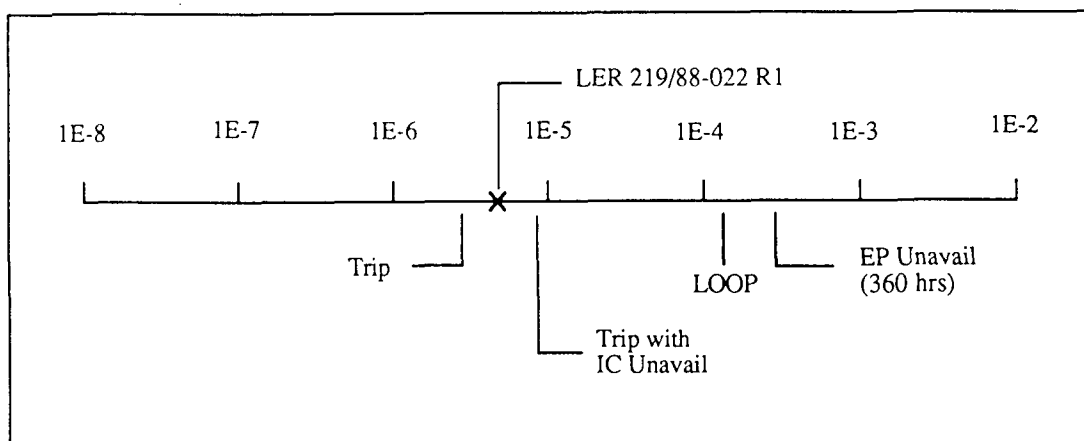


Accident Sequence Precursor Program Event Analysis

LER No: 219/88-022 R1
 Event Description: Trip with one safety-related bus unavailable
 Date of Event: October 2, 1988
 Plant: Oyster Creek Unit 1

Summary

During a refueling outage, power to an emergency 4160-V bus was lost when a breaker tripped and locked out due to a ground fault on the bus. Because this event could have happened at power, it has been modeled as a trip with one safety-related bus unavailable. The conditional probability for core damage is calculated at 5.0×10^{-6} . The relative significance of this event compared with other potential events at Oyster Creek Unit 1 is shown below.



Event Description

During a refueling outage on Oct. 2, 1988, at 1357 h, power was lost to safety-related 4160-V Bus 1D when a breaker tripped and locked out due to a ground fault on a cable between Bus 1D and the diesel generator No. 2 breaker. The root cause of the cable failure was determined to be a defect in the cable insulation. The lockout of the faulted bus prevented the No. 2 emergency diesel generator from starting. The loss of power on the bus generated a reactor protection system actuation, which caused a full reactor scram signal and a main steam line isolation since RCS pressure was <600 psig. At 1506 h, power was restored to the reactor protection system No. 2 channel, allowing operators to reset the scram and main steam line isolation signals. At approximately 2130 h, the cable fault was isolated and power was restored to the 4160-V Bus 1D.

At 0140 h the next morning, operators were manually restoring normal power to instrument panel VACP-1 when a momentary loss of power caused isolation of the drywell and torus vent and purge valves, drywell sump, the drywell equipment drain tank, and the realignment of the circuitry for the standby gas treatment system to autostart. All systems were returned to normal shortly after the normal power supply to VACP-1 was restored.

Event-Related Plant Design Information

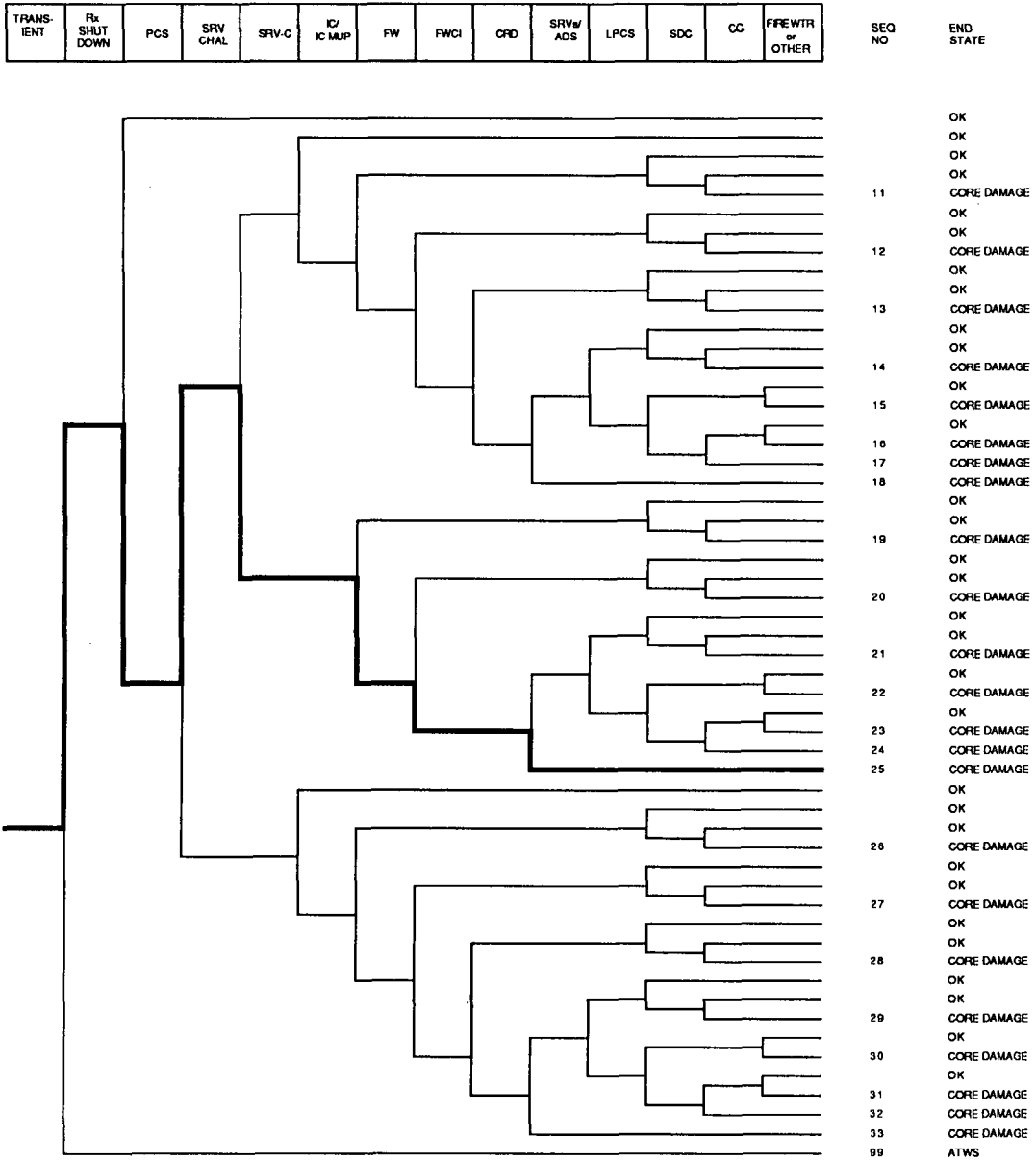
Oyster Creek Unit 2 has two diesel generators that provide emergency power to vital 4160-V loads. Diesel No. 2 provides power to bus 1D, which supplies a core spray pump, an emergency service water pump, containment spray pump, and various other 4160-V vital loads and 480-V emergency busses.

ASP Modeling Assumptions and Approach

The event has been modeled assuming that it could have occurred at power, and that if that were the case, a reactor scram would have also resulted.

Analysis Results

The conditional probability of core damage estimated for the event is 5.0×10^{-6} , which is indicative of a low significance event. The dominant core damage sequence involves failure of an SRV to close, failure of FWCI, and failure to depressurize to RPV, as shown on the following event tree. An almost equally significant sequence involves successful depressurization, failure of core spray, and failure to utilize fire water in conjunction with shutdown cooling to mitigate the open SRV.



Dominant Core Damage Sequence for LER 219/88-022 R1

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 219/88-022
 Event Description: Trip with one safety-related bus unavailable
 Event Date: 10/02/88
 Plant: Oyster Creek

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS 1.0E+00

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
TRANS	5.0E-06
Total	5.0E-06
ATWS	
TRANS	3.0E-05
Total	3.0E-05

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
25 trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p CD	CD	2.5E-06	2.4E-01
cs.trans fwci/fw.trans srv.ads			
22 trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p CD	CD	2.0E-06	1.1E-01
cs.trans fwci/fw.trans -srv.ads LPCS -SDC firewater			
20 trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p CD	CD	1.6E-07	3.2E-01
cs.trans -fwci/fw.trans SDC CC/SDC			
12 trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close isol CD	CD	1.3E-07	3.2E-01
.cond fw/pcs.trans -fwci/fw.trans SDC CC/SDC			
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**
12 trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close isol CD	CD	1.3E-07	3.2E-01
.cond fw/pcs.trans -fwci/fw.trans SDC CC/SDC			
20 trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p CD	CD	1.6E-07	3.2E-01
cs.trans -fwci/fw.trans SDC CC/SDC			
22 trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p CD	CD	2.0E-06	1.1E-01
cs.trans fwci/fw.trans -srv.ads LPCS -SDC firewater			
25 trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p CD	CD	2.5E-06	2.4E-01
cs.trans fwci/fw.trans srv.ads			
99 trans rx.shutdown	ATWS	3.0E-05	1.0E+00

** non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\sealmod\bwrseal.cmp
 BRANCH MODEL: c:\asp\sealmod\oyster.s11
 PROBABILITY FILE: c:\asp\sealmod\bwr_cs11.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
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Event Identifier: 219/88-022

trans	2.6E-04	1.0E+00	
loop	1.6E-05	3.6E-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	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	1.2E-02	1.0E+00	
emerg.power	2.9E-03	8.0E-01	
ep.rec	1.6E-01	1.0E+00	
fw/pcs.trans	1.0E+00	1.0E+00	
fwci/fw.trans	2.9E-01	3.4E-01	
fwci/loop	1.0E+00	1.0E+00	
fwci/loca	1.0E-03	3.4E-01	
isol.cond	1.0E-02	1.0E+00	
crd	1.0E-02	1.0E+00	1.0E-02
srv.ads	3.7E-03	7.1E-01	1.0E-02
LPCS	3.0E-03 > 3.0E-02	3.4E-01	
Branch Model: 1.OF.2			
Train 1 Cond Prob:	3.0E-03 > 3.0E-02		
Train 2 Cond Prob:	1.0E+00		
SDC	2.1E-02 > 2.3E-02	3.4E-01	1.0E-03
Branch Model: 1.OF.3+ser+opr			
Train 1 Cond Prob:	3.0E-02		
Train 2 Cond Prob:	1.0E-01		
Train 3 Cond Prob:	3.0E-01 > Unavailable		
Serial Component Prob:	2.0E-02		
CC/SDC	1.0E-03 > 1.0E-02	1.0E+00	
Branch Model: 1.OF.2			
Train 1 Cond Prob:	1.0E-02		
Train 2 Cond Prob:	1.0E-01 > Unavailable		
firewater	1.0E+00	1.0E+00	2.0E-03
* branch model file			
** forced			

Minarick
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