INTERNAL EVENTS DELTA CDF DERIVATION

DELTA CDF DERIVATION FROM DOMINANT ACCIDENT SEQUENCES FOR INTERNAL EVENTS

1	MLMF	TOTAL LOSS OF MAIN FEEDWATER [INIT EVENT]	1.90E-01	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				8.5E-09
2	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS [INIT EVENT]	2.01E-03	
	FPM1A-SAFS	AFW MD PUMP A FTS	2.20E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				5.8E-09
3	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS [INIT EVENT]	2.01E-03	
	FCVAF-16TN	CHECK VALVE 1AF-16 MD PUMP A DISCHARGE FTO	1.55E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				4.1E-09
4	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS [INIT EVENT]	2.01E-03	
	FHVAF-19FN	HYDRAULIC VALVE 1AF-19 MD PUMP A DISCH PCV TRANSFER CLOSED	1.40E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				3.7E-09
5	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS [INIT EVENT]	2.01E-03	
	PT2150AFN	PRES TRANS PT-2150A MD PUMP A DISC FAILS LOW	1.47E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	

	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				3.9E-09
6	ACCFC%FTR	CCF 3 OF 3 AIR COMPRESSORS FAIL TO RUN	4.80E-02	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.2E-09
7	ACP1ANS%FN	IA COMPRESSOR 1A-NNS FAILS TO RUN	6.18E-01	
	ACP1BN%SFN	IA COMPRESSOR 1B-NNS FAILS TO RUN	6.18E-01	
	ACPRACOMNN	IA COMPRESSOR 1C FAILS TO START	5.40E-02	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				9.3E-10
8	ACCFAC%FR	CCF 2 OF 3 AIR COMPRESSORS 1A & 1C FAIL TO RUN	2.40E-02	
	ACP1BN%SFN	IA COMPRESSOR 1B-NNS FAILS TO RUN	6.18E-01	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				6.7E-10
9	ACCFBC%FR	CCF 2 OF 3 AIR COMPRESSORS 1B & 1C FAIL TO RUN	2.40E-02	
	ACP1BN%SFN	IA COMPRESSOR 1B-NNS FAILS TO RUN	6.18E-01	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				6.7E-10
10	ACCFAB%FR	CCF 2 OF 3 AIR COMPRESSORS 1B & 1A FAIL TO RUN	2.40E-02	
	ACP1CN%SFN	IA COMPRESSOR 1C-NNS FAILS TO RUN	6.18E-01	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	

	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				6.7E-10
11	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS [INIT EVENT]	2.01E-03	
	FTMMDPA	AFW MD PUMP A OOS	5.50E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	X-PROTB	CONDITIONAL PROBABILITY SAFETY TRAIN B PROTECTED	5.00E-01	
	RESTORE	RETURN MD PUMP A TO SERVICE	1.40E-01	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1E-09
12	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY SHORT CIRCUIT OF BATTERY [INIT EVEN	1.66E-03	
	FTMMDPA	AFW MD PUMP A OOS	5.50E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	X-PROTB	CONDITIONAL PROBABILITY SAFETY TRAIN B PROTECTED	5.00E-01	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				3E-10
13	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY SHORT CIRCUIT OF BATTERY [INIT EVEN	1.66E-03	
	FPM1A-SAFS	AFW MD PUMP A FTS	2.20E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.4E-10
14	DPA1B-SBFN	DC DISTRIBUTION PNL DP-1B-SB FAILS [INIT EVENT]	1.23E-03	
	FTMMDPA	AFW MD PUMP A OOS	5.50E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	X-PROTB	CONDITIONAL PROBABILITY SAFETY TRAIN B PROTECTED	5.00E-01	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.2E-10
15	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY SHORT CIRCUIT OF BATTERY [INIT EVEN	1.66E-03	
	FPM1A-SAFS	AFW MD PUMP A FTS	2.20E-03	

	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.4E-10
16	DPA1B-SBFN	DC DISTRIBUTION PNL DP-1B-SB FAILS [INIT EVENT]	1.23E-03	
	FPM1A-SAFS	AFW MD PUMP A FTS	2.20E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.8E-10
17	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY SHORT CIRCUIT OF BATTERY [INIT EVEN	1.66E-03	
	FCVAF-16TN	CHECK VALVE 1AF-16 MD PUMP A DISCHARGE FTO	1.55E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.7E-10
18	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY SHORT CIRCUIT OF BATTERY [INIT EVEN	1.66E-03	
	PT2150AFN	PRES TRANS PT-2150A MD PUMP A DISC FAILS LOW	1.47E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.6E-10
19	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY SHORT CIRCUIT OF BATTERY [INIT EVEN	1.66E-03	
	FHVAF-19FN	HYDRAULIC VALVE 1AF-19 MD PUMP A DISCH PCV TRANSFER CLOSED	1.40E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.5E-10
20	DPA1B-SBFN	DC DISTRIBUTION PNL DP-1B-SB FAILS [INIT EVENT]	1.23E-03	
	FCVAF-16TN	CHECK VALVE 1AF-16 MD PUMP A DISCHARGE FTO	1.55E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	

				1.3E-10
21	DPA1B-SBFN	DC DISTRIBUTION PNL DP-1B-SB FAILS [INIT EVENT]	1.23E-03	
	PT2150AFN	PRES TRANS PT-2150A MD PUMP A DISC FAILS LOW	1.47E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.2E-10
		BASE CASE CDF FOR INTERNAL EVENTS FROM DOMINANT CUTSETS		2.6E-08
		3E-8/1.32E-2 * 1.0 = 2.27E-6 = NON-CONFORMING CASE		
		3E-8 = BASE CASE		
		2.27E-6 - 3E-8 = 2.24E-6 = DELTA CDF		

DELTA CDF DERIVATION FOR LOCAS FOR INTERNAL EVENTS

LOCAs WILL ALSO BE CONSIDERED TO ENSURE THE DOMINANT ACCIDENT SEQUENCES ARE ENCOMPASSED

THE LICENSEE USES A SLIGHTLY DIFFERENT METHODOLGY IN THEIR FULL SCOPE MODEL TO DERIVE LOCA INITIATING EVENT PROBABILITIES AND DEFINE SUCCESS CRITERIA. FOR PURPOSES OF THIS ANALYSIS, THEIR MB & LBLOCA FREQUENCIES ARE A MAGNITUDE CONSERVATIVE WHEN EVALUATED AGAINST NUREG/CR 5750 INFORMATION. THEREFORE, A 5E-6 IE FREQUENCY IS ASSIGNED TO THE COMPOSITE LB & MB LOCA

NO CREDIT FOR ALTERNATE ECCS INJECTION OR RECIRCULATION METHODS WILL BE CREDITED FOR LB & MBLOCA. CREDIT WILL BE GIVEN FOR S2 & S1 LOCAS.

A 4E-5 WILL BE ASSIGNED TO THE LICENSEE'S S2 LOCA IE FREQUENCY AND 5E-4 TO THE LICENSEE'S S1 LOCA FREQUENCY. THIS IS A MAGNITUDAL SHIFT UPWARDS FOR S2 AND A MAGNITUDAL SHIFT DOWNWARDS FOR S1. S2 LOCAS ARE SMALL BREAK LOCAS AND S1 LOCAS ARE ACTUALLY LEAKS WITHIN THE CAPABILITY OF THE CHARGING SYSTEM (NOT REALLY LOCAS).

FROM THE LICENSEE'S BASIC EVENTS AND IPE DESCRIPTION OF THE LHSI SYSTEM A FAILURE PROBABILITY FOR ONE TRAIN OF LPR CAN BE DERIVED. THIS IS 5E-2. RATHER THAN LOOK AT INDIVIDUAL CUTSETS THAT WOULD INVOLVE THE BASIC EVENTS THAT CAUSE RANDOM FAILURE OF TRAIN B. THIS 5E-2 SURROGATE WILL BE APPLIED.

MOV 301 FAIL TO OPEN	1.32E-02
MOV 311 FAIL TO OPEN	1.32E-02
LHSI PUMP B FAIL TO START	1.40E-03
LHSI PUMP B FAIL TO RUN	4.32E-04
HEAT EXCHGR PLUGS	4.20E-03
HEAT EXCHGR LEAKS	2.48E-03
MOV CCW MOV 167 TO SHELL OF RHR HEAT EXCHGR FAILS CLOSED	3.00E-03
AIR OP FLOW CONTROL VALVE 66 FAILS CLOSED	1.10E-02
AIR OP HEAT EXCHGR BYPASS FLOW CTRL VALVE 58 FAILS OPEN	7.54E-04
SURROGATE FOR LPR TRAIN B	4.97E-02

	%A	LARGE BREAK/MEDIUM BREAK LOCA	5.00E-06	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	LPR TRAIN B	SURROGATE FOR FAILURE OF LPR TRAIN B	5.00E-02	
				3.3E-09
		NONCONFORMING CDF = [3E-9] / 1.32E-2 = 2.27E-7		
		CONFORMING CDF = 3E-9		
		DELTA CDF = 2.27E-7 - 3E-9 = 2.24E-7		
	%S2	SMALL LOCA S2	4.00E-05	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	LPR TRAIN B	SURROGATE FOR FAILURE OF LPR TRAIN B	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.6E-09
		3E-9 / 1.32E-2 = 2.27E-7 = NONCONFORMING CDF		
		3E-9 = CONFORMING CDF		
		2.27E-7 - 3E-9 = 2.24E-7 = DELTA CDF		

THE CRITICAL S1 EVENT TREE INVOLVING THE PERFORMANCE DEFICIENCY WILL BE THOSE ASSOCIATED WITH:

1) S1 * /HHSI * /SSHR * /COOLDOWN * RHR * HPR/LPR * ALT INJ

2) S1 * /HHSI * /SSHR * COOLDOWN * HPR * ALT INJ
3) SI * /HHSI * SSHR * /BLEED * HPR * ALT INJ

SUCCESSES ARE SET TO 1.0 & ARE DENOTED BY A /
COOLDOWN FAILURE IS DOMINATED BY OPERATOR ACTION FAILURE AND
IS SET TO 1.5E-3 FROM LICENSEE'S
FULL SCOPE MODEL BASIC EVENT OPER-9 [FAILURE TO INITIATE RCS
COOLDOWN TO USE LPSI/RHR]
RHR FAILURE CAN BE FOR ONLY THOSE COMPONENTS THAT ARE NOT COMMON TO THE
HPR FUNCTION, THESE ARE THE SUCTION VALVES FROM THE RCS HOT LEG
RH-39 & RH-40 WITH FAILURE PROBABILITIES OF 4.65E-2

SEQUENCE #1

%S1	S1 SBLOCA	5.00E-04	
RHR	FAILURE OF EITHER SUCTION VALVE	9.30E-02	
HPR/LPR TRAI		5.00E-02	
LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
			3.1E-09

SEQUENCE #2

%S1	S1 SBLOCA	5.00E-04	
CLDN	OPERATOR FAILURE TO COOLDOWN AND DEPRESSURIZE	1.50E-03	
HPR TRAIN B	SURROGATE FOR FAILURE OF ACTIVE COMPONENTS FOR HPR B	1.00E-01	
LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
			9.9E-11

SEQUENCE #3

%S1	S1 SBLOCA	5.00E-04	
NO SSHR	SURROGATE FOR LOSS OF MFW & AFW	1.00E-03	
HPR TRAIN B	SURROGATE FOR FAILURE OF ACTIVE COMPONENTS FOR HPR B	1.00E-01	
LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
			6.6E-11
	[3E-9 + 1E-10 + 7E-11] / 1.32E-2 = 2.4E-7 = NONCONFORMING CDF		
	3.17E-9 = CONFORMING CDF		
	2.4E-7 - 3.17E-9 = 2.37E-7 DELTA CDF		

TOTAL DELTA CDF FOR INTERNAL EVENTS

DOMINANT ACCIDENT SEQUENCES	2.24E-06	
LARGE BREAK/MEDIUM BREAK LOCA	2.24E-07	
S2 LOCA	2.24E-07	
S1 LOCA	2.37E-07	
TOTAL DELTA CDF FOR INTERNAL EVENTS		2.93E-06

EXTERNAL EVENTS DELTA CDF DERIVATION

FROM THE 21 INTERNAL EVENTS DOMINANT CUTSETS, FIRE INITIATING EVENTS WILL BE DEVELOPED TO ASCERTAIN THE RISK INCREASE DUE TO THE PERFORMANCE DEFICIENCY FOR EXTERNAL EVENTS

CUTSET #1 IS A NON-RECOVERABLE MFW LOSS

		NON-RECOVERABLE MFW LOSS INITIATING EVENT DEVELOPMENT	IGNITION	SEVERITY	
		FROM PAGE 12 OF IPEEE RESPONSE TO RIA DATED 2/16/98	FREQ	FACTOR	
			4.00E-03	0.2	0.0008
			5.50E-03	0.57	0.003135
			1.30E-02	0.13	0.00169
			4.30E-03	0.2	0.00086
			1.00E-03	0.1	0.0001
			1.60E-03	0.25	0.0004
			1.10E-03	0.13	0.000143
			3.20E-03	1	0.0032
			3.30E-03	0.3	0.00099
			1.30E-03	0.3	0.00039
		SURROGATE FOR MFW LOSS DUE TO FIRE INITIATING EVENT FREQ			0.011708
1	MLMF	TOTAL LOSS OF MAIN FEEDWATER DUE TO FIRE [INIT EVENT]	1.10E-02		
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04		
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01		
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02		
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01		
				4.9E-10	

		5E-10 / 1.32E-2 = 3.8E-8 NONCONFORMING CASE		
		5E-10 CONFORMING CASE		
		3.8E-8 - 5E-10 = 3.75E-8 DELTA CDF		

THE NEXT CUTSETS [2, 3, 4, 5, 11] INVOLVE A LOSS OF 6.9 KV BUS. THERE ARE TWO FIRE SCENERIOS THAT WILL BE CONSIDERED. 1ST A FIRE ORIGINATING IN THE 6.9 KV BUS. 2ND A FIRE ORIGINATING IN THE COMPARTMENT THAT EVENTUALLY ENCOMPASSES THE BUS IN QUESTION. RECOVERY OF THE BUS IS NOT CONSIDERED.

SCENERIO #1 FROM THE IPEEE IGNITION SOURCE DATA SHEET ELECTRICAL CABINET FIRE FREQUENCY IS 7.3E-3 /YR. FOR THE 1-A-SWGRB ROOM. THERE ARE 4 6.9 KV BUSES IN THE COMPARTMENT. THEREFORE, 7.3E-3 /4 = 1.8E-3 FOR BUS 1B-SB IGNITION FREQUENCY SUBSTITUTE THIS 1.8E-3 FOR THE INITIATING EVENT

2	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS FROM FIRE ORIGINATING IN 1B-SB [INIT EVENT]	1.80E-03	
	FPM1A-SAFS	AFW MD PUMP A FTS	2.20E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				5.2E-09
3	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS FROM FIRE ORIGINATING IN 1B-SB [INIT EVENT]	1.80E-03	
	FCVAF-16TN	CHECK VALVE 1AF-16 MD PUMP A DISCHARGE FTO	1.55E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				3.7E-09
4	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS FROM FIRE ORIGINATING IN 1B-SB [INIT EVENT]	1.80E-03	
	FHVAF-19FN	HYDRAULIC VALVE 1AF-19 MD PUMP A DISCH PCV TRANSFER CLOSED	1.40E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				3.3E-09
5	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS FROM FIRE ORIGINATING IN 1B-SB [INIT EVENT]	1.80E-03	
	PT2150AFN	PRES TRANS PT-2150A MD PUMP A DISC FAILS LOW	1.47E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	

				3.5E-09
11	JBS1B_SBFN	6.9 KV BUS 1B-SB FAILS FROM FIRE ORIGINATING IN 1B-SB [INIT EVENT]	1.80E-03	
	FTMMDPA	AFW MD PUMP A OOS	5.50E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	X-PROTB	CONDITIONAL PROBABILITY SAFETY TRAIN B PROTECTED	5.00E-01	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				6.5E-09

CONFORMING CDF 2.2E-08
NONCONFORMING CDF = 2.2E-8 / 1.32E-2 = 1.67E-6
DELTA CDF = 1.67E-6 - 2.2E-8 = 1.64E-6

SCENERIO #2 FIRES THAT CAUSE LOSS OF 6.9 KV THAT DO NOT ORIGINATE IN 1B-SB

DOMINANT IGNITION FREQUENCIES FROM IPEEE
OTHER BUSES [7.3E-3 - 1.8E-3] * .214 [SEVERITY FACTOR] * .5 [MANUAL SUPPRESSION] = 5.885E-4
TRANSFORME 3.29E-3 * .24 [SEVERITY FACTOR] * .5 [MANUAL SUPPRESSION] = 3.95E-4
5.885E-4 + 3.95E-4 = 9.8E-4 = IGNITION FREQ CAUSING LOSS OF 6.9 KV FROM OTHER THAN 1B-SB BUS

9.8E-4 * 2E-8/1.8E-3 = 1.1E-8 = CONFORMING CDF
1.1E-8 / 1.32E-2 = 8.3E-7 NONCONFORMING CDF
8.3E-7 - 1.1E-8 = 8.2E-7 DELTA CDF

THE SEVERITY FACTORS AND MANUAL SUPPRESSION TERMS WERE DEVELOPED IN A PREVIOUS ANALYSIS ASSOCIATED WITH THERMO-LAG BARRIER PERFORMANCE DEFICIENCY

THE NEXT CUTSETS [6, 7, 8, 9, 10] INVOLVE A LOSS OF INSTRUMENT AIR

1.85E-3/YR WILL BE USED AS THE SURROGATE FOR A FIRE CAUSING THE LOSS OF IA & THE LOSS OF TWO COMPRESSORS. THIS IS CONSERVATIVE AND IS BASED UPON IPEEE RIA RESPONSE DATED 2/16/98. PAGE 12 ASSIGNS A 1.85E-3 IGNITION FREQUENCY TO ONE COMPRESSORS. FOR PURPOSES OF THIS ANALYSIS A CONSERVATIVE ASSUMPTION THAT THIS REPRESENTS A TOTAL LOSS OF IA WILL BE USED AS THE SURROGATE.

6	ACCFC%FTR	CCF 3 OF 3 AIR COMPRESSORS FAIL TO RUN DUE TO FIRE	1.85E-03	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				8.3E-11
7	ACP1ANS%FN	IA COMPRESSOR 1A-NNS FAILS TO RUN DUE TO FIRE	1.85E-03	
	ACP1BN%SFN	IA COMPRESSOR 1B-NNS FAILS TO RUN DUE TO FIRE		
	ACPRACOMNN	IA COMPRESSOR 1C FAILS TO START	5.40E-02	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				4.5E-12
8	ACCFAC%FR	CCF 2 OF 3 AIR COMPRESSORS 1A & 1C FAIL TO RUN DUE TO FIRE	1.85E-03	
	ACP1BN%SFN	IA COMPRESSOR 1B-NNS FAILS TO RUN	6.18E-01	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				5.1E-11
9	ACCFBC%FR	CCF 2 OF 3 AIR COMPRESSORS 1B & 1C FAIL TO RUN DUE TO FIRE	1.85E-03	
	ACP1BN%SFN	IA COMPRESSOR 1B-NNS FAILS TO RUN	6.18E-01	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				5.1E-11
10	ACCFAB%FR	CCF 2 OF 3 AIR COMPRESSORS 1B & 1A FAIL TO RUN DUE TO FIRE	1.85E-03	
	ACP1CN%SFN	IA COMPRESSOR 1C-NNS FAILS TO RUN	6.18E-01	
	FCCFPUMPS	CCF 3 OF 3 AFW PUMP FTS	3.40E-04	
	HMV1RH63TN	MOV 1RH-63 RHR B TO CSIP SUCTION FTO	1.00E-01	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	

				5.1E-11

CONFORMING CASE CDF 2.4E-10
NON-CONFORMING CDF = 2.4E-10 / 1.32E-2 = 1.8E-8
DELTA CDF = 1.8E-8 - 2.4E-10 = 1.79E-8

THE NEXT CUTSETS [12, 13, 15, 17, 18, 19] INVOLVE A FAILURE OF THE BATTERY. THE IGNITION FREQUENCY OF A BATTERY FIRE IS ESTABLISHED AS 3.2E-3 / THE NUMBER OF BATTERIES - IN THIS CASE 2 [THIS IS FROM THE IPEEE AND FIVE]. THEREFORE, THE FIRE IGNITION FREQUENCY IS ESTABLISHED AS 3.2E-3 / 2 = 1.6E-3. TWO SCENERIOS WILL BE CONSIDERED. FIRST A SMALL FIRE THAT CAUSES ONLY A FAILURE OF THE BATTERY. SECOND A BATTERY FIRE THAT EVENTUALLY CAUSES A LOSS OF THE COMPARTMENT.

SCENERIO#1 - THE SMALL BATTERY FIRE

12	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY BATTERY FIRE [INIT EVENT]	1.60E-03	
	FTMMDPA	AFW MD PUMP A OOS	5.50E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	X-PROTB	CONDITIONAL PROBABILITY SAFETY TRAIN B PROTECTED	5.00E-01	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.9E-10
13	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY BATTERY FIRE [INIT EVENT]	1.60E-03	
	FPM1A-SAFS	AFW MD PUMP A FTS	2.20E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.3E-10
15	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY BATTERY FIRE [INIT EVENT]	1.60E-03	
	FPM1A-SAFS	AFW MD PUMP A FTS	2.20E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				2.3E-10
17	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY BATTERY FIRE [INIT EVENT]	1.60E-03	

	FCVAF-16TN	CHECK VALVE 1AF-16 MD PUMP A DISCHARGE FTO	1.55E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.6E-10
18	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY BATTERY FIRE [INIT EVENT]	1.60E-03	
	PT2150AFN	PRES TRANS PT-2150A MD PUMP A DISC FAILS LOW	1.47E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.6E-10
19	DBA1B_SBTN	LOSS OF DC BUS DP-1B-SB BY BATTERY FIRE [INIT EVENT]	1.60E-03	
	FHVAF-19FN	HYDRAULIC VALVE 1AF-19 MD PUMP A DISCH PCV TRANSFER CLOSED	1.40E-03	
	LMVSI310TS	MOV 1SI-310 SUMP TO RHR PUMP A FTO	1.32E-02	
	CLOSE BKR	MANUALLY CLOSE MD PUMP B BKR	5.00E-02	
	RWST REFILL	PROVIDE ALTERNATE RCS INJECT FROM RWST VIA REFILL OF RWST	1.00E-01	
				1.5E-10

CONFORMING CDF 1.2E-09
NON-CONFORMING CDF = 1.2E-9 / 1.32E-2 = 9E-8
DELTA CDF = 9E-8 - 1.2E-9 = 8.9E-8

SCENERIO #2 - THE LARGE FIRE

IN THE LARGE FIRE THE RECOVERY ACTION TO CLOSE THE MD PUMP B BKR IS LOST. HOWEVER, FOR THE FIRE TO REACH THIS PORPORTION THE FIRE MUST CAPABLE OF DEVELOPING INTO A LARGE FIRE AND MANUAL SUPPRESSION FAILS. FOR PURPOSES OF THIS ANALYSIS A 5E-2 SURROGATE WILL REPRESENT THE POSSIBLE DEVELOPMENT OF THE FIRE AND THE FAILURE OF MANUAL SUPPRESSION EFFORTS. THEREFORE, THE CONFORMING, NON-CONFORMING & DELTA CDF IS THE SAME AS FOR THE SMALL BATTERY FIRE.

CONFORMING CDF 1.9E-09
NON-CONFORMING CDF = 1.2E-9 / 1.32E-2 = 9E-8
DELTA CDF = 9E-8 - 1.2E-9 = 8.9E-8

THE FINAL CUTSETS [14, 16, 20, 21] DEAL WITH THE FAILURE OF THE DC DISTRIBUTION PANEL. HOWEVER, THESE CUTSETS ARE SUB-SUMED IN THE 6.9 KV BUS FIRES SINCE THESE FIRES INVOLVED ALL CABINET FIRES AS A CONSERVATISM OF THE ANALYSIS.

TOTAL DELTA CDF DERIVATION [EXTERNAL & INTERNAL EVENTS]

DOMINANT INTERNAL EVENTS ACCIDENT SEQUENCES	2.24E-06	
LARGE BREAK/MEDIUM BREAK LOCA	2.24E-07	
S2 LOCA	2.24E-07	
S1 LOCA	2.37E-07	
TOTAL DELTA CDF FOR INTERNAL EVENTS		2.93E-06
FIRE BATTERY SMALL	8.90E-08	
FIRE BATTERY LARGE	8.90E-08	
FIRE LOSS OF IA	1.79E-08	
FIRE TOTAL LOSS OF MFW	3.75E-08	
FIRE 6.9 KV SMALL	1.64E-06	
FIRE 6.9 KV COMPARTMENT	8.20E-07	
TOTAL DELTA CDF FOR EXTERNAL EVENTS		2.69E-06
TOTAL DELTA CDF		5.62E-06