

















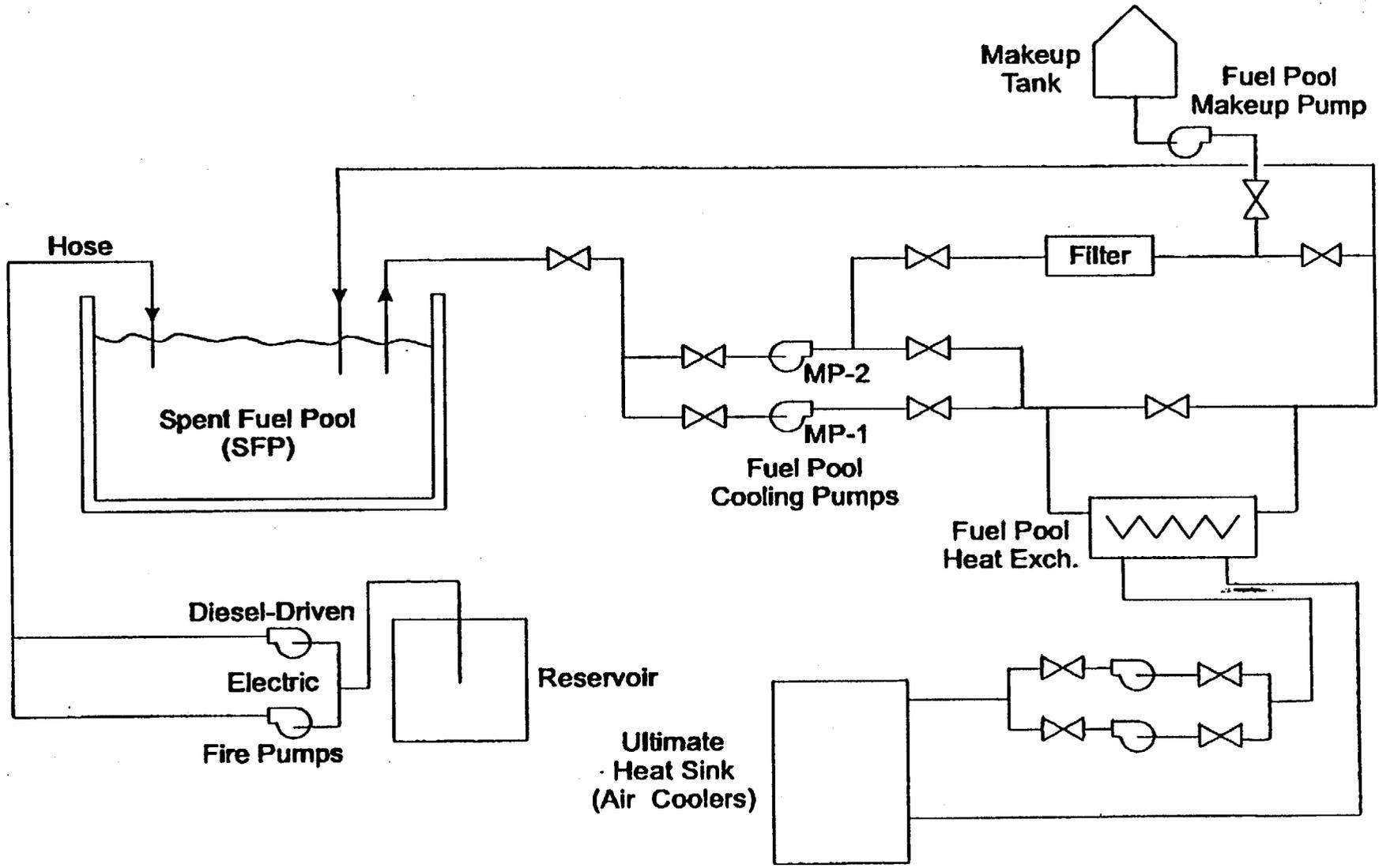






Table 1 Basic Event Summary for the Loss of Cooling Event Tree

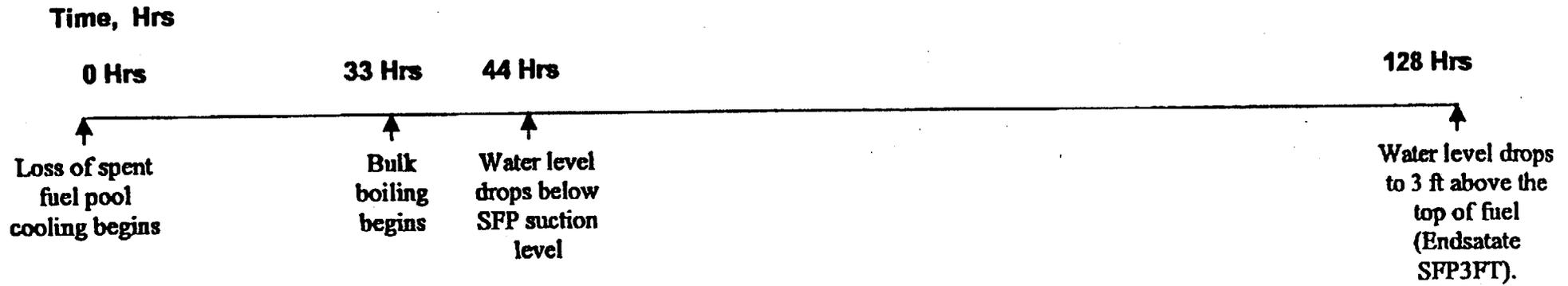
Basic Event Name	Description	Best Case	Sensitivity Case
HEP-DIAG-ALARM	Operator fails to respond to a signal indication in the control room	3.0E-4	3.0E-3
HBP-WLKDOWN-LSFPC	Operator fails to observe the loss of cooling in walkdowns (independent case)	1.0E-5	5.0E-3
HBP-WLKDOWN-DEPEN	Operator fails to observe the loss of cooling in walkdowns (dependent case)	5.0E-2	5.0E-2
HEP-COOL-REP-B	Repair crew fails to repair SFPC system	1.8E-1	1.8E-1
HEP-COOL-REP-L	Repair crew fails to repair SFPC system	1.0	1.0
HEP-RECG-FWSTART	Operator fails to diagnoses need to start the firewater system	2.0E-5	1.0E-1
HBP-FW-START	Operator fails to start firewater pump and provide alignment	1.0E-5	1.5E-1
HEP-FW-REP-DEPEN	Repair crew fails to repair firewater system	5.0E-2	5.0E-2
HEP-INV-OFFSITE	Operator fails to provide alternate sources of cooling from offsite	5.0E-2	3.2E-1
FP-2PUMPS-FTF	Failure of firewater pump system	6.7E-4	5.0E-2
SPC-LVL-LOF	Failure of control room alarm channel	1.0E-5	1.0E-1
SPC-LVL-LOP	Electrical faults leading to alarm channel failure	2.0E-3	2.0E-2



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**Figure 1 Simplified Diagram of Spent Fuel Pool Cooling and Inventory Makeup Systems**

**Figure 2 Loss of Cooling Event Timeline**



LOSS OF COOLING	CONTROL ROOM ALARMS	OTHER INDICATIONS OF LOSS OF COOLING	OPERATOR RECOVERY OF COOLING SYSTEM	OPERATOR INITIATES MAKEUP USING FIRE PUMPS	RECOVERY USING OFF SITE SOURCES					
IE-LOC	CRA	IND	OCS	OFD	OFB	#	SEQUENCE-NAMES	END-STATE-NAMES	FREQUENCY	
							1	IE-LOC	OK	
							2	IE-LOC OCS	OK	
							3	IE-LOC OCS OFD	OK	
							4	IE-LOC OCS OFD OFB	SFP3FT	1.197E-008
							5	IE-LOC CRA	OK	
							6	IE-LOC CRA OCS	OK	
							7	IE-LOC CRA OCS OFD	OK	
							8	IE-LOC CRA OCS OFD OFB	SFP3FT	1.637E-010
							9	IE-LOC CRA IND	SFP3FT	4.906E-008

Figure 3 Loss of Cooling Event Tree



BEST CASE ANALYSIS

SEQUENCE CUT SETS (QUANTIFICATION) REPORT

Minicut Upper Bound : 1.197E-008

IE-LOC

Sequence : 4

Cut No.	% Total	% Cut Set	Prob/ Freq.	CURRENT CUT SETS
1	90.2	90.2	1.1E-008	HEP-COOL-REP-E, HEP-RECG-FWSTART
2	97.8	7.6	9.1E-010	FP-2PUMPS-FTF, HEP-COOL-REP-E, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE
3	100.0	2.3	2.7E-010	HEP-COOL-REP-E, HEP-FW-START, HEP-INV-OFFSITE

IE-LOC

Sequence : 8

Minicut Upper Bound : 1.537E-010

Cut No.	% Total	% Cut Set	Prob/ Freq.	CURRENT CUT SETS
1	78.1	78.1	1.2E-010	HEP-COOL-REP-L, HEP-RECG-FWSTART, SPC-LVL-LOP
2	89.8	11.7	1.8E-011	HEP-COOL-REP-L, HEP-DIAG-ALARM, HEP-RECG-FWSTART
3	96.3	6.5	1.0E-011	FP-2PUMPS-FTF, HEP-COOL-REP-L, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE, SPC-LVL-LOP
4	98.3	2.0	3.0E-012	HEP-COOL-REP-L, HEP-FW-START, HEP-INV-OFFSITE, SPC-LVL-LOP
5	99.3	1.0	1.5E-012	FP-2PUMPS-FTF, HEP-COOL-REP-L, HEP-DIAG-ALARM, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE
6	99.7	0.4	6.0E-013	HEP-COOL-REP-L, HEP-RECG-FWSTART, SPC-LVL-LOP
7	99.9	0.3	4.5E-013	HEP-COOL-REP-L, HEP-DIAG-ALARM, HEP-FW-START, HEP-INV-OFFSITE
8	100.0	0.0	5.0E-014	FP-2PUMPS-FTF, HEP-COOL-REP-L, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE, SPC-LVL-LOP
9	100.0	0.0	1.5E-014	HEP-COOL-REP-L, HEP-FW-START, HEP-INV-OFFSITE, SPC-LVL-LOP

IE-LOC

Sequence : 9

Minicut Upper Bound : 4.506E-008

Cut No.	% Total	% Cut Set	Prob/ Freq.	CURRENT CUT SETS
1	99.9	99.9	4.5E-008	HEP-DIAG-ALARM, HEP-WLKDOWN-DEPEN
2	100.0	0.1	6.0E-011	HEP-WLKDOWN-LSFTC, SPC-LVL-LOP
3	100.0	0.0	3.0E-013	HEP-WLKDOWN-LSFTC, SPC-LVL-LOP

SENSITIVITY CASE ANALYSIS

SEQUENCE CUT SETS (QUANTIFICATION) REPORT

Miscut Upper Bound : 7.987E-005

IE-LOC

Sequence : 4

Cut No.	% Total Set	% Cut Prob/ Freq.	CURRENT CUT SETS
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1	67.6	67.6	5.4E-005 HEP-COOL-REP-E, HEP-RECG-FWSTART
2	100.0	32.5	2.6E-005 HEP-COOL-REP-E, HEP-FW-START, HEP-INV-OFFSITE
3	100.0	0.5	4.3E-007 FF-2PUMPS-FTF, HEP-COOL-REP-E, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE

IE-LOC

Sequence : 8

Miscut Upper Bound : 5.460E-005

Cut No.	% Total Set	% Cut Prob/ Freq.	CURRENT CUT SETS
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1	55.0	55.0	3.0E-005 HEP-COOL-REP-L, HEP-RECG-FWSTART, SPC-LVL-LOF
2	81.3	26.4	1.4E-005 HEP-COOL-REP-L, HEP-FW-START, HEP-INV-OFFSITE, SPC-LVL-LOF
3	92.3	11.0	6.0E-006 HEP-COOL-REP-L, HEP-RECG-FWSTART, SPC-LVL-LOF
4	97.6	5.3	2.9E-006 HEP-COOL-REP-L, HEP-FW-START, HEP-INV-OFFSITE, SPC-LVL-LOF
5	99.2	1.7	9.0E-007 HEP-COOL-REP-L, HEP-DIAG-ALARM,
6	100.0	0.8	4.3E-007 HEP-COOL-REP-L, HEP-DIAG-ALARM, HEP-FW-START, HEP-INV-OFFSITE
7	100.0	0.4	2.4E-007 FF-2PUMPS-FTF, HEP-COOL-REP-L, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE, SPC-LVL-LOF
8	100.0	0.1	4.5E-008 FF-2PUMPS-FTF, HEP-COOL-REP-L, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE, SPC-LVL-LOF
9	100.0	0.0	7.2E-009 FF-2PUMPS-FTF, HEP-COOL-REP-L, HEP-DIAG-ALARM, HEP-FW-REP-DEPEN, HEP-INV-OFFSITE

IE-LOC

Sequence : 9

Miscut Upper Bound : 2.250E-006

Cut No.	% Total Set	% Cut Prob/ Freq.	CURRENT CUT SETS
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1	66.7	66.7	1.5E-006 HEP-WLKDN-LSFFC, SPC-LVL-LOF
2	86.7	20.0	4.5E-007 HEP-DIAG-ALARM, HEP-WLKDN-DEPEN
3	100.0	13.3	3.0E-007 HEP-WLKDN-LSFFC, SPC-LVL-LOF

