ATTACHMENT 3
CALCULATION PTN-BFJR-06-001
PHASE 3 SDP FOR TURKEY POINT "B" AFW PUMP FAILURE

CALCULATION COVER SHEET

Calculation No: PTN-BFJR-06-001

Title: PHASE 3 SDP FOR TURKEY POINT B AFW PUMP FAILURE

No.	Description	By	Date	Chk/Ver	Date	Appr	Date
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LIST OF EFFECTIVE PAGES

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1.0 PURPOSE/SCOPE

This calculation documents the methodology and input used to support a response to the NRC phase 3 SDP (Ref. 1) associated with B AFW pump failure identified in a test run on November 7, 2005. During IST testing 11/7/05, the B AFW pump P2B exhibited high vibration and temperatures at the inboard journal bearing location inspection point (Reference 4). The reading was documented as 0.8 in/sec. On 11/8/05 the AFW pump was disassembled for inspection. The initial inspection included disassembling the coupling and pump inboard bearing. The results of this inspection found signs of uneven tooth wear on the pump coupling and evidence of grease caking. Inspection of the inboard journal bearing found that the bearing was installed incorrectly. The bearing was installed 90 degrees from its correct orientation. This incorrect installation resulted in inadequate lubrication to the bearing and caused flaking of the sleeve bearing babbit.

2.0 REFERENCES

1. Turkey Point Nuclear Plant Integrated Inspection Report , 05000250/2005005 and 05000251/2005005 Preliminary White Finding, ; January 27, 2005.
2. NURG/CR-6883, The SPAR-H Human Reliability Analysis Method, 8/2005.
3. Emails from Glen Blinde 12/28/2005, Re: PTN AFW SDP issue success criteria need; 2/16/2006, Re: Questions on B5B & AFW MAAP runs.
4. CR 2005-30750 (High Vibrations on the P2B AFW Pump - Extent of Condition).
5. NEI-99-02 Appendix F, "Methodologies for Computing The Unavailability Index, The Unreliability Index and Component Performance Limits", Revision 4.
6. PTN Change Form PTN-C-06-001, February, 2006.
7. PTN-BFJR-00-001, "PTN PSA Model Update," FPL-RRAG, Revision 5, 6/24/04.
8. SPAR Model for Turkey Point Units 3 and 4, August 2005, version 9/30/2005.

3.0 METHODOLOGY

Because the degradation of B AFW pump is time-dependent, its safety significance is assessed by including the following factors:

1. Based on the test data and operating experience of the B AFW pump, .the B AFW pump would run at least one hour on or before October 30, 2005. Afterwards, the performance of B AFW pump is not determined, and is conservatively assumed to fail within the first hour.

2. If B AFW pump runs for an hour and then fails, the decay heat is significantly lower, allowing more time for operators to take actions stipulated in the EOP.

3. The lower decay heat after one hour from hypothetical accidents also allows a less stringent success criterion for feed and bleed.

4. Credit for operator actions (e.g., certain offsite power recovery actions) not included in the original baseline PSA model, which were not important due to lower probability of the sequences, should be included for consistency.

5. Using a mission time of 24 hours for 3 AFW pumps and 2 standby steam generator feed pumps overestimates the probability of selected sequences.

The approach used in the Phase 3 SDP is to review the SPAR model (Reference 8), the Turkey Point PSA model (Reference 7), MSPI data base and insights obtained from the sensitivity studies to develop a scoping estimate of the risk impact.

4.0 ASSUMPTIONS/BASES

1. SPAR-H for Human Error Probability estimates are used for revising the HEPs for cases in which B AFW pump fails after 1 hour.
2. Run times for B AFW pump collected from AFW system engineer indicate that the AFW pump was capable of running for more than one hour (see run time for 10/10/05). The pump capability (residual runtime) given a demand would be increasingly longer looking back in time due to the progressively less wear when pump experienced fewer run hours. This is indicated in the table below per email from Joe Laduca 12/31/2005.

Table (1): AFW Pump B Surveillance Data.

Date	Surveillance Runs plus Rx Trips(hours)	Reason (Procedure or Trip)	Residual runtime
9/3/2003	0.7	4-OSP-075.9	54.83
9/6/2003	1.3	4-OSP-075.2	54.13
9/6/2003	0.5	4-OSP-075.9	52.83
9/7/2003	1.75	4-OSP-075.2	52.33
9/8/2003	3.5	4-OSP-075.7	50.58
9/9/2003	1.5	3-OSP-075.2	47.08
9/10/2003	0.6	4-OSP-075.2	45.58
9/12/2003	0.5	4-OSP-075.9	44.98
10/13/2003	0.6	3-OSP-075.2	44.48
11/4/2003	0.5	4-OSP-075.7	43.88
11/10/2003	1.5	3-OSP-075.7	43.38
12/8/2003	0.6	3-OSP-075.2	41.88
12/9/2003	0.8	4-OSP-075.7	41.28
1/5/2004	0.9	3-OSP-075.2	40.48
1/5/2004	0.4	4-OSP-075.2	39.58
1/30/2004	1	3-OSP-075.7	39.18
2/2/2004	0.6	4-OSP-075.2	38.18
3/2/2004	0.5	3-OSP-075.2	37.58
3/4/2004	1.7	4-OSP-075.7	37.08
3/29/2004	1.1	4-OSP-075.2	35.38
3/29/2004	0.25	3-OSP-075.2	34.28
4/26/2004	1.1	3-OSP-075.7	34.03
5/14/2004	2.75	Rxr Trip AFW Auto Initiation	32.93

Table (1): AFW Pump B Surveillance Data.			
Date	Surveillance Runs plus Rx Trips(hours)	Reason (Procedure or Trip)	Residual runtime
5/24/2004	0.5	3-OSP-075.2	30.18
6/21/2004	0.5	3-OSP-075.2	29.68
6/21/2004	0.9	4-OSP-075.2	29.18
7/19/2004	1.7	3-OSP-075.7	28.28
7/20/2004	0.5	4-OSP-075.2	26.58
8/16/2004	0.4	3-OSP-075.2	26.08
9/13/2004	0.25	3-OSP-075.2	25.68
9/13/2004	0.5	4-OSP-075.2	25.43
10/11/2004	0.4	4-OSP-075.2	24.93
11/8/2004	0.9	4-OSP-075.2	24.53
11/12/2004	1.4	4-OSP-075.7	23.63
12/1/2004	1.2	3-OSP-75.7	22.23
12/6/2004	1	4-OSP-075.2	21.03
12/14/2004	1.8	Rxr Trip AFW Auto Initiation	20.03
12/25/2004	1.1	Rxr Trip AFW Auto Initiation	18.23
12/28/2004	0.9	Rxr Trip AFW Auto Initiation	17.13
1/10/2005	0.9	4-OSP-075.2	16.23
1/31/2005	1.33	4-OSP-075.7	15.33
2/24/2005	1.05	4-OSP-075.2	14.00
2/28/2005	0.43	4-OSP-075.2	12.95
2/28/2005	0.52	3-OSP-075.2	12.52
2/28/2005	0.5	3-OSP-075.9	12.00
3/22/2005	0.5	3-OSP-075.2	11.50
3/22/2005	1.5	Rxr Trip AFW Auto Initiation	11.00
4/25/2005	0.4	3-OSP-075.2	9.50
5/6/2005	0.3	3-OSP-075.2	9.10
5/23/2005	0.5	3-OSP-075.2	8.80
5/27/2005	0.2	3-OSP-075.2	8.30
6/25/2005	0.5	4-OSP-075.2	8.10
6/25/2005	0.6	3-OSP-075.7	7.60
6/27/2005	0.9	Rxr Trip AFW Auto Initiation	7.00
7/18/2005	1	4-OSP-075.7	6.1
7/20/2005	0.5	3-OSP-075.2	5.1
8/15/2005	0.5	4-OSP-075.2	4.6
9/12/2005	0.3	4-OSP-075.2	4.1
10/10/2005	0.4	3-OSP-075.2	3.8
10/10/2005	2.1	4-OSP-075.7	3.4
10/31/2005	0.6	Rxr Trip AFW Auto Initiation	1.3
		November 7 ran 0.7 hours	

3. As a sensitivity study, the MSPI industry reliability data as a new generic prior and the SPAR model failure data were used for AFW pumps failure to start and run.

5.0 CALCULATION

Based on the test data and operating experience of the B AFW pump, .the B AFW pump would run at least one hour at normal failure rate (thus for the first hour given any hypothetical accidents, there is no Delta CDF increase) on or before October 31, 2005. Afterwards, the performance of B AFW pump is not determined, and is conservatively assumed to fail.

The risk impact of degraded B AFW pump is composed of two time windows, each with a different risk increase.

Time Window 1: ***Before October 30, 2005, B AFW pump is assumed to fail one hour or longer after automatic actuation***

1. If B AFW pump runs for an hour and then fails, the decay heat is significantly lower, allowing more time for operators to take actions stipulated in the EOP.

   A scoping MAAP run and an analysis based on decay heat equation indicated that at least an additional hour would be available for execution (Reference 7). The Human Error Probabilities, based on the SPAR-H, for the performance shaping factor "Available Time", are adjusted from "just enough" to "nominal" due to much longer time and potentially less stress. Thus HEPs (see Attachment 6, which is excerpted from Reference 2) would be reduced by a factor of 10 or more.

2. The lower decay heat after one hour from hypothetical accidents also allows a less stringent success criterion for bleed and feed. Instead of 2 PORVs for bleed, either PORV opening is sufficient for the successful operation of bleed and feed. (see Attachment 4, which is excerpted from Reference 3, second and third cases)

   This reduces the contribution of the dominant sequences LDC3A, by a factor of 10 or more.

   The above factors are included in the Turkey Point SPAR model to estimate the delta CDF for the case where B AFW pump would fail after one hour of operation. Delta CDF is estimated to be approximately 3.2E-7 (a factor of 10 reduction from 3.2E-6/Yr).

Time Window 2: ***After October 31, 2005, B AFW pump is assumed to fail within one hour of automatic actuation.***

A review of the cutsets for loss of DC bus, indicates that if AFW fails within the first hour, those cutsets involving the stopping of the C pump are not valid, as the condition for it being failed due to deadheading is eliminated by B pump failing. The CDF is conservatively assumed to be 1.6 E-6/Yr (3.2E-6/Yr, subtracted by 1.6E-6/Yr, a scoping elimination of the top cutest of loss of DC bus).

The core damage frequency increase due to the degraded B AFW pump over a year is estimated to be:

1.6E-6/Yr * 1/12 + 3.2E-7/Yr * 11/12 = 4.3E-7/Yr, which is less than 1.0E-6/Yr. The Delta CDF increase is considered not risk significant.

There is still some margin in the estimated safety significance from the threshold of 1.0E-6/Yr, even if it is conservatively assumed that risk impact of the B AFW pump due to external events is as high as that due to internal events.

Other mitigating factors that may reduce the risk impact include:

1. Unit 3 and Unit 4 were shutdown to Mode 3 on October 24 because of grid instabilities due to Hurricane Wilma. Unit 3 was returned to full power operation on November 2. Unit 4 remained shutdown due to secondary chemistry problems. On October 31, the switchyard insulator salting caused loss of Unit 4 startup transformer and on November 1, the unit was placed in Mode 5. Following restoration of offsite power and resolution of chemistry problems, the unit was restarted on November 12 and returned to full power operation on November 14.

2. Using a mission time of 24 hours for 3 AFW pumps and 2 standby steam generator feed pumps overestimates the probability of selected sequences.

3. Manual actions stipulated in the plant procedures to recover failure of AFW pumps were not credited in the original baseline PSA model should be included to be consistent with NRC's SPAR model

4. The delta CDF for the time windows where B AFW pump was degraded, but could have run for longer than one hour, is lower than that for which B AFW pump was assumed to run for just one hour.

SAPHIRE 7 and the latest Turkey Point model were used to understand the three dominant sequences contributing to the phase 3 SDP summarized in the NRC inspection report. The SPAR model was modified by incorporating the key modeling assumptions related to using SSGFW pump, with slightly higher delta CDF than that estimated in Reference 2 (see Attachment 5)

Mitigating factor 1: For the case of B AFW pump failing within the first hour, the operator action to stop the weaker pump is not applicable, as the B AFW pump would fail before the deadheading of the weaker pump becomes an issue.

For the case when B AFW pump fails after running for one hour or more, the probability of dominant cutsets can be reduced by a factor of 10 or more, because:

1. The success criterion for feed and bleed is relaxed from two PORVs to one PORV.
2. Recovery action to locally use AFW train A given loss of DC bus A is proceduralized and credited in the Turkey Point PSA model, with failure probability of 0.11 including the hardware failure.

Table (2): Top 10 cutsets from SPAR Model for LODC3A.						
Cut No.	**% Total**	**% Cut Set**	**Prob./Frequency**	**Basic Event**	**Description**	**Event Prob.**
1	93.79	93.79	1.750E-006	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-TDPC-WEAKER	AFW TDP-C WEAKER OF THE TWO TRAIN 2 PUMPS (PSA)	5.000E-001
				AFW-XHE-XM-TRIP1	OPERATOR FAILS TO TRIP AFW PUMP	1.400E-003
				MFW-XHE-XL-TRIP	OPERATOR FAILS TO RECOVER MFW	1.000E+000
2	95.67	1.88	3.500E-008	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-TDP-FS-C	AFW TDP C FAILS TO START	7.000E-003
				MFW-XHE-XL-RESTORE	OPERATOR FAILS TO RESTORE MFW (LODC3A - PSA)	2.000E-003
3	97.01	1.34	2.500E-008	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-TDP-TM-C	AFW TDP C UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
				MFW-XHE-XL-RESTORE	OPERATOR FAILS TO RESTORE MFW (LODC3A - PSA)	2.000E-003
4	98.25	1.24	2.305E-008	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-TDP-CF-FRBC	COMMON CAUSE FAILURE OF TDP B & C TO RUN	4.610E-003
				MFW-XHE-XL-RESTORE	OPERATOR FAILS TO RESTORE MFW (LODC3A - PSA)	2.000E-003
5	98.97	0.72	1.348E-008	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				MFW-XHE-XL-RESTORE	OPERATOR FAILS TO RESTORE MFW (LODC3A - PSA)	2.000E-003
6	99.13	0.16	2.951E-009	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-TDP-FR-C	AFW TDP C FAILS TO RUN	5.366E-003
				AFW-XHE-XL-TDPA	OPERATOR FAILS TO MANUALLY ALIGN TDP-A GIVEN LOSS OF DC-3A (PSA)	1.100E-001
				MFW-XHE-XL-RESTORE	OPERATOR FAILS TO RESTORE MFW (LODC3A - PSA)	2.000E-003
7	99.26	0.13	2.500E-009	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-CKV-CC-3012	FAILURE OF FLOW TO SG-3B THROUGH CHECK VALVE 3-012	1.000E-004
				AFW-XHE-XM-FLOW2	OPERATOR FAILS TO INCREASE AFW TRAIN 2 FLOW GIVEN ONE DISCH PATH FAILED	1.000E-002

Table (2): Top 10 cutsets from SPAR Model for LODC3A.						
Cut No.	**% Total**	**% Cut Set**	**Prob./Frequency**	**Basic Event**	**Description**	**Event Prob.**
				MFW-XHE-XL-TRIP	OPERATOR FAILS TO RECOVER MFW	1.000E+000
8	99.39	0.13	2.500E-009	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-CKV-CC-3010	FAILURE OF FLOW TO SG-3A THROUGH CHECK VALVE 3-010	1.000E-004
				AFW-XHE-XM-FLOW2	OPERATOR FAILS TO INCREASE AFW TRAIN 2 FLOW GIVEN ONE DISCH PATH FAILED	1.000E-002
				MFW-XHE-XL-TRIP	OPERATOR FAILS TO RECOVER MFW	1.000E+000
9	99.52	0.13	2.500E-009	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-CKV-CC-3014	FAILURE OF FLOW TO SG-3C THROUGH CHECK VALVE 3-014	1.000E-004
				AFW-XHE-XM-FLOW2	OPERATOR FAILS TO INCREASE AFW TRAIN 2 FLOW GIVEN ONE DISCH PATH FAILED	1.000E-002
				MFW-XHE-XL-TRIP	OPERATOR FAILS TO RECOVER MFW	1.000E+000
10	99.63	0.11	2.134E-009	IE-LODC3A	LOSS OF DC BUS 3A	2.500E-003
				AFW-TDP-TM-TRAIN2	AFW TRAIN 2 UNAVAILABLE DUE TO TEST AND MAINTENANCE (PSA)	3.880E-003
				AFW-XHE-XL-TDPA	OPERATOR FAILS TO MANUALLY ALIGN TDP-A GIVEN LOSS OF DC-3A (PSA)	1.100E-001
				MFW-XHE-XL-RESTORE	OPERATOR FAILS TO RESTORE MFW (LODC3A - PSA)	2.000E-003

For the case when B AFW pump fails after running for one hour or more, the HEPs are reduced by a factor of 10 because available time is nominal (See Attachment 6, the basis of SPAR-H for execution).

Table (3): List of Key HEPs and Performance shaping Factors.				
HRA Basic Event Name	**Event Description/Shaping Factor**	**Distribution Type/PSF**	**Probability/ Percentage**	**Initial/Multiplier**
AFW-XHE-XM-THRTL	OPERATOR FAILS TO THROTTLE SG FCVs	Constrained Noninformative	1.0E-3	
	Action is modeled.			1.0E-3
	Available Time	Nominal time	100%	1.00
	Stress/Stressors	Nominal	100%	1.00
	Complexity	Nominal	100%	1.00
	Experience/Training	Nominal	100%	1.00
	Procedures	Nominal	100%	1.00
	Egonomics/HMI	Nominal	100%	1.00

Table (3): List of Key HEPs and Performance shaping Factors.				
HRA Basic Event Name	**Event Description/Shaping Factor**	**Distribution Type/PSF**	**Probability/ Percentage**	**Initial/Multiplier**
	Fitness for Duty	Nominal	100%	1.00
	Work Processes	Nominal	100%	1.00
	Dependency is not modeled.			
SFP-XHE-XM-SSGFP	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS	Constrained Noninformative		
	Action is modeled.			1.0E-3
	Available Time	Nominal time	100%	1.00
	Stress/Stressors	Nominal	100%	1.00
	Complexity	Nominal	100%	1.00
	Experience/Training	Nominal	100%	1.00
	Procedures	Nominal	100%	1.00
	Egonomics/HMI	Nominal	100%	1.00
	Fitness for Duty	Nominal	100%	1.00
	Work Processes	Nominal	100%	1.00
	Dependency is not modeled.			
HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	Constrained Noninformative	2.0E-3	
	Action is modeled.			1.0E-3
	Available Time	Nominal time	100%	1.00
	Stress/Stressors	High	100%	2.00
	Complexity	Nominal	100%	1.00
	Experience/Training	Nominal	100%	1.00
	Procedures	Nominal	100%	1.00
	Egonomics/HMI	Nominal	100%	1.00
	Fitness for Duty	Nominal	100%	1.00
	Work Processes	Nominal	100%	1.00
	Dependency is not modeled.			

Table (4): Top 10 cutsets from SPAR Model for LOCHS.						
Cut No.	**% Total**	**% Cut Set**	**Prob./ Frequency**	**Basic Event**	**Description**	**Event Prob.**
1	70.82	70.82	2.888E-007	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
2	73.80	2.98	1.213E-008	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				PPR-SRV-CC-456	PORV 1 (PCV-456) FAILS TO OPEN ON DEMAND	5.000E-003

Table (4): Top 10 cutsets from SPAR Model for LOCHS.						
Cut No.	% Total	% Cut Set	Prob./ Frequency	Basic Event	Description	Event Prob.
				SFP-XHE-XM-SSGFP	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS	1.000E-002
3	76.78	2.98	1.213E-008	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				PPR-SRV-CC-455C	PORV 2 (PCV-455C) FAILS TO OPEN ON DEMAND	5.000E-003
				SFP-XHE-XM-SSGFP	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS	1.000E-002
4	78.07	1.29	5.248E-009	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				AFW-TDP-FS-C	AFW TDP C FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
5	79.26	1.19	4.853E-009	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-MOV-CC-3012	FAILURE OF SSGFP DISCHARGE PATH VALVE 3-012	1.000E-003
6	80.25	0.99	4.023E-009	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-FR-A	AFW TDP A FAILS TO RUN	5.366E-003
				AFW-TDP-FS-C	AFW TDP C FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
7	81.24	0.99	4.023E-009	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-FR-C	AFW TDP C FAILS TO RUN	5.366E-003
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
8	82.16	0.92	3.749E-009	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				AFW-TDP-TM-C	AFW TDP C UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
9	83.08	0.92	3.749E-009	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002

Table (4): Top 10 cutsets from SPAR Model for LOCHS.						
Cut No.	% Total	% Cut Set	Prob./ Frequency	Basic Event	Description	Event Prob.
				AFW-TDP-FS-C	AFW TDP C FAILS TO START	7.000E-003
				AFW-TDP-TM-A	AFW TDP A UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
10	83.93	0.85	3.456E-009	IE-LOCHS	LOSS OF CONDENSER HEAT SINK	9.000E-002
				AFW-TDP-CF-FRBC	COMMON CAUSE FAILURE OF TDP B & C TO RUN	4.610E-003
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002

For the case when B AFW pump fails after running for one hour or more, the HEPs are reduced by a factor of 10 because available time is "nominal" instead of "just enough".

Table (5): Top 10 cutsets from SPAR Model for LOMFW.						
Cut No.	% Total	% Cut Set	Prob./ Frequency	Basic Event	Description	Event Prob.
1	70.78	70.78	3.209E-007	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
2	73.75	2.97	1.348E-008	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				PPR-SRV-CC-456	PORV 1 (PCV-456) FAILS TO OPEN ON DEMAND	5.000E-003
				SFP-XHE-XM-SSGFP	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS	1.000E-002
3	76.72	2.97	1.348E-008	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				PPR-SRV-CC-455C	PORV 2 (PCV-455C) FAILS TO OPEN ON DEMAND	5.000E-003
				SFP-XHE-XM-	OPERATOR FAILS TO START AND	1.000E-002

Table (5): Top 10 cutsets from SPAR Model for LOMFW.						
Cut No.	% Total	% Cut Set	Prob./ Frequency	Basic Event	Description	Event Prob.
				SSGFP	ALIGN STANDBY SG PUMP TRAINS	
4	78.01	1.29	5.831E-009	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				AFW-TDP-FS-C	AFW TDP C FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
5	79.20	1.19	5.392E-009	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-CF-FRALL	COMMON CAUSE FAILURE OF TURBINE DRIVEN PUMPS TO RUN	2.696E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-MOV-CC-3012	FAILURE OF SSGFP DISCHARGE PATH VALVE 3-012	1.000E-003
6	80.19	0.99	4.470E-009	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-FR-C	AFW TDP C FAILS TO RUN	5.366E-003
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
7	81.18	0.99	4.470E-009	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-FR-A	AFW TDP A FAILS TO RUN	5.366E-003
				AFW-TDP-FS-C	AFW TDP C FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
8	82.10	0.92	4.165E-009	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-FS-C	AFW TDP C FAILS TO START	7.000E-003
				AFW-TDP-TM-A	AFW TDP A UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002

Table (5): Top 10 cutsets from SPAR Model for LOMFW.						
Cut No.	% Total	% Cut Set	Prob./ Frequency	Basic Event	Description	Event Prob.
9	83.02	0.92	4.165E-009	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				AFW-TDP-TM-C	AFW TDP C UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002
10	83.87	0.85	3.840E-009	IE-LOMFW	LOSS OF MAIN FEEDWATER	1.000E-001
				AFW-TDP-CF-FRBC	COMMON CAUSE FAILURE OF TDP B & C TO RUN	4.610E-003
				AFW-TDP-FS-A	AFW TDP A FAILS TO START	7.000E-003
				HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.000E-002
				MFW-XHE-XL-MFWREC	OPERATOR FAILS TO RECOVER MFW	1.000E+000
				SFP-XHE-XM-SSGFP1	OPERATOR FAILS TO START AND ALIGN STANDBY SG PUMP TRAINS (DE	5.950E-002

Similarly, the probability of cutsets for other sequences are reduced by a factor of 10 due to the following mitigating factors:

1. Feed and bleed success criterion being relaxed to one of 2 PORVs,
2. Time to take actions is increased by at least an hour
3. Condensate system may be used for scenarios not involving power conversion systems

6.0 CALCULATIONAL FILES

The key assumptions and data used in the calculation are documented in the calculation. Additional files and information used for sensitivity studies are found in directory \\Ws08478\4\Max1\PTNAFW,

7.0 RESULTS

The CDF increase is estimated by combining the different CDF for the two different time windows, one for B AFW pump failing before one hour and the other B AFW pump failing after one hour. For the purpose of bounding evaluation, conservative values are used to simplify the calculation. A best-estimate based on the review of the NRC's phase 3 SDP and revised SPAR model yields the following:

Table (6): Best Estimate Delta CDF.			
Exposure Time	**11 months**	**1 month**	**Delta CDF**
AFW Failure Time	after 1 hour	in the first hour	weighted by exposure time
delta CDF	3.20E-07	1.60E-06	4.27E-07

Additional sensitivity studies were performed by using the Turkey Point Rev 5B model with newer MSPI industry average failure data (Reference 6) for MOVs, Motor Driven Pumps, Turbine Driven Pumps, AOVs, EDGs, etc. Attachments 1 and 2 provide a list of dominant cutsets involving the B AFW pump, for failure probability of running set to 1.0 and 1.6E-2 respectively.

Comparable results are obtained using a similar approach but using Turkey Point PSA model with a scoping assumption based on insights of many exploratory runs considering the following factors:

1. Top cutsets involving A & C AFW failing to runs, can be reduced by a factor of 2 to 4, simply by applying convolution.

2. Top cutsets involving A& C AFW failing to start, can apply 0.5 or smaller for reasons similar to that of MSPI AFW FTS, PSL SPAR or even lower say a factor of 0.1 based on PSL Unit 2 C AFW pump case

3. Selected cutsets involving LOG I.E. do not have offsite power recovery

4. For AFW failing within the first hour, cutsets involving AHFAFWPTRP may be eliminated

5. Cutsets involving T3 and T1 may be mitigated by using condensate for secondary heat removal

6. Cutsets involving loss of 4 KV bus may be mitigated by condensate for secondary heat removal

A scoping estimate is performed assuming a factor of 2 reduction (based on judgment and the fact that SPAR model results indicate a factor of 5 reduction as indicated in Table 6) for the delta CDF associated with B AFW pump failing after one hour from that when AFW fails within the first hour. The delta CDF in the first hour for the second case in Table 7, PTN Model with MSPI data is obtained by using the cutest files indicated in Attachments 1 and 2, by setting AHFPAFWPTRP to false, as this operator action is not required if AFW is assumed to fail in less than one hour. The delta CDF for the case in which AFW fails after one hour is obtained by reducing by a factor of 2 that for the case in which AFW is assumed to fail in less than one hour.

The results are summarized below.

Table (7): Summary of Delta CDF Sensitivity Study.				
	Exposure Time	**11 months**	**1 month**	**Delta CDF**

	AFW Failure Time	after 1 hour	in the first hour	weighted by exposure time
SPAR Model	delta CDF	3.20E-07	1.60E-06	4.27E-07
PTN Model with MSPI data	delta CDF	2.79E-07	5.58E-07	3.02E-07

The increase in the CDF associated with the degraded B AFW pump is estimated to be lower than 4.3E-7/Yr.

In summary, a phase 3 safety significance determination has been performed, based in part, on the following key assumptions:

1. The degradation of the B AFW pump is time-dependent, as the pump continued to deliver adequate flow at least for one hour until 10/30/2005. Between 10/30/2005 and the date of condition discovery (11/07/05), the ability to deliver flow for longer than an hour is not determined.
2. Based on the test operating data, the B AFW pump would run at least one hour on or before October 30, 2005 (eight days prior to discovery). After October 30, 2005, the B AFW pump is conservatively assumed to fail in the first hour.
3. If the B AFW pump runs for one hour prior to failure, the decay heat is significantly lower, which allows more time for operators to take actions stipulated in the EOP.
4. Manual actions stipulated in the plant procedures (e.g. EOP, ONOP and OP) to provide secondary heat removal after the failure of AFW pumps by use of Standby Steam Generator Feedwater pumps and bleed and feed are included in the model (e.g. reduces the need for two pressurizer power operated relief valves to one).

The safety significance determination has concluded that the core damage probability increase over a year is less than 1.0E-6.

Attachment 1: Sensitivity Case, Using MSPI data, with AFW B failure to run set to 1.0

Cutsets with Descriptions Report
PTNR5C10 = 6.21E-06

C:\2006MSPI\CAFTA Files Rev C\Cuts\PTNR5C10AFWB.CUT 2/15/2006 9:20 PM

#	Cutset Prob	Event Prob	C	Rate	U	Exposure	U	Event	Description
1	7.95E-08	3.50E-03	9			3.50E-03		%ZZRU3C	STEAM GENERATOR TUBE RUPTURE 3C GENERATOR
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00				0.5		FHFPAFWSTM	OPERATING CREW FAILS TO SWITCH STEAM SUPPLY TO AFW TRAIN 1 GIVEN SGTR IN SG 3C
		1.00E+00	0			.5		FHFPCD4-1	FAILURE TO RESET SI AND RESTART MFW FOLLOWING A REACTOR TRIP OR SI ACTUATION
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		6.40E-04	0			6.4E-4		ZHF-C2-004	FAILURE TO RESET SI AND RESTORE MFW AFTER LOSS OF AFW AND FAILURE TO USE SSGFW AS A BACKUP SOURCE
OF FEEDWATER (FHFPCD4-1*FHFPSSGFW)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		7.10E-02	0			.071		ZZU4OOS	UNIT 4 OUT OF SERVICE
2	7.63E-08	1.27E-01	9			1.27E-01		%ZZT3CU3	LOSS OF MAIN FEEDWATER--NOT RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
3	6.72E-08	1.00E+00	9			1.0		%ZZDC3A	SPECIAL INITIATOR - LOSS OF 125VDC BUS 3A
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		8.76E-04	3	1.00E-07	H	1	Y	EBDF33D01I	125V DC BUS 3A FAILURE
		1.00E+00	0			.5		FHFPT4CD4-1	FAILURE TO RECOVER MFW OPERATING FWBFCVs LOCALLY
		1.40E-03	0			1.4E-03		ZHFPAFWPTRP	FAILURE TO TRIP AFW PUMP B OR C WHEN BOTH ARE RUNNING ON TRAIN 2
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.10E-01	0			0.1097		ZHFPTRNAMAN	OPERATORS FAIL TO MANUALLY ALIGN, START, AND RUN AFW TRAIN A GIVEN A LOSS OF DC BUS 3A
4	4.84E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		2.43E-02	3	1.03E-03	H	24		EDGF44A	DIESEL GENERATOR 4A FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC	HVAC FLAG
5	3.97E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		EHFPCLR4KVS	OPERATOR FAILS TO MANUALLY OPEN BREAKER TO ALLOW BUS TO LOAD - SOFT BREAKER FAIL
		2.00E-02				1.999E-02		EMM4ACLR	4160V BUS 4A BREAKERS FAIL TO OPEN - SOFT FAILURES
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS

		1.00E+00				1.0		ZZHVAC	HVAC FLAG
6	3.97E-08	1.27E-01	9			1.27E-01		%ZZT3CU3	LOSS OF MAIN FEEDWATER--NOT RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPBLFEEDL	OPERATING CREW FAILS TO IMPLEMENT BLEED-AND-FEED - LMFW W/LOW SG LEVEL
		3.90E-05	0			4.0E-5		ZHF-C3-007	FAILURE TO TRIP ONE OF THE TWO TRAIN 2 AFW PUMPS, FAILURE TO RESTORE SECONDARY COOLING USING SSGFW
AFTER LOSS OF AFW, AND FAILURE TO RESET SI AND INITIATE BLEED-AND-FEED COOLING (AHFPAFWPTRP*FHFPSSGF									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
7	3.31E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		EHFPDOSTXT	OPERATOR FAILS TO ATTEMPT DOST XTIE
		1.67E-02	3	2.10E-03	N	8	N	EMPA4P241A	DIESEL OIL TRANSFER PUMP 4P241A FAILS TO START
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC	HVAC FLAG
8	3.25E-08	1.27E-01	9			1.27E-01		%ZZT3CU3	LOSS OF MAIN FEEDWATER--NOT RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		6.83E-03	0			6.825E-03		ATM0TRAIN1	AFW TRAIN 1 UNAVAILABLE DUE TO TEST OR MAINTENANCE
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
9	3.24E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.63E-02	0			1.630E-02		ETM4AEDG	EDG 4A IN TEST OR MAINTENANCE
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC	HVAC FLAG
10	3.19E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
11	3.17E-08	1.10E-01	9			1.10E-01		%ZZT3AU3	LOSS OF MAIN FEEDWATER - RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPCD4-1	FAILURE TO RESET SI AND RESTART MFW FOLLOWING A REACTOR TRIP OR SI ACTUATION

		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPBLFEEDL	OPERATING CREW FAILS TO IMPLEMENT BLEED-AND-FEED - LMFW W/LOW SG LEVEL
		3.60E-05	0			3.6E-05		ZHF-C3-006	FAILURE TO TRIP ONE OF THE TWO TRAIN 2 AFW PUMPS, FAILURE TO RESTORE MFW AFTER LOSS OF AFW, AND
FAILURE TO RESET SI AND INITIATE BLEED-AND-FEED COOLING (AHFPAFWTRP*FHFPCD4-1*GHFPBLFEEDL)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
12	3.15E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.59E-02	3	2.00E-03	N	8	N	ESVN43434A	SOLENOID VALVE SV-4-3434A FAILS TO OPEN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC	HVAC FLAG
13	3.02E-08	1.00E+00	9			1.00		%ZZIAU3	UNIT 3 LOSS OF IA
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPT4CD4-1	FAILURE TO RECOVER MFW OPERATING FWBFCVs LOCALLY
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		5.02E-02	3	5.88E-06	H	1	Y	HADF33T9I	AIR DRYER 3T9 FAILS TO DELIVER FLOW (1 YR EXPOSURE)
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
14	2.98E-08	3.50E-03	9			3.50E-03		%ZZRU3A	STEAM GENERATOR TUBE RUPTURE 3A GENERATOR
		1.00E+00	0			.5		AHFPAFWFLO	OPERATOR FAILS TO THROTTLE UP AFW FLOW
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPCD4-1	FAILURE TO RESET SI AND RESTART MFW FOLLOWING A REACTOR TRIP OR SI ACTUATION
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.70E-05	0			1.7E-5		ZHF-C2-026	FAILURE TO THROTTLE UP AFW FLOW AND FAILURE TO USE SSGFW AS A BACKUP SOURCE OF FEEDWATER
(AHFPAFWFLO * FHFPSSGFW)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
15	2.98E-08	3.50E-03	9			3.50E-03		%ZZRU3B	STEAM GENERATOR TUBE RUPTURE 3B GENERATOR
		1.00E+00	0			.5		AHFPAFWFLO	OPERATOR FAILS TO THROTTLE UP AFW FLOW
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPCD4-1	FAILURE TO RESET SI AND RESTART MFW FOLLOWING A REACTOR TRIP OR SI ACTUATION
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.70E-05	0			1.7E-5		ZHF-C2-026	FAILURE TO THROTTLE UP AFW FLOW AND FAILURE TO USE SSGFW AS A BACKUP SOURCE OF FEEDWATER
(AHFPAFWFLO * FHFPSSGFW)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
16	2.98E-08	3.50E-03	9			3.50E-03		%ZZRU3C	STEAM GENERATOR TUBE RUPTURE 3C GENERATOR
		1.00E+00	0			.5		AHFPAFWFLO	OPERATOR FAILS TO THROTTLE UP AFW FLOW
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPCD4-1	FAILURE TO RESET SI AND RESTART MFW FOLLOWING A REACTOR TRIP OR SI ACTUATION
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.70E-05	0			1.7E-5		ZHF-C2-026	FAILURE TO THROTTLE UP AFW FLOW AND FAILURE TO USE SSGFW AS A BACKUP SOURCE OF FEEDWATER
(AHFPAFWFLO * FHFPSSGFW)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
17	2.58E-08	8.94E-01	9			8.94E-01		%ZZT1U3	REACTOR TRIP
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.80E-06	0			1.80E-06		NRDFPHYSICAL	FAILURE OF CONTROL RODS TO INSERT WITH POWER REMOVED
		1.00E+00				1.0		ZZATWS	ATWS FLAG
18	2.58E-08	8.94E-01	9			8.94E-01		%ZZT1U3	REACTOR TRIP

		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWC	AFW TURBINE-DRIVEN PUMP C FAILS TO RUN
		1.80E-06	0			1.80E-06		NRDFPHYSICAL	FAILURE OF CONTROL RODS TO INSERT WITH POWER REMOVED
		1.00E+00				1.0		ZZATWS	ATWS FLAG
19	2.44E-08	1.27E-01	9			1.27E-01		%ZZT3CU3	LOSS OF MAIN FEEDWATER–NOT RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		5.13E-03	3	5.14E-03	N	1	N	ATPA0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO START
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
20	2.23E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.12E-02	3	1.13E-02	N	1	N	EDGA44A	DIESEL GENERATOR 4A FAILS TO START
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC	HVAC FLAG
21	2.19E-08	1.27E-01	9			1.27E-01		%ZZT3CU3	LOSS OF MAIN FEEDWATER–NOT RECOVERABLE
		1.57E-04				1.569E-04		AMM0CCTPAAC	CCF (2/3) OF TURBINE-DRIVEN PUMP A,C TO START
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPBLFEEDL	OPERATING CREW FAILS TO IMPLEMENT BLEED-AND-FEED - LMFW W/LOW SG LEVEL
		1.10E-03	0			1.1E-3		ZHF-C2-028	OPERATORS FAIL TO RECOVER SEC COOLING USING SSGFW AND FAIL TO IMPLEMENT BLEED-AND-FEED COOLING
(FHPSSGFW*GHFPBLFEEDL)									
22	2.15E-08	1.00E+00	9			1.00		%ZZIA34	DUAL UNIT LOSS OF IA
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPT4CD4-1	FAILURE TO RECOVER MFW OPERATING FWBFCVs LOCALLY
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		3.72E-01				3.717E-01		HMM3M332I	LOCAL FAULTS IN HEADER M 332 (1 YR EXPOSURE)
		3.09E-03				3.086E-03		HMMCCFALLR	CCF TO RUN- 4/4 U3 & U4 IA COMPRESSORS (2 DAY EXPOSURE)
		1.00E+00	0			.5		XHFPRCPTRP	OPERATING CREW FAILS TO TRIP RCPs GIVEN DUAL-UNIT TRIP
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		5.00E-01	0			0.5		ZZIAU3	FLAG - 3CM RUNNING, 4CM IN STANDBY
23	2.15E-08	1.00E+00	9			1.00		%ZZIA34	DUAL UNIT LOSS OF IA
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPT4CD4-1	FAILURE TO RECOVER MFW OPERATING FWBFCVs LOCALLY
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		3.72E-01				3.717E-01		HMM4M432I	LOCAL FAULTS IN HEADER M 432 (1 YR EXPOSURE)
		3.09E-03				3.086E-03		HMMCCFALLR	CCF TO RUN- 4/4 U3 & U4 IA COMPRESSORS (2 DAY EXPOSURE)
		1.00E+00	0			.5		XHFPRCPTRP	OPERATING CREW FAILS TO TRIP RCPs GIVEN DUAL-UNIT TRIP
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		5.00E-01	0			0.5		ZZIAU4	FLAG - 4CM RUNNING, 3CM IN STANDBY
24	2.15E-08	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS

		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.08E-02	2	3.00E-05	H	1	M	EBSP46332A	*BASKET STRAINER BS-4-6332A PLUGS*
		1.00E+00	0			.5		EHFPDOSTXT	OPERATOR FAILS TO ATTEMPT DOST XTIE
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE
UNIT RWST (GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC	HVAC FLAG
25	1.80E-08	3.50E-03	9			3.50E-03		%ZZRU3A	STEAM GENERATOR TUBE RUPTURE 3A GENERATOR
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPCD4-1	FAILURE TO RESET SI AND RESTART MFW FOLLOWING A REACTOR TRIP OR SI ACTUATION
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		6.40E-04	0			6.4E-4		ZHF-C2-004	FAILURE TO RESET SI AND RESTORE MFW AFTER LOSS OF AFW AND FAILURE TO USE SSGFW AS A BACKUP SOURCE
OF FEEDWATER (FHFPCD4-1*FHFPSSGFW)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS

Report Summary:
Filename: C:\2006MSPI\CAFTA Files Rev C\Cuts\PTNR5C10AFWB.CUT
Print date: 2/15/2006 9:20 PM
Not sorted
Printed the first 25

Attachment 2, Sensitivity Study: Base Case, Using MSPI data, Nominal AFW B failure to run

Cutsets with Descriptions Report
PTNR5C10 = 3.87E-06
C:\2006MSPI\CAFTA Files Rev C\Cuts\PTNR5C10.CUT 2/15/2006 9:30 PM

#	Cutset Prob	Event Prob	C	Rate	U	Exposure	U	Event	Description
1	1.27E-09	3.50E-03	9			3.50E-03		%ZZRU3C	STEAM GENERATOR TUBE RUPTURE 3C GENERATOR
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00				0.5		FHFPAFWSTM	OPERATING CREW FAILS TO SWITCH STEAM SUPPLY TO AFW TRAIN 1 GIVEN SGTR IN SG 3C
		1.00E+00	0			.5		FHFPCD4-1	FAILURE TO RESET SI AND RESTART MFW FOLLOWING A REACTOR TRIP OR SI ACTUATION
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		6.40E-04	0			6.4E-4		ZHF-C2-004	FAILURE TO RESET SI AND RESTORE MFW AFTER LOSS OF AFW AND FAILURE TO USE SSGFW AS A BACKUP SOURCE OF FEEDWATER
(FHFPCD4-1*FHFPSSGFW)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		7.10E-02	0			.071		ZZU4OOS	UNIT 4 OUT OF SERVICE
2	1.22E-09	1.27E-01	9			1.27E-01		%ZZT3CU3	LOSS OF MAIN FEEDWATER--NOT RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA	AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE UNIT RWST
(GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
3	1.08E-09	1.00E+00	9			1.0		%ZZDC3A	SPECIAL INITIATOR - LOSS OF 125VDC BUS 3A
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		8.76E-04	3	1.00E-07	H	1	Y	EBDF33D01I	125V DC BUS 3A FAILURE
		1.00E+00	0			.5		FHFPT4CD4-1	FAILURE TO RECOVER MFW OPERATING FWBFCVs LOCALLY
		1.40E-03	0			1.4E-03		ZHFPAFWPTRP	FAILURE TO TRIP AFW PUMP B OR C WHEN BOTH ARE RUNNING ON TRAIN 2
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.10E-01	0			0.1097		ZHFPTRNAMAN	OPERATORS FAIL TO MANUALLY ALIGN, START, AND RUN AFW TRAIN A GIVEN A LOSS OF DC BUS 3A
4	7.76E-10	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		2.43E-02	3	1.03E-03	H	24		EDGF44A	DIESEL GENERATOR 4A FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE UNIT RWST
(GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC	HVAC FLAG
5	6.37E-10	5.30E-02	9			5.30E-02		%ZZLOG	LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP	OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB	AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		EHFPCLR4KVS	OPERATOR FAILS TO MANUALLY OPEN BREAKER TO ALLOW BUS TO LOAD - SOFT BREAKER FAIL
		2.00E-02				1.999E-02		EMM4ACLR	4160V BUS 4A BREAKERS FAIL TO OPEN - SOFT FAILURES
		1.00E+00	0			.5		FHFPSSGFW	FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI	OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC	OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN	OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC	OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020	OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE UNIT RWST
(GHFPS2RCRC*GHFPOPPSI)									
		5.00E-01				0.5		ZZAFWPUMPC	AFW PUMP C IS THE WEAKER OF THE 2 PUMPS

		1.00E+00				1.0		ZZHVAC HVAC FLAG
6	6.36E-10	1.27E-01	9			1.27E-01		%ZZT3CU3 LOSS OF MAIN FEEDWATER–NOT RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPBLFEEDL OPERATING CREW FAILS TO IMPLEMENT BLEED-AND-FEED - LMFW W/LOW SG LEVEL
		3.90E-05	0			4.0E-5		ZHF-C3-007 FAILURE TO TRIP ONE OF THE TWO TRAIN 2 AFW PUMPS, FAILURE TO RESTORE SECONDARY COOLING USING SSGFW AFTER LOSS OF AFW, AND FAILURE TO RESET SI AND INITIATE BLEED-AND-FEED COOLING (AHFPAFWPTRP*FHFPSSGF
		5.00E-01				0.5		ZZAFWPUMPC AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
7	5.31E-10	5.30E-02	9			5.30E-02		%ZZLOG LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		EHFPDOSTXT OPERATOR FAILS TO ATTEMPT DOST XTIE
		1.67E-02	3	2.10E-03	N	8	N	EMPA4P241A DIESEL OIL TRANSFER PUMP 4P241A FAILS TO START
		1.00E+00	0			.5		FHFPSSGFW FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020 OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE UNIT RWST (GHFPS2RCRC*GHFPOPPSI)
		5.00E-01				0.5		ZZAFWPUMPC AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC HVAC FLAG
8	5.21E-10	1.27E-01	9			1.27E-01		%ZZT3CU3 LOSS OF MAIN FEEDWATER–NOT RECOVERABLE
		1.00E+00	0			.5		AHFPAFWPTRP OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		6.83E-03	0			6.825E-03		ATM0TRAIN1 AFW TRAIN 1 UNAVAILABLE DUE TO TEST OR MAINTENANCE
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		7.50E-05	0			7.5E-05		ZHF-C2-020 OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE UNIT RWST (GHFPS2RCRC*GHFPOPPSI)
		5.00E-01				0.5		ZZAFWPUMPC AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
9	5.19E-10	5.30E-02	9			5.30E-02		%ZZLOG LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.63E-02	0			1.630E-02		ETM4AEDG EDG 4A IN TEST OR MAINTENANCE
		1.00E+00	0			.5		FHFPSSGFW FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		1.00E+00	0			.5		IHFPPORTFN OPERATOR FAILS TO UTILIZE PORTABLE FANS
		1.00E+00	0			.5		RHFPSRHVAC OPERATOR FAILURE TO START SR HVAC
		7.50E-05	0			7.5E-05		ZHF-C2-020 OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE UNIT RWST (GHFPS2RCRC*GHFPOPPSI)
		5.00E-01				0.5		ZZAFWPUMPC AFW PUMP C IS THE WEAKER OF THE 2 PUMPS
		1.00E+00				1.0		ZZHVAC HVAC FLAG
10	5.11E-10	5.30E-02	9			5.30E-02		%ZZLOG LOSS OF GRID
		1.00E+00	0			.5		AHFPAFWPTRP OPERATORS FAIL TO SHUT DOWN 1 OF THE TRAIN 2 PUMPS
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWA AFW TURBINE-DRIVEN PUMP A FAILS TO RUN
		1.60E-02	3	6.73E-04	H	24	H	ATPF0AFWB AFW TURBINE-DRIVEN PUMP B FAILS TO RUN
		1.00E+00	0			.5		FHFPSSGFW FAILURE TO RECOVER SECON. HEAT SINK BY SSGFW
		1.00E+00	0			.5		GHFPOPPSI OPERATING CREW FAILS TO USE HHSI FROM OPPOSITE UNIT
		1.00E+00	0			.5		GHFPS2RCRC OPERATOR FAILS TO SWITCHOVER TO HIGH HEAD COLD LEG RECIRC (SMALL LOCA)
		7.50E-05	0			7.5E-05		ZHF-C2-020 OPERATING CREW FAILS TO IMPLEMENT HHSR FOR A SMALL LOCA AND FAILS TO IMPLEMENT HHSI FROM OPPOSITE UNIT RWST (GHFPS2RCRC*GHFPOPPSI)
		5.00E-01				0.5		ZZAFWPUMPC AFW PUMP C IS THE WEAKER OF THE 2 PUMPS

Report Summary:
Filename: C:\2006MSPI\CAFTA Files Rev C\Cuts\PTNR5C10.CUT
Print date: 2/15/2006 9:30 PM
Not sorted, Printed the first 10

Attachment 3: Clarification of Loss of DC 3A Operator Recovery Action

----- Forwarded by Ching Guey/Juno/Nuclear/FplNuc on 02/17/2006 07:53 AM -----

Mark Averett

02/17/2006 07:44 AM

To: ching_guey@fpl.com
cc: Brien Vincent/Juno/Nuclear/FplNuc@FplNuc, Glen Blinde/Ptn/Nuclear/FplNuc@FplNuc, Mahmoud Heiba/Juno/Nuclear/FplNuc@FplNuc
Subject: Re: AHFPTRNAMAN

See response in blue.

Mark

Ching Guey

02/17/2006 07:31 AM

To: Mark Averett/Juno/Nuclear/FplNuc@FplNuc
cc: Brien Vincent/Juno/Nuclear/FplNuc@FplNuc, Mahmoud Heiba/Juno/Nuclear/FplNuc, Glen Blinde/Ptn/Nuclear/FplNuc@FplNuc
Subject: Re: AHFPTRNAMAN

Does this imply that the Birnbaum importance of the hardware (A AFW pump, and train 1 steam admission valve, mainly) involved may need to be added (or allocated based on its contribution to 0.1083, which may be reduced if the MSPI data is used, I presume that FTR of 0.096 for Train A AFW pump may dominate)? Yes, it does. Replacing ZHFPTRNAMAN with ATPF0AFWA in the cutsets would approximate the increase in Birnbaum due to the hardware portion of the AHFPTRNAMAN recovery.

This may not be an important issue, until DC bus 3A becomes dominant sequence of concern.

Also, Glen's email earlier may change the HEP somewhat? No. Glen's email simply confirms that the AHFPTRNAMAN recovery is possible.

Ching

Mark Averett

02/17/2006 07:10 AM

To: ching_guey@fpl.com
cc: Brien Vincent/Juno/Nuclear/FplNuc@FplNuc, Mahmoud Heiba/Juno/Nuclear/FplNuc@FplNuc, glen_blinde@fpl.com
Subject: AHFPTRNAMAN

Ching,

I found the reference for the 0.11 probability for the recovery event AHFPTRNAMAN in the Rev. 4 update calculation.

PTN-03-068 Recovery for %ZZDC3A/B Sequences

Description	*Actual Changes*
During the cutset review with the Licensed Operator Instructors, it was pointed out that it did not appear that the dependency of SSGFW on the feedwater bypass valves (FCV-3-479, 489, and 499) was adequately modeled. This was discovered by noting that the loss of DC Bus 3A (power for these valves) was not resulting in a failure of SSGFW. This was corrected via change PTN-03-066. This change brought a lot of loss of DC Bus 3A cutsets to the top. The Licensed Operator Instructors also pointed out that Train 1 of AFW which is lost due to the loss of DC Bus 3A due to steam admission valve not opening and the FCVs not opening could be recovered by manually opening these valves and manually controlling the FCVs using local indication. **RECOVERY** ZHFPTRNAMAN 0.1097 %ZZDC3A ATPF0AFWB ATPF0AFWC	This recovery action was modeled in the HRA Toolbox as event AHFPTRNAMAN. The hardware portion of this recovery was determined by quantifying the gate A0003, giving a failure probability of 0.1083, dwarfing the the human error part of the recovery of 1.4E-3. This recovery cannot easily be placed into the fault tree itself as it is very cutset-specific. Therefore, the recovery was applied using the recovery rule file to apply it to the individual cutsets. The probability of the recovery was set to the sum of the hardware and human error probabilities, or 0.1097. The addition to the recovery rule file is shown below: **CLEAR RECOVERY FLAGS**

%ZZDC3A ATPA0AFWB ATPF0AFWC
%ZZDC3A ATPF0AFWB ATPA0AFWC
%ZZDC3A ATM0TRAIN2
%ZZDC3A AHFA0PUMPB ATPF0AFWC
%ZZDC3A AHFA0PUMPC ATPF0AFWB
%ZZDC3A AHFA0PUMPB ATPA0AFWC
%ZZDC3A AHFA0PUMPC ATPA0AFWB
%ZZDC3A AHFPAFWPTRP ATPF0AFWB ZZAFWPUMPC
%ZZDC3A AHFPAFWPTRP ATPF0AFWC ZZAFWPUMPB
%ZZDC3A AHFPAFWPTRP ATPA0AFWB ZZAFWPUMPC
%ZZDC3A AHFPAFWPTRP ATPA0AFWC ZZAFWPUMPB
%ZZDC3A AROP0-3418 ATPF0AFWC
%ZZDC3A ATPF0AFWB AROP0-3419
%ZZDC3A AROP0-3418 ATPA0AFWC
%ZZDC3A ATPA0AFWB AROP0-3419
%ZZDC3A AMM0CCFAVBD
%ZZDC3A AMM0CCFAVBF
%ZZDC3A AMM0CCFAVDF
%ZZDC3A AMM3SSHV2 ZZU4OOS
%ZZDC3A ACVN0PD243 ATPF0AFWC
%ZZDC3A ACVN0PD243 ATPF0AFWC
%ZZDC3A ACVN0S003B ATPF0AFWC
%ZZDC3A ACVN0S003C ATPF0AFWB
%ZZDC3A ACVN0PD243 ATPA0AFWC
%ZZDC3A ACVN0PD243 ATPA0AFWC
%ZZDC3A ACVN0S003B ATPA0AFWC
%ZZDC3A ACVN0S003C ATPA0AFWB

Added ZHFPTRNAMAN to gate ZREC6 for placeholding.

Mark

Attachment 4: Summary of Turkey Point Plant Response to Loss of AFW 1 Hour after a Loss of Feedwater

MAAP File Name	Event Description	Results
PTN_AFW1HR_LSGWR_2HHSI_2PORV_SGL60 86400 sec run	Loss of feedwater Loss of AFW @ 1hr SSGFW available	S/G dryout - none Core uncovery - none Fuel damage - none Bleed & feed - none CL recirc - none
PTN_LOHS1HR_1HHSI_1PORV_SGL60_HRA 43200 sec run	Loss of feedwater Loss of AFW/SSGFW @ 1hr Bleed & feed initiated (1 HHSIP - 1 PORV) to avoid core uncovery	S/G dryout - none Core uncovery - none Fuel damage - none Bleed & feed - 22596 sec CL recirc - > 43200 sec
PTN_LOHS1HR_2HHSI_1PORV_SGL60_HRA 43200 sec run	Loss of feedwater Loss of AFW/SSGFW @ 1hr Bleed & feed initiated (2 HHSIP - 1 PORV) to avoid core uncovery	S/G dryout - none Core uncovery - none Fuel damage - none Bleed & feed - 23166 sec CL recirc - > 43200 sec
PTN_LOHS1HR_2HHSI_2PORV_SGL60_HRA 43200 sec run	Loss of feedwater Loss of AFW/SSGFW @ 1hr Bleed & feed initiated (2 HHSIP - 2 PORV) to avoid core uncovery	S/G dryout - none Core uncovery - none Fuel damage - none Bleed & feed - 23746 sec CL recirc - 33132 sec
PTN_LOHS1HR_2HHSI_2PORV_SGL60_NOCD 36000 sec run	Loss of feedwater Loss of AFW/SSGFW @ 1hr Bleed & feed initiated (2 HHSIP - 2 PORV) to avoid core damage	S/G dryout - 26834 sec Core uncovery - 28406 sec Fuel damage - none Bleed & feed - 27646 sec CL recirc - 35861 sec
PTN_LOHS1HR_NOF&B_NOCHG 36000 sec run	Loss of feedwater Loss of AFW/SSGFW @ 1hr No bleed & feed initiated No charging	S/G dryout - 25787 sec Core uncovery - 28221 sec Fuel damage - 30657 sec Bleed & feed - n/a CL recirc - n/a
PTN_LOHS1HR_NOF&B_NOCHG_AFWREST_HRA 43200 sec run	Loss of feedwater Loss of AFW/SSGFW @ 1hr No bleed & feed initiated No charging AFW restored to avoid core damage	S/G dryout - 25787 sec Core uncovery - 28221 sec Fuel damage - none Bleed & feed - n/a CL recirc - n/a AFW restored - 28746 sec
PTN_LOOP_LOHS1HR_NOF&B_NOCHG 30000 sec	LOOP/Loss of feedwater Loss of AFW/SSGFW @ 1hr No bleed & feed initiated No charging	S/G dryout - 23810 sec Core uncovery - 26186 sec Fuel damage - 28580 sec Bleed & feed - n/a CL recirc - n/a
PTN_2IN_S1LOCA_LOHS1HR_NOCHG 86400 sec	2" S1LOCA Loss of AFW/SSGFW @ 1hr Minimum SI @ 77 sec No charging	S/G dryout - none Core uncovery - none Fuel damage - none Bleed & feed - none CL recirc - 78507 sec
PTN_LOOP_AFW1HR_LSGWR_2HHSI_2PORV_SGL60 86400 sec run	Loss of feedwater Loss of AFW @ 1hr SSGFW available	S/G dryout - none Core uncovery - none Fuel damage - none Bleed & feed - none CL recirc - none

Attachment 5: Summary of NRC Phase 3 SDP Results

Sequence Base Vs. Current Report by Diff. Min cut (b-c)

Project : TKPT_3
Analysis: RANDOM

Units: Per Year

Event tree	Sequence	Curr Freq Per Year	Base Freq Per Year	Difference	Ratio	Curr Cnt	Base Cnt	Difference	End State
LOCHS	02-07-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCCW	18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCCW	17	3.738E-12	3.738E-12	0.000E+00	1.000E+00	3	3	0	CD
LOCCW	15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	1	-1	CD
LOCCW	13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	1	-1	CD
LOCCW	26-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCHS	02-02-05	1.462E-11	1.462E-11	0.000E+00	1.000E+00	5	5	0	CD
LOCCW	26-10	3.331E-11	3.331E-11	0.000E+00	1.000E+00	3	3	0	CD
LOCCW	26-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCHS	02-06-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCHS	02-06-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCCW	26-12	2.331E-11	2.331E-11	0.000E+00	1.000E+00	3	3	0	CD
LOCHS	02-06-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCCW	26-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCHS	02-07-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCHS	02-07-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOCHS	02-04-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0	0	0	CD
LOOP	18-43-3	1.667E-11	1.136E-11	5.310E-12	1.467E+00	3	5	-2	CD
LDC3A	15-11	7.286E-12	2.311E-13	7.055E-12	3.153E+01	3	14	-11	CD
LOCHS	13	1.096E-11	0.000E+00	1.096E-11	0.000E+00	3	0	3	CD
LOMFW	13	1.217E-11	0.000E+00	1.217E-11	0.000E+00	3	0	3	CD
LOOP	16	1.403E-11	0.000E+00	1.403E-11	0.000E+00	6	0	6	CD
MLOCA	12	9.331E-11	2.383E-11	6.948E-11	3.918E+00	23	9	14	CD
LOCCW	26-11	9.312E-11	2.313E-11	6.999E-11	4.026E+00	30	12	18	CD
LOICW	26-11	9.312E-11	2.313E-11	6.999E-11	4.026E+00	30	12	18	CD
SLOCA	19-11	9.312E-11	2.313E-11	6.999E-11	4.026E+00	30	12	18	CD
LOOP	18-45	3.152E-10	2.055E-10	1.097E-10	1.534E+00	17	38	-21	CD
LOOP	14	1.925E-10	3.306E-12	1.892E-10	5.823E+01	28	2	26	CD
LAC3A	14	4.494E-10	5.052E-12	4.444E-10	8.896E+01	44	44	0	CD
LOIAS	19-11	1.939E-09	4.757E-10	1.463E-09	4.078E+00	48	17	31	CD
SLOCA	18	1.685E-09	3.892E-11	1.646E-09	4.329E+01	33	13	20	CD
LOOP	19-11	2.470E-09	6.425E-10	1.828E-09	3.844E+00	15	30	-15	CD
TRANS	14	2.507E-09	1.764E-10	2.431E-09	1.478E+01	109	179	-70	CD
LAC3B	14	3.092E-09	8.120E-11	3.011E-09	3.808E+01	27	109	-82	CD
LAC3B	15-11	4.873E-09	1.227E-09	3.646E-09	3.972E+00	63	50	13	CD
LAC3A	15-11	4.873E-09	1.227E-09	3.646E-09	3.972E+00	63	50	13	CD
SGTR	30	5.580E-09	1.261E-10	5.452E-09	4.356E+01	255	49	206	CD
SGTR	32-11	9.932E-09	3.306E-10	9.601E-09	3.004E+01	50	18	32	CD
LOCHS	15-11	2.195E-08	5.710E-09	1.624E-08	3.844E+00	72	104	-32	CD
LOMFW	15-11	2.439E-08	6.344E-09	1.805E-08	3.845E+00	73	104	-31	CD
LOIAS	18	4.268E-08	1.328E-09	4.136E-08	3.214E+01	173	86	87	CD
TRANS	15-11	1.708E-07	4.449E-08	1.263E-07	3.839E+00	95	135	-40	CD
SGTR	31	1.598E-07	5.430E-09	1.544E-07	2.943E+01	434	163	271	CD
LOOP	17	1.968E-07	1.693E-08	1.799E-07	1.162E+01	471	299	172	CD
LOCHS	14	3.870E-07	1.100E-08	3.760E-07	3.518E+01	341	214	127	CD
LOMFW	14	4.300E-07	1.225E-08	4.178E-07	3.510E+01	353	293	60	CD
LDC3A	14	1.867E-06	2.123E-08	1.846E-06	8.794E+01	59	212	-153	CD
	TOTALS =	5.655E-06	2.473E-06	[illegible]	2.287E+00	5390	5010	380	

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Attachment 6: SPAR-H Performance Shaping Factors for Execution

Plant:_____ **Initiating Event:**_____ **Basic Event :**_____ **Event Coder:**_____

Basic Event Context:_____

Basic Event Description:_____

Part II. EVALUATE EACH PSF FOR ACTION

A. Evaluate PSFs for the Action Portion of the Task, If Any.

PSFs	PSF Levels	Multiplier for Action	Please note specific reasons for PSF level selection in this column.
Available Time	Inadequate time	P(failure) = 1.0 ☐	
	Time available is ~ the time required	10 ☐	
	Nominal time	1 ☐	
	Time available ≥ 5x the time required	0.1 ☐	
	Time available is > 50x the time required	0.01 ☐	
	Insufficient Information	1 ☐	
Stress/ Stressors	Extreme	5 ☐	
	High	2 ☐	
	Nominal	1 ☐	
	Insufficient Information	1 ☐	
Complexity	Highly complex	5 ☐	
	Moderately complex	2 ☐	
	Nominal	1 ☐	
	Insufficient Information	1 ☐	
Experience/ Training	Low	3 ☐	
	Nominal	1 ☐	
	High	0.5 ☐	
	Insufficient Information	1 ☐	
Procedures	Not available	50 ☐	
	Incomplete	20 ☐	
	Available, but poor	5 ☐	
	Nominal	1 ☐	
	Insufficient Information	1 ☐	
Ergonomics/ HMI	Missing/Misleading	50 ☐	
	Poor	10 ☐	
	Nominal	1 ☐	
	Good	0.5 ☐	
	Insufficient Information	1 ☐	
Fitness for Duty	Unfit	P(failure) = 1.0 ☐	
	Degraded Fitness	5 ☐	
	Nominal	1 ☐	
	Insufficient Information	1 ☐	
Work Processes	Poor	5 ☐	
	Nominal	1 ☐	
	Good	0.5 ☐	
	Insufficient Information	1 ☐	

[END]