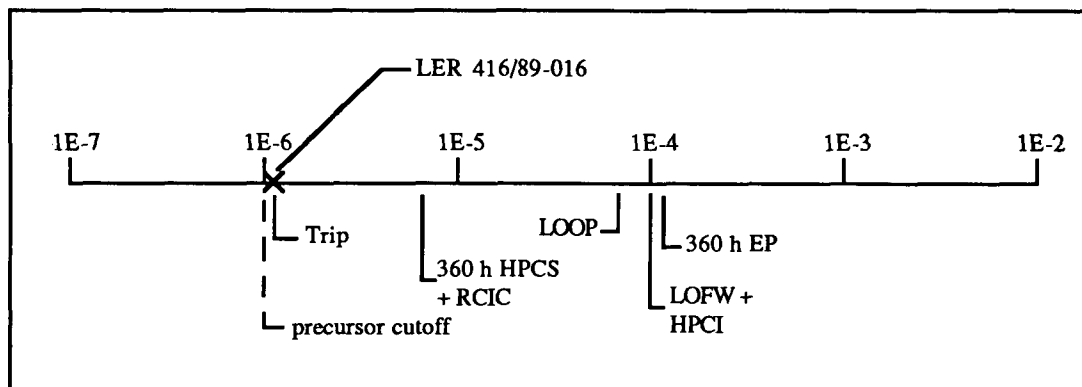


ACCIDENT SEQUENCE PRECURSOR PROGRAM EVENT ANALYSIS

LER No: 416/89-016
 Event Description: Scram with RCIC unavailable
 Date: December 6, 1989
 Plant: Grand Gulf 1

Summary

A lightning strike caused an electrical spike on the average power range monitors (APRMs), resulting in a high flux scram. The reactor core isolation cooling (RCIC) system received an initiation signal but could not initiate because the RCIC trip throttle valve was closed in preparation for surveillance testing. The conditional probability estimated for this event is 1.2×10^{-6} . The relative significance of this event compared with other postulated events at Grand Gulf is shown below.



Event Description

During a severe electrical storm, lightning struck the plant site and caused electrical disturbances in plant instrumentation. A spurious high flux signal was detected by three of the eight APRM channels, and a high flux scram resulted.

Two high-pressure core spray (HPCS) low water level channels also tripped but did not seal in due to the short duration of the trip signal. RCIC received an auto-initiation signal but did not operate because the RCIC trip throttle valve was closed in preparation for an I & C surveillance.

ASP Modeling Assumptions and Approach

The event has been modeled as a scram with RCIC initially unavailable but locally recoverable.

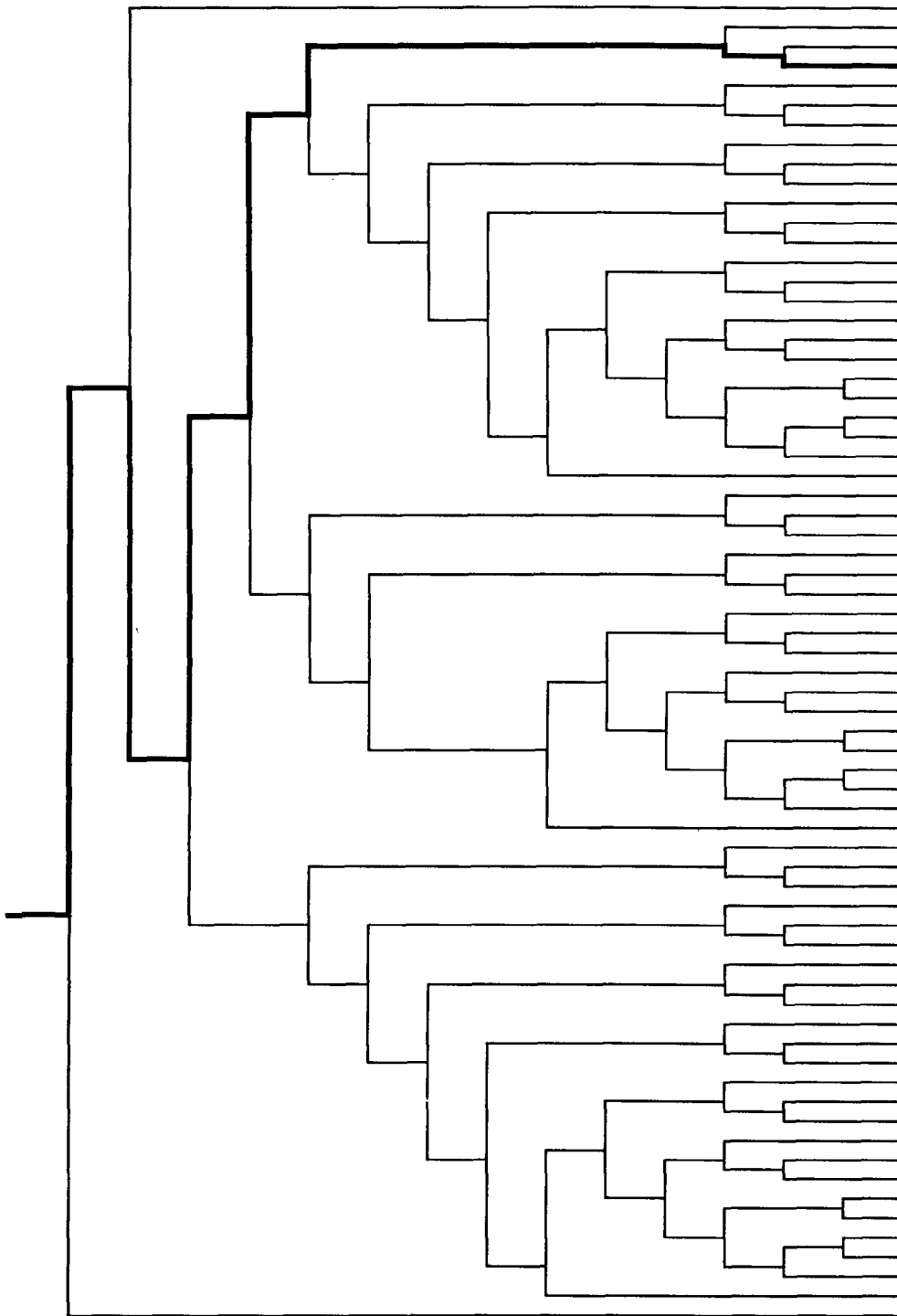
Analysis Results

The conditional probability of severe core damage estimated for this event is 1.2×10^{-6} . The dominant sequence for this event involves failure of the power conversion system, successful short-term core cooling, and failure to remove heat from the suppression pool in the long term. The dominant sequence for this event is highlighted on the following event tree.

B-395

TRANS- IENT	Rx SHUT DOWN	PCS	SRV CHAL	SRV-C	FW	HPCI OR HPCS	RCIC	CRD	SRV/ ADS	LPCS	LPCI (RHR)	RHR (SDC MODE)	RHR (SP COOLING MODE)	RHRSW or OTHER
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SEQ
NO END
STATE



OK
OK
OK
11 CORE DAMAGE
OK
OK
12 CORE DAMAGE
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13 CORE DAMAGE
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14 CORE DAMAGE
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15 CORE DAMAGE
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31 CORE DAMAGE
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34 CORE DAMAGE
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35 CORE DAMAGE
OK
OK
36 CORE DAMAGE
37 CORE DAMAGE
38 CORE DAMAGE
99 ATWS

Dominant core damage sequence for LER 416/89-016

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 416/89-016
 Event Description: Reactor scram with RCIC unavailable
 Event Date: 12/06/89
 Plant: Grand Gulf 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS 1.0E+00

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
TRANS	1.2E-06
Total	1.2E-06
ATWS	
TRANS	3.0E-05
Total	3.0E-05

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
11 trans -rx.shutdown pcs/trans srv.chall/trans.-scram -srv.close -fw/pcs.trans rhr(sdc) rhr(spcool)/rhr(sdc)	CD	8.0E-07	1.0E-01
28 trans -rx.shutdown pcs/trans srv.chall/trans.-scram srv.close fw/pcs.trans hpci srv.ads	CD	1.5E-07	8.2E-02
12 trans -rx.shutdown pcs/trans srv.chall/trans.-scram -srv.close fw/pcs.trans -hpci rhr(sdc) rhr(spcool)/rhr(sdc)	CD	1.5E-07	3.9E-02
21 trans -rx.shutdown pcs/trans srv.chall/trans.-scram srv.close -fw/pcs.trans rhr(sdc) rhr(spcool)/rhr(sdc)	CD	5.7E-08	1.0E-01
99 trans rx.shutdown	ATWS	3.0E-05	1.0E+00

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

Sequence	End State	Prob	N Rec**
11 trans -rx.shutdown pcs/trans srv.chall/trans.-scram -srv.close -fw/pcs.trans rhr(sdc) rhr(spcool)/rhr(sdc)	CD	8.0E-07	1.0E-01
12 trans -rx.shutdown pcs/trans srv.chall/trans.-scram -srv.close fw/pcs.trans -hpci rhr(sdc) rhr(spcool)/rhr(sdc)	CD	1.5E-07	3.9E-02
21 trans -rx.shutdown pcs/trans srv.chall/trans.-scram srv.close -fw/pcs.trans rhr(sdc) rhr(spcool)/rhr(sdc)	CD	5.7E-08	1.0E-01
28 trans -rx.shutdown pcs/trans srv.chall/trans.-scram srv.close fw/pcs.trans hpci srv.ads	CD	1.5E-07	8.2E-02
99 trans rx.shutdown	ATWS	3.0E-05	1.0E+00

** non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\1989\bwrsealed.cmp
 BRANCH MODEL: c:\asp\1989\gulf.s11
 PROBABILITY FILE: c:\asp\1989\bwr_cs11.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
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Event Identifier: 416/89-016

B-397

trans	5.1E-04	1.0E+00	
loop	1.6E-05	5.3E-01	
loca	3.3E-06	5.0E-01	
rx.shutdown	3.0E-05	1.0E+00	
rx.shutdown/ep	3.5E-04	1.0E+00	
pcs/trans	1.7E-01	1.0E+00	
srv.chall/trans.-scram	1.0E+00	1.0E+00	
srv.chall/loop.-scram	1.0E+00	1.0E+00	
srv.close	6.6E-02	1.0E+00	
emerg.power	2.9E-03	8.0E-01	
ep.rec	4.9E-02	1.0E+00	
fw/pcs.trans	4.6E-01	3.4E-01	
fw/pcs.loca	1.0E+00	3.4E-01	
hpci	2.0E-02	3.4E-01	
RCIC	6.0E-02 > 1.0E+00	7.0E-01 > 3.4E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	6.0E-02 > Unavailable		
crd	1.0E-02	1.0E+00	1.0E-02
srv.ads	3.7E-03	7.1E-01	1.0E-02
lpcs	2.0E-02	3.4E-01	
lpci(rhr)/lpcs	6.0E-04	7.1E-01	
rhr(sdc)	2.3E-02	3.4E-01	1.0E-03
rhr(sdc)/-lpci	2.0E-02	3.4E-01	1.0E-03
rhr(sdc)/lpci	1.0E+00	1.0E+00	1.0E-03
rhr(spcool)/rhr(sdc)	2.0E-03	3.4E-01	
rhr(spcool)/-lpci.rhr(sdc)	2.0E-03	3.4E-01	
rhr(spcool)/lpci.rhr(sdc)	9.3E-02	1.0E+00	
rhrsw	2.0E-02	3.4E-01	2.0E-03
* branch model file			
** forced			

Minarick
06-13-1990
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