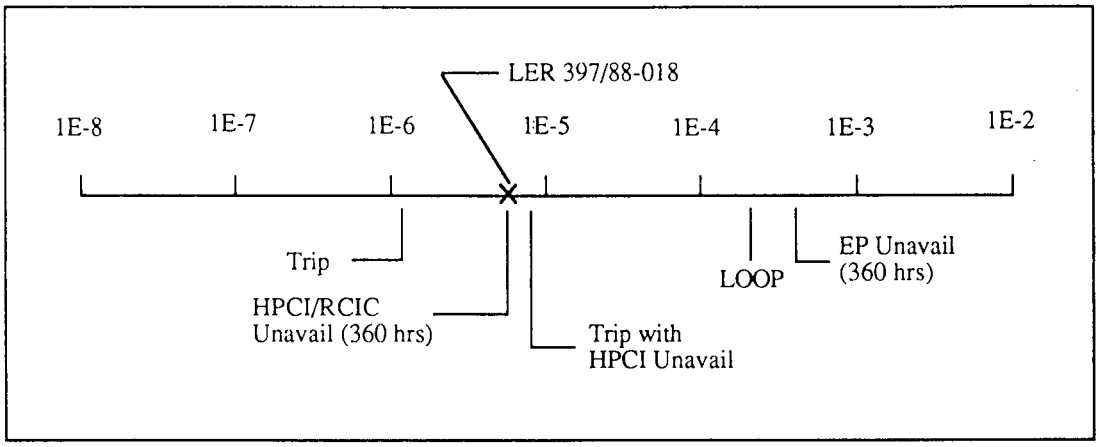
Accident Sequence Precursor Program Event Analysis

LER No: 397/88-018
Event Description: Both emergency diesel generators unavailable
Date of Event: May 22, 1988
Plant: Washington Nuclear Plant, Unit 2

Summary

While at 0% power, an emergency diesel generator was discovered unavailable while the other was out for maintenance. Based on event specifics, this could have occurred at power. The conditional probability of core damage has been calculated at 5.6×10^{-6}. The relative significance of this event compared with other potential events at WNPS 2 is shown below.



Event Description

While at 0% power, the control room operator noted that the green status light for the division two emergency diesel generator start circuit was not energized. Investigation revealed that a two-position transfer switch was in a midposition between the " Normal" and "Emergency" position, which would probably prevent the diesel generator from starting on demand. Since the switch was located at waist height and 6 in. from the edge of the control panel, it was postulated that the switch may have been inadvertently bumped into this middle position by an equipment operator. Coincident with the unavailability of the division two emergency diesel generator, the division one diesel generator was out of service for modification. Corrective action was taken to determine if protective barriers should be installed to prevent recurrence of this incident.

Event-Related Plant Design Information

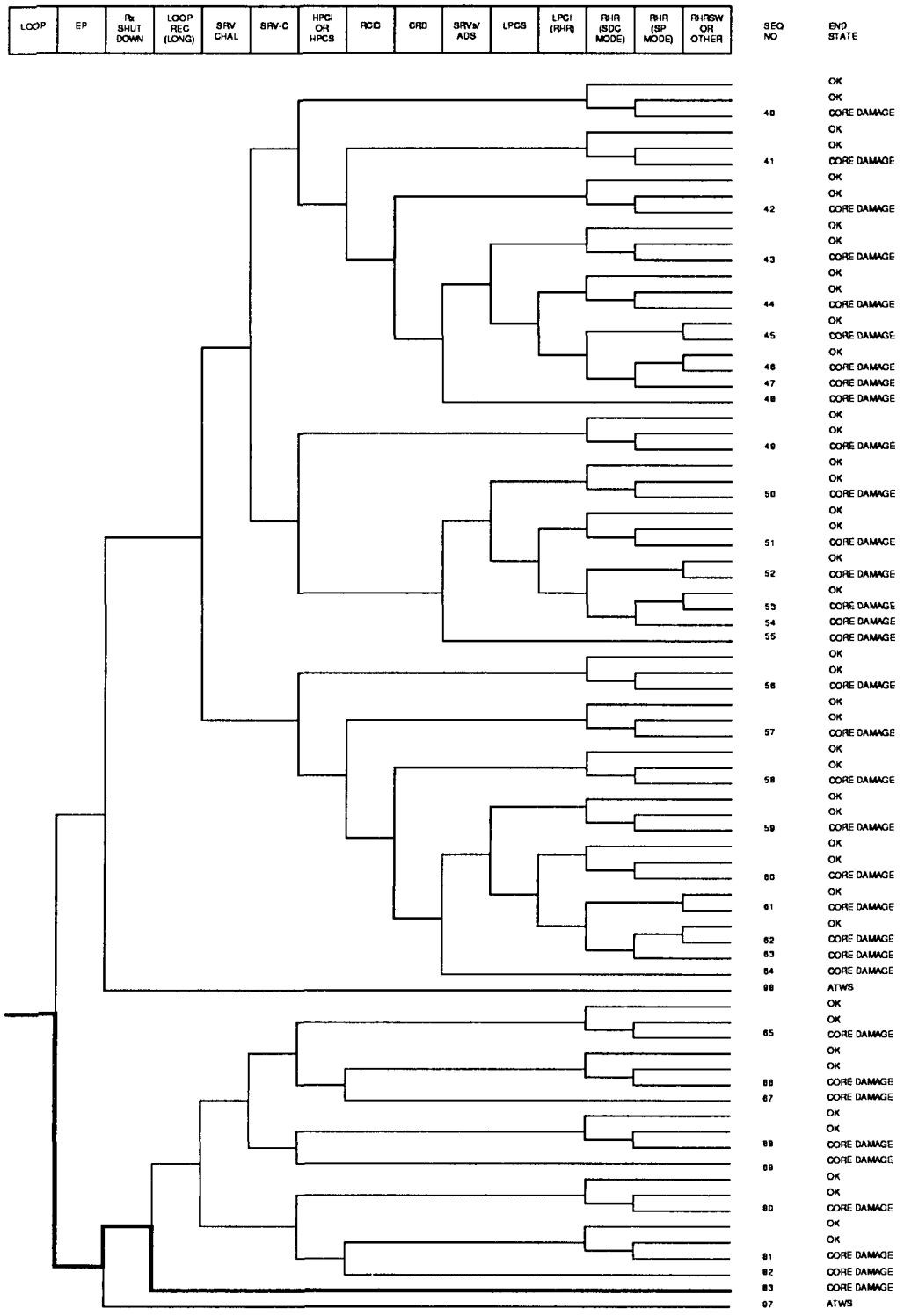
The emergency power system on WNPS 2 utilizes two diesel generators that supply power to two safety-related divisions. A third diesel generator powers the high-pressure core spray pumps.

ASP Modeling Assumptions and Approach

The event has been modeled as a 10-h emergency power system unavailability. The likelihood of nonrecovery was estimated to be 0.34 (local recovery).

Analysis Results

The conditional probability of core damage is estimated to be 5.6×10^{-6}. The dominant core damage sequence (highlighted in the following event tree) is associated with a loss of offsite power occurring during the 10-h vulnerability ($p = 8.6 \times 10^{-5}$), failure to recover emergency power ($p = .34$), and failure to recover electric power in the long term ($p = 0.17$).



Dominant Core Damage Sequence for LER 397/88-018

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 397/88-018
Event Description: Unavailability of emergency power
Event Date: 05/22/88
Plant: WNPSS 2

UNAVAILABILITY, DURATION= 10

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

LOOP	8.6E-05

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
LOOP	5.0E-06
Total	5.0E-06
ATWS	
LOOP	(5.6E-17)
Total	(5.6E-17)

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

	Sequence	End State	Prob	N Rec**
83	loop EMERG.POWER -rx.shutdown/ep ep.rec	CD	5.0E-06	1.8E-01
97	loop EMERG.POWER rx.shutdown	ATWS	8.8E-10	1.8E-01
98	loop -EMERG.POWER rx.shutdown	ATWS	(8.8E-10)	3.5E-01

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

	Sequence	End State	Prob	N Rec**
98	loop -EMERG.POWER rx.shutdown	ATWS	(8.8E-10)	3.5E-01
83	loop EMERG.POWER -rx.shutdown/ep ep.rec	CD	5.0E-06	1.8E-01
97	loop EMERG.POWER rx.shutdown	ATWS	8.8E-10	1.8E-01

** non-recovery credit for edited case

Note: For unavailabilities, conditional probability values are differential values which reflect the added risk due to failures associated with an event. Parenthetical values indicate a reduction in risk compared to a similar period without the existing failures.

SEQUENCE MODEL: c:\asp\sealmod\bwrcseal.cmp
BRANCH MODEL: c:\asp\sealmod\wnp2.sll
PROBABILITY FILE: c:\asp\sealmod\bwr_csll.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	4.8E-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	5.9E-02	1.0E+00	
EMERG.POWER	2.9E-03 > 1.0E+00	8.0E-01 > 3.4E-01	
Branch Model: 1.OF.2			
Train 1 Cond Prob:	5.0E-02 > Unavailable		
Train 2 Cond Prob:	5.7E-02 > Unavailable		
ep.rec	1.7E-01	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	7.0E-01	
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
11-13-1989
13:31:53