
12	SEIFLD13	Y	SEIFLD13.FRG	5	\HCE FP335	\CST ISOSFS13	\RMST
13	SEIFLD15	Y	SEIFLD15.FRG	8	\HCE \FP335 ISOFPS15	\CST \SW SYSFLRS	RMST FP
14	SEIFLD16	Y	SEIFLD16.FRG	6	\HCE \FP335	\CST \SW	RMST ISOFPS16
15	SEIFLD17	Y	SEIFLD17.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	RMST \ISOLSW
16	SEIFLD18	Y	SEIFLD18.FRG	6	\HCE \FP335	\CST SW	RMST ISOLSW
17	SEIFLD19	Y	SEIFLD19.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	RMST \FP
18	SEIFLD20	Y	SEIFLD20.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	RMST \FP
19	SEIFLD21	Y	SEIFLD21.FRG	8	\HCE FP335 ISOSFS21	\CST \SW SYSFLRS	RMST FP
20	SEIFLD22	Y	SEIFLD22.FRG	6	\HCE FP335	\CST \SW	RMST ISOSFS22

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
21	SEIFLD23	Y	SEIFLD23.FRG	7	\HCE FP335 SYSFLRS	\CST SW	RMST \ISOSWS24
22	SEIFLD24	Y	SEIFLD24.FRG	6	\HCE FP335	\CST SW	RMST ISOSWS24
23	SEIFLD25	Y	SEIFLD25.FRG	2	\HCE	CST	
24	SEIFLD26	Y	SEIFLD26.FRG	1	HCE		

Damage State Summary

No.	Damage State Name	To be stored? Y/N	Filename	No. of Sequences	Sequence Names		
1	ALL	Y	ALL.FRG	24	SEIFLD02	SEIFLD03	SEIFLD04
					SEIFLD05	SEIFLD06	SEIFLD07
					SEIFLD08	SEIFLD09	SEIFLD10
					SEIFLD11	SEIFLD12	SEIFLD13
					SEIFLD15	SEIFLD16	SEIFLD17
					SEIFLD18	SEIFLD19	SEIFLD20
					SEIFLD21	SEIFLD22	SEIFLD23
					SEIFLD24	SEIFLD25	SEIFLD26

Best Estimate of Sequence Frequencies

No.	Sequence	Annual Frequency
1	SEIFLD02	4.28E-08
2	SEIFLD03	3.66E-08
3	SEIFLD04	6.62E-08
4	SEIFLD05	1.78E-08
5	SEIFLD06	8.10E-07
6	SEIFLD07	5.61E-07
7	SEIFLD08	4.17E-08
8	SEIFLD09	3.95E-08
9	SEIFLD10	4.71E-08
10	SEIFLD11	1.11E-07
11	SEIFLD12	7.08E-09
12	SEIFLD13	1.39E-07
13	SEIFLD15	1.33E-08
14	SEIFLD16	6.24E-08
15	SEIFLD17	2.83E-08
16	SEIFLD18	7.62E-09
17	SEIFLD19	1.33E-07
18	SEIFLD20	9.21E-08
19	SEIFLD21	2.72E-08
20	SEIFLD22	1.57E-07
21	SEIFLD23	5.49E-08
22	SEIFLD24	2.47E-07
23	SEIFLD25	3.97E-06
24	SEIFLD26	4.90E-07

Best Estimate of Damage State Frequencies

No.	Damage State	Annual Frequency
1	ALL	7.20E-06

No.	Damage State Name	Damage State Risk	No. of Sequences	Contributing Sequence Risks (in decreasing order of importance)			
1	ALL	7.20E-06	24	No.	Sequence Name	Sequence Risk	% of Total
				1	SEIFLD25	3.97E-06	55.13
				2	SEIFLD06	8.10E-07	11.24
				3	SEIFLD07	5.61E-07	7.79
				4	SEIFLD26	4.90E-07	6.80
				5	SEIFLD24	2.47E-07	3.43
				6	SEIFLD22	1.57E-07	2.18
				7	SEIFLD13	1.39E-07	1.93
				8	SEIFLD19	1.33E-07	1.85
				9	SEIFLD11	1.11E-07	1.54
				10	SEIFLD20	9.21E-08	1.28
				11	SEIFLD04	6.62E-08	.92
				12	SEIFLD16	6.24E-08	.87
				13	SEIFLD23	5.49E-08	.76
				14	SEIFLD10	4.71E-08	.65
				15	SEIFLD02	4.28E-08	.59
				16	SEIFLD08	4.17E-08	.58
				17	SEIFLD09	3.95E-08	.55
				18	SEIFLD03	3.66E-08	.51
				19	SEIFLD17	2.83E-08	.39
				20	SEIFLD21	2.72E-08	.38
				21	SEIFLD05	1.78E-08	.25
				22	SEIFLD15	1.33E-08	.18
				23	SEIFLD18	7.62E-09	.11
				24	SEIFLD12	7.08E-09	.10
					Sum:	7.20E-06	100.00

Summary of Plant Level Fragility

Conditional Probability of Failure	pga(units:g)
.050	.282
.150	.378
.250	.440
.500	.564
.750	.717
.850	.827
.950	1.057
HCLPF (See note)	.195

Note: Best Estimate Case HCLPF

HCLPF = Ground motion level for which there is a high confidence of a low probability of failure

= Amed * exp(-2.3 * Beta)
(Assuming the plant fragility is Lognormally distributed, the HCLPF corresponds to a 1.072% probability of failure)

Fldng SDP LLNL Curve
Date: 10/28/2005
Time: 09:28:40.44

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*                                                                           *
*                                                                           *
*                                  SHIP                                     *
*                      Seismic Hazard Integration Package                   *
*                                                                           *
*                                 Developed by                              *
*                     Jack R. Benjamin and Associates, Inc.                 *
*                              Menlo Park, California                       *
*                                                                           *
*                                Copyright 1996                             *
*                                 Version 1.02                              *
*                             Release Date: 07/02/96                        *
*                                                                           *
*  Code: SHIP                                          Code No. : S001-102  *
*                                                  Serial No. : S001-102-006Q *
*                                                                           *
*              This code has been QA verified and complies with             *
*              the requirements of 10 CFR 50 Appendix B                     *
*                                                                           *
*****************************************************************************
```

Problem : Kewaunee Power Station
Case : Seismic PRA
Fldng SDP LLNL Curve

Analysis Parameters

No. of Lognormal Fragilities	(NCOMPS)	:	29
No. of Non-Lognormal Fragilities	(NCMPNLN)	:	0
No. of Supercomponents	(NSUPCMP)	:	0
No. of Random Failures	(NR)	:	14
Ground Motion Measure (units)	(AHEAD)	:	pga(units:g)
Minimum Ground Motion Level	(AMIN)	:	.050
Maximum Ground Motion Level	(AMAX)	:	1.590
Increment on Ground Motion	(ADELT)	:	.020

Analysis Options Selected

Best Estimate Analysis	===>	IBEST = 1
Sequences Analyzed	===>	NSEQ = 24
Integration of Hazard and Fragility Curves done	===>	IINTGRT = 1

Input Files

File Description		Filename
Names File	:	seifllnl.nam
Basic Input	:	SeifLLNL.inp
Component Fragilities	:	Seiflood.cmp
System Model	:	Seiflood.stm
Accident Sequences	:	Seiflood.seq
Seismic Hazard	:	LLNL93Ex.haz

Summary of Output Files

File Description	Write to Disk?	Filename
SHIP Basic Output	Y	SeifLLNL.BAS
Error Messages	Y	SeifLLNL.ERR
Component Fragilities	Y	SeifLLNL.CFC
System Fragilities	Y	SeifLLNL.SYC
Sequence Fragilities	Y	SeifLLNL.SFC
Percent Contribution of each Ground Motion Level to the Mean Risk	Y	SeifLLNL.APC

Summary of Plot Files

File Description	Write to Disk?	Filename
Hazard Curve(s)	Y	SeifLLNL.HZP
Fragility Curves for Sequences and Damage States	Y	SeifLLNL.SQP
System Fragility Curves	Y	SeifLLNL.SYP

Seismic Hazard Data
(Hazard Curves Defined at 14 Points)

Curve No.	Probability Weight	pga(units:g) .050	.051	.076	.153	.255	.306	.408	.510
1	1.000	3.104E-04	3.040E-04	1.777E-04	6.422E-05	2.748E-05	1.979E-05	1.141E-05	7.212E-06

Curve No.	Probability Weight	pga(units:g) .663	.816	1.020	1.200	1.400	1.600
1	1.000	4.043E-06	2.474E-06	1.409E-06	8.598E-07	4.962E-07	2.864E-07

Seismic Lognormal Fragility Parameters

Median Capacity Defined in Terms of pga(units:g)

Number	Component Name	Median	Beta-R	Beta-U	Beta-C	HCLPF	Cutoff
1	S-PP-CDPSP---FA	2.200	.500	.000	.500	.964	.000
2	S-PP-FP201---FA	1.380	.500	.000	.500	.605	.000
3	S-PP-FP250---FA	1.710	.500	.000	.500	.749	.000
4	S-PP-FP270---FA	1.970	.500	.000	.500	.863	.000
5	S-PP-FP275---FA	1.760	.500	.000	.500	.771	.000
6	S-PP-FP275-1-FA	1.930	.500	.000	.500	.846	.000
7	S-PP-FP276---FA	1.280	.500	.000	.500	.561	.000
8	S-PP-FP280---FA	1.670	.500	.000	.500	.732	.000
9	S-PP-FP320---FA	1.080	.500	.000	.500	.473	.000
10	S-PP-FP321-1-FA	2.200	.500	.000	.500	.964	.000
11	S-PP-FP331---FA	1.310	.500	.000	.500	.574	.000
12	S-PP-FP335---FA	.420	.500	.000	.500	.184	.000
13	S-PP-FP345---FA	2.030	.500	.000	.500	.890	.000
14	S-PP-FP370---FA	1.310	.500	.000	.500	.574	.000
15	S-PP-FP380A--FA	2.020	.500	.000	.500	.885	.000
16	S-PP-SW1801ABFA	1.800	.500	.000	.500	.789	.000
17	S-PP-SW2200--FA	1.370	.500	.000	.500	.600	.000
18	S-PP-SW2500--FA	1.800	.500	.000	.500	.789	.000
19	S-PP-SW2501ABFA	1.530	.500	.000	.500	.670	.000
20	S-PP-SW2800--FA	1.070	.500	.000	.500	.469	.000
21	S-PP-SW2810--FA	1.070	.500	.000	.500	.469	.000
22	S-PP-SW2820--FA	1.070	.500	.000	.500	.469	.000
23	S-PP-SW2900--FA	1.260	.500	.000	.500	.552	.000
24	S-PPFP341-123FA	1.310	.500	.000	.500	.574	.000
25	S-TK-CNDSR---FA	1.870	.400	.000	.400	.967	.000
26	S-TK-CST-----FA	.670	.400	.000	.400	.346	.000
27	S-TK-MSR-----FA	1.870	.400	.000	.400	.967	.000
28	S-TK-RMST----FA	.540	.400	.000	.400	.279	.000
29	S-TK-SGBT----FA	1.410	.400	.000	.400	.729	.000

Random Failures

No.	Component Name	Mean Failure Rate
1	02-SW4A-B--FSHE	2.50E-02
2	08-FPISO30-F-HE	4.90E-01
3	08-FPISO40-F-HE	5.90E-02
4	08-FPISO57-F-HE	3.10E-02
5	ISOL-FP-S15-SUC	8.22E-01
6	ISOL-FP-S2-SUC	9.61E-01
7	ISOL-FP-S8-SUC	9.56E-01
8	ISOL-FPSW-S10-SC	8.61E-01
9	ISOL-FPSW-S12-SC	4.02E-01
10	ISOL-FPSW-S21-SC	7.81E-01
11	S-SYS-FAIL---FA	9.54E-02
12	SX-SWFP-34-F-HE	3.00E-01
13	SX-SWFP-40-F-HE	1.50E-01
14	SX-SWFP-57-F-HE	5.60E-02

Seismic Systems Analysis

	Computed	Available On File	Total
No. of Systems:	22	0	22
No. of Sequences:	24	0	24
No. of Damage States:	1	-	1

Systems Summary

No.	System Name	Available on disk? Y/N	Filename	To be analyzed? Y/N	To be stored? Y/N	Filename
1	CST	N	-	Y	Y	CST.FRG
2	FP	N	-	Y	Y	FP.FRG
3	FP335	N	-	Y	Y	FP335.FRG
4	HCE	N	-	Y	Y	HCE.FRG
5	ISOFPS15	N	-	Y	Y	ISOFPS15.FRG
6	ISOFPS16	N	-	Y	Y	ISOFPS16.FRG
7	ISOLFP57	N	-	Y	Y	ISOLFP57.FRG
8	ISOLFPS2	N	-	Y	Y	ISOLFPS2.FRG
9	ISOLFPS3	N	-	Y	Y	ISOLFPS3.FRG
10	ISOLFPS8	N	-	Y	Y	ISOLFPS8.FRG
11	ISOLFPS9	N	-	Y	Y	ISOLFPS9.FRG
12	ISOLSW	N	-	Y	Y	ISOLSW.FRG
13	ISOSFS12	N	-	Y	Y	ISOSFS12.FRG
14	ISOSFS13	N	-	Y	Y	ISOSFS13.FRG
15	ISOSFS21	N	-	Y	Y	ISOSFS21.FRG
16	ISOSFS22	N	-	Y	Y	ISOSFS22.FRG
17	ISOSWM10	N	-	Y	Y	ISOSWM10.FRG
18	ISOSWM11	N	-	Y	Y	ISOSWM11.FRG
19	ISOSWS24	N	-	Y	Y	ISOSWS24.FRG
20	RMST	N	-	Y	Y	RMST.FRG
21	SW	N	-	Y	Y	SW.FRG
22	SYSFLRS	N	-	Y	Y	SYSFLRS.FRG

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
1	SEIFLD02	Y	SEIFLD02.FRG	8	\HCE \FP335 ISOLFPS2	\CST \SW SYSFLRS	\RMST FP
2	SEIFLD03	Y	SEIFLD03.FRG	6	\HCE \FP335	\CST \SW	\RMST ISOLFPS3
3	SEIFLD04	Y	SEIFLD04.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	\RMST \ISOLSW
4	SEIFLD05	Y	SEIFLD05.FRG	6	\HCE \FP335	\CST SW	\RMST ISOLSW
5	SEIFLD06	Y	SEIFLD06.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	\RMST \FP
6	SEIFLD07	Y	SEIFLD07.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	\RMST \FP
	SEIFLD08	Y	SEIFLD08.FRG	8	\HCE FP335 ISOLFPS8	\CST \SW SYSFLRS	\RMST FP
8	SEIFLD09	Y	SEIFLD09.FRG	6	\HCE FP335	\CST \SW	\RMST ISOLFPS9
9	SEIFLD10	Y	SEIFLD10.FRG	8	\HCE FP335 ISOSWM10	\CST SW SYSFLRS	\RMST \FP
10	SEIFLD11	Y	SEIFLD11.FRG	6	\HCE FP335	\CST \FP	\RMST ISOSWM11

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
11	SEIFLD12	Y	SEIFLD12.FRG	8	\HCE FP335 ISOSFS12	\CST SW SYSFLRS	\RMST FP
12	SEIFLD13	Y	SEIFLD13.FRG	5	\HCE FP335	\CST ISOSFS13	\RMST
13	SEIFLD15	Y	SEIFLD15.FRG	8	\HCE \FP335 ISOFPS15	\CST \SW SYSFLRS	RMST FP
14	SEIFLD16	Y	SEIFLD16.FRG	6	\HCE \FP335	\CST \SW	RMST ISOFPS16
15	SEIFLD17	Y	SEIFLD17.FRG	7	\HCE \FP335 SYSFLRS	\CST SW	RMST \ISOLSW
16	SEIFLD18	Y	SEIFLD18.FRG	6	\HCE \FP335	\CST SW	RMST ISOLSW
17	SEIFLD19	Y	SEIFLD19.FRG	8	\HCE FP335 \ISOLFP57	\CST \SW SYSFLRS	RMST \FP
18	SEIFLD20	Y	SEIFLD20.FRG	7	\HCE FP335 ISOLFP57	\CST \SW	RMST \FP
19	SEIFLD21	Y	SEIFLD21.FRG	8	\HCE FP335 ISOSFS21	\CST \SW SYSFLRS	RMST FP
20	SEIFLD22	Y	SEIFLD22.FRG	6	\HCE FP335	\CST \SW	RMST ISOSFS22

Sequence Summary

No.	Sequence Name	To be stored? Y/N	Filename	No. of Events	Event Names		
21	SEIFLD23	Y	SEIFLD23.FRG	7	\HCE FP335 SYSFLRS	\CST SW	RMST \ISOSWS24
22	SEIFLD24	Y	SEIFLD24.FRG	6	\HCE FP335	\CST SW	RMST ISOSWS24
23	SEIFLD25	Y	SEIFLD25.FRG	2	\HCE	CST	
24	SEIFLD26	Y	SEIFLD26.FRG	1	HCE		

Damage State Summary

No.	Damage State Name	To be stored? Y/N	Filename	No. of Sequences	Sequence Names		
1	ALL	Y	ALL.FRG	24	SEIFLD02	SEIFLD03	SEIFLD04
					SEIFLD05	SEIFLD06	SEIFLD07
					SEIFLD08	SEIFLD09	SEIFLD10
					SEIFLD11	SEIFLD12	SEIFLD13
					SEIFLD15	SEIFLD16	SEIFLD17
					SEIFLD18	SEIFLD19	SEIFLD20
					SEIFLD21	SEIFLD22	SEIFLD23
					SEIFLD24	SEIFLD25	SEIFLD26

Best Estimate of Sequence Frequencies

No.	Sequence	Annual Frequency
1	SEIFLD02	3.62E-08
2	SEIFLD03	1.56E-08
3	SEIFLD04	5.66E-08
4	SEIFLD05	1.52E-08
5	SEIFLD06	7.12E-07
6	SEIFLD07	2.39E-07
7	SEIFLD08	3.77E-08
8	SEIFLD09	1.83E-08
9	SEIFLD10	4.23E-08
10	SEIFLD11	6.50E-08
11	SEIFLD12	7.43E-09
12	SEIFLD13	1.18E-07
13	SEIFLD15	1.28E-08
14	SEIFLD16	2.96E-08
15	SEIFLD17	2.73E-08
16	SEIFLD18	7.34E-09
17	SEIFLD19	1.21E-07
18	SEIFLD20	4.04E-08
19	SEIFLD21	2.77E-08
20	SEIFLD22	8.28E-08
21	SEIFLD23	7.48E-08
22	SEIFLD24	1.38E-07
23	SEIFLD25	4.41E-06
24	SEIFLD26	9.85E-07

Best Estimate of Damage State Frequencies

No.	Damage State	Annual Frequency
1	ALL	7.32E-06

No.	Damage State Name	Damage State Risk	No. of Sequences	Contributing Sequence Risks (in decreasing order of importance)			
1	ALL	7.32E-06	24	No.	Sequence Name	Sequence Risk	% of Total
				1	SEIFLD25	4.41E-06	60.26
				2	SEIFLD26	9.85E-07	13.45
				3	SEIFLD06	7.12E-07	9.72
				4	SEIFLD07	2.39E-07	3.26
				5	SEIFLD24	1.38E-07	1.89
				6	SEIFLD19	1.21E-07	1.65
				7	SEIFLD13	1.18E-07	1.61
				8	SEIFLD22	8.28E-08	1.13
				9	SEIFLD23	7.48E-08	1.02
				10	SEIFLD11	6.50E-08	.89
				11	SEIFLD04	5.66E-08	.77
				12	SEIFLD10	4.23E-08	.58
				13	SEIFLD20	4.04E-08	.55
				14	SEIFLD08	3.77E-08	.52
				15	SEIFLD02	3.62E-08	.49
				16	SEIFLD16	2.96E-08	.40
				17	SEIFLD21	2.77E-08	.38
				18	SEIFLD17	2.73E-08	.37
				19	SEIFLD09	1.83E-08	.25
				20	SEIFLD03	1.56E-08	.21
				21	SEIFLD05	1.52E-08	.21
				22	SEIFLD15	1.28E-08	.18
				23	SEIFLD12	7.43E-09	.10
				24	SEIFLD18	7.34E-09	.10
					Sum:	7.32E-06	100.00

Summary of Plant Level Fragility

Conditional Probability of Failure	pga(units:g)
.050	.292
.150	.389
.250	.453
.500	.588
.750	.758
.850	.874
.950	1.095
HCLPF (See note)	.203

Note: Best Estimate Case HCLPF

HCLPF = Ground motion level for which there is a high confidence of a low probability of failure

= Amed * exp(-2.3 * Beta)
(Assuming the plant fragility is Lognormally distributed, the HCLPF corresponds to a 1.072% probability of failure)

Appendix F

Seismic Analysis

Attachment 6 – Tank Volume Calculation

Tank Volume Calculation

Prepared by: _____ KENNETH P. DEWBERRY
Signature Print Name

10/19/05
Date

Reviewed by: _____ PAUL E. SNYDER
Signature Print Name

10/19/05
Date

Tank Name	Equipment No.	Drwg/ Sys Dscrp/ Field Calc (FC)	Capacity
SG B/D Tank	153-131	Drwg XK-146-3 & FC 4' X 10'10" System Dscrp # 7	1000g
Heater Drain	153-321	Drwg XK-146-4 System Dscrp # 11	10,000g
Waste Neutralization Tank	153-211	Drwg XK-147-35 & FC 15' X 15' System Dscrp #27A	19,000g
Caustic Tank	153-251	Drwg XK-146-2 System Dscrp #27A	5,000g
Sulfuric Acid Day Tank	153-271	System Dscrp #27A	300g
Hydro Pneumatic Tank	153-241	Operm-209-3 System Dscrp #26	1000g
Brine	153-111	XK-171-1 System Dscrp #26 (6' X 4')	564g
Hot Water Heater	153-491	System Dscrp #26	865g
Boric Acid	153-081 & 153-082	XK-100-180-3 & System Dscrp #35	600g EA
SG BT Hold UP	153-511 & 153-512	M-368 System Dscrp # 7	10,000g EA
SG BT Monitor	153-451 & 153-452	M-368 System Dscrp # 7	10,000g EA
Potable Water Break Tank	153-923	DCR 1789 / PO 37255 FC 60" X 5'2"	750g
SWPT Coagulant Aid Feed Tank	153-731	System Dscrp #27B	400g
SWPT Coagulant Feed Tank	153-741	System Dscrp #27B	400g
SWPT Settled Water Tank	153-721	System Dscrp #27B	3,125g
Flocculator		System Dscrp #27B	17,775g