

B.4 LER Number 219/92-005

Event Description: Loss of Offsite Power Due to Forest Fire

Date of Event: May 3, 1992

Plant: Oyster Creek

B.4.1 Summary

Oyster Creek lost offsite power for 5 min when a forest fire near the plant caused the offsite transmission lines to fault. The two emergency diesel generators (EDGs) operated as designed. Although offsite power was restored in 5 min, the emergency buses were supplied from the EDGs for 17 h until reliability of the offsite power supply could be assured. The conditional core damage probability estimated for this event is 7.1×10^{-5} . The relative significance of this event compared to other postulated events at Oyster Creek is shown in Fig. B.1.

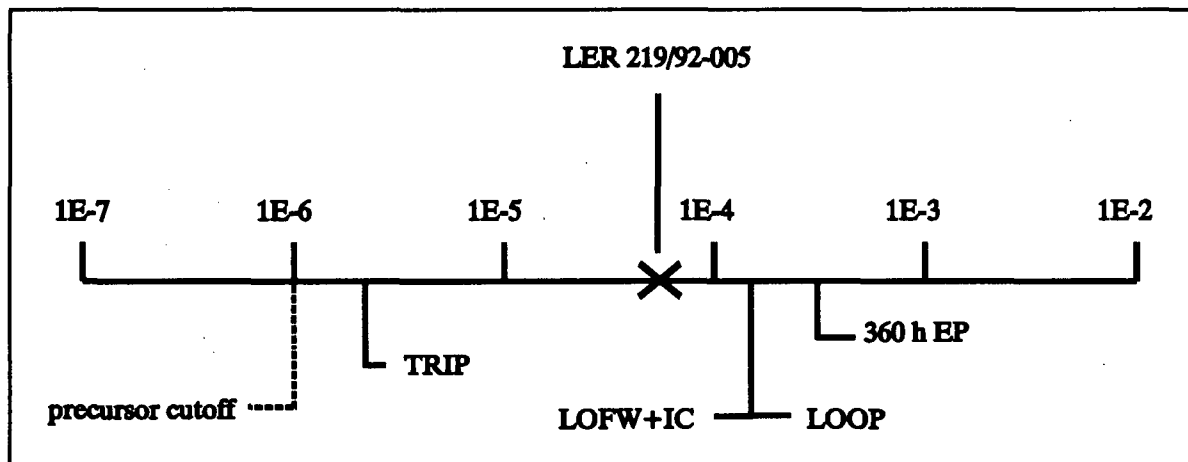


Fig. B.1. Relative significance of LER 219/92-005 compared with other potential events at Oyster Creek.

B.4.2 Event Description

On May 3, 1992, at 1310 hours, the control room at Oyster Creek was informed that a forest fire was burning to the west of the plant near the 230-kV offsite distribution lines. At 1326 hours, a full reactor scram occurred following the loss of the 230-kV lines. It is believed that the heavy smoke and heat from the fire ionized the air near the lines and caused the line to fault. The 34.5-kV supply was also lost and the result was a complete loss of offsite power (LOOP). The two EDGs started and loaded onto the two emergency buses (1C and 1D). However, control rod drive (CRD) pump A failed to start during the loading sequence because of high-resistance contacts in its time-delay relay. Offsite power was restored

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from the 34.5-kV system through the two startup transformers at 1331 hours, and the two nonemergency buses were reenergized. The plant staff questioned the reliability of the offsite supply due to the proximity of the fire to the station and the reduced number of offsite supply lines that were available. In addition, difficulties were encountered in transferring the emergency buses to offsite power. As a result, the emergency buses continued to be supplied from the two EDGs for another 17 h. By 0631 hours on May 4, 1992, the emergency buses were restored to their normal offsite supplies.

B.4.3 Additional Event-Related Information

Oyster Creek has three 230-kV supply lines and five 34.5-kV offsite lines. Two of the three 230-kV lines share double-circuit transmission towers. Normal operation is with two or three of the 230-kV lines and at least three of the 34.5-kV lines in service.

During startups and shutdowns, station power is supplied from the 34.5-kV system to the two startup transformers. During normal operation station power is supplied from the main generator through an auxiliary transformer and no loads are carried by the startup transformers. The two 4160-V emergency buses (1C and 1D) are normally supplied by the auxiliary transformer via the two nonemergency buses (1A and 1B). The EDGs associated with each emergency bus can supply power in case of a LOOP.

B.4.4 Modeling Assumptions

This event was modeled as a recoverable LOOP. To reflect the impact of the fire on the 230-kV lines and the extended time on the EDGs, nonrecovery probabilities for short-term and long-term ac power were developed by averaging the probabilities normally used for plant-centered and grid-related LOOPS. (See ORNL/NRC/LTR-89/11, *Revised LOOP Recovery and PWR Seal LOCA Models*, August 1989). This calculation results in somewhat higher short-term and long-term nonrecovery probabilities when compared to the plant-centered LOOP model and gives credit for the startup transformers as a source of supply for the safeguards buses that was available but not utilized. The nominal LOOP includes the effects of extreme severe weather and severe weather induced LOOPS in addition to the plant-centered and grid-related LOOPS, with correspondingly higher nonrecovery probabilities. Therefore the core damage probability for this event is less than that for the nominal case.

The failure of the CRD pump to start during EDG loading was not addressed in the event model. This pump would have been manually started if required (operator action to start and align the CRD system is included in the branch model).

B.4.5 Analysis Results

The conditional probability of core damage estimated for this event is 7.1×10^{-5} . The dominant core damage sequence, highlighted on the following event tree in Fig. B.2, involves a LOOP with a postulated failure of emergency power and failure to restore ac power prior to battery depletion.

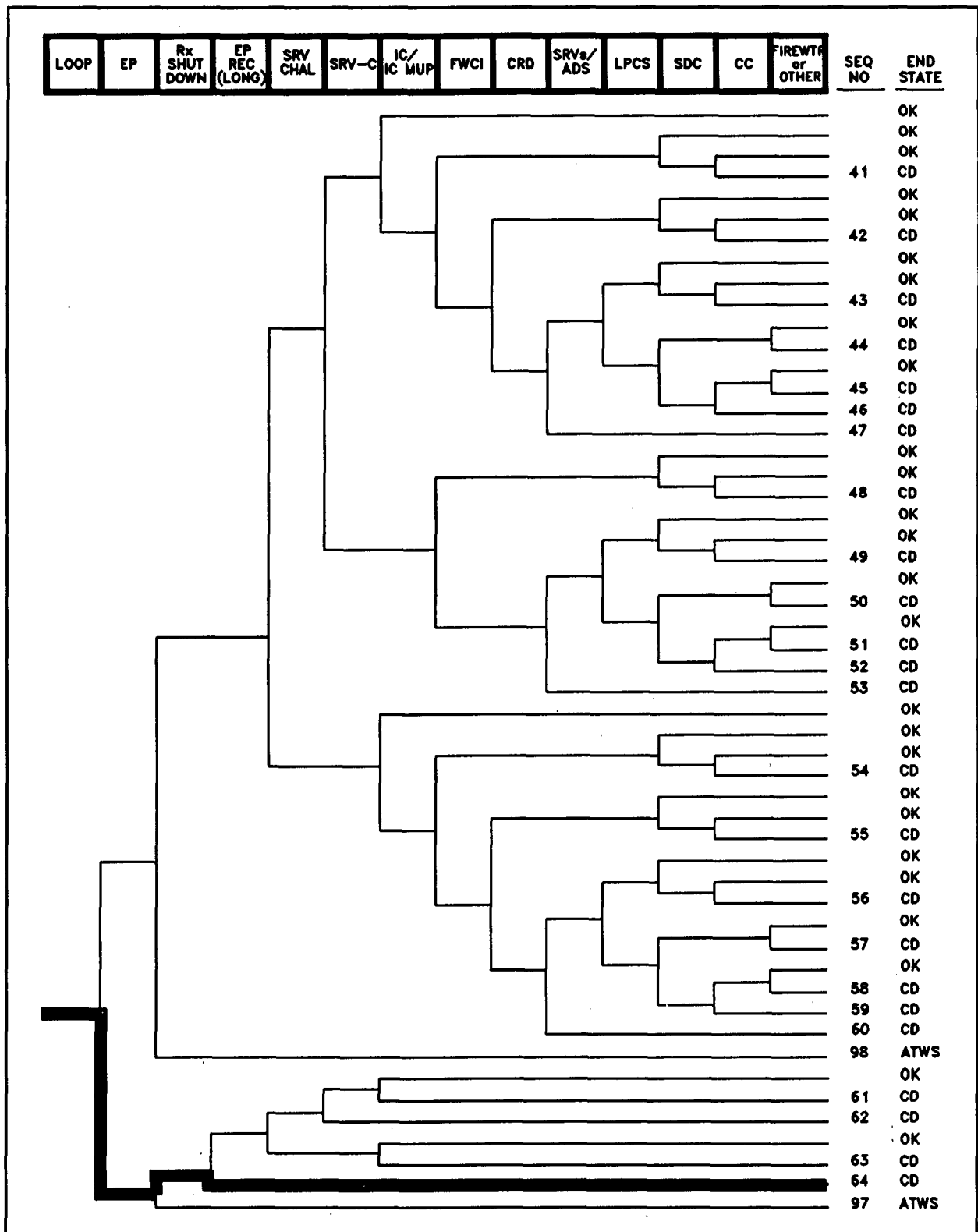


Fig. B.2. Dominant core damage sequences for LER 219/92-005.

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CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 219/92-005
 Event Description: LOOP Due to Forest Fire
 Event Date: 05/03/92
 Plant: Oyster Creek

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

LOOP 3.9E-01

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
LOOP	7.1E-05
Total	7.1E-05
ATWS	
LOOP	1.2E-05
Total	1.2E-05

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
64 LOOP emerg.power -rx.shutdown/ep EP.REC	CD	6.0E-05	3.1E-01
62 LOOP emerg.power -rx.shutdown/ep -EP.REC srv.chall/loop.-scram	CD	9.9E-06	3.1E-01
srv.close			
98 LOOP -emerg.power rx.shutdown	ATWS	1.2E-05	3.9E-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	1.2E-05	3.9E-01
62 LOOP emerg.power -rx.shutdown/ep -EP.REC srv.chall/loop.-scram	CD	9.9E-06	3.1E-01
srv.close			
64 LOOP emerg.power -rx.shutdown/ep EP.REC	CD	6.0E-05	3.1E-01

** non-recovery credit for edited case

SEQUENCE MODEL: C:\asppra\models\bwrseal.cmp
 BRANCH MODEL: C:\asppra\models\oyster.sl1
 PROBABILITY FILE: C:\asppra\models\bwr_csl1.pro

No Recovery Limit

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BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	2.6E-04	1.0E+00	
LOOP	1.6E-05 > 1.6E-05	3.6E-01 > 3.9E-01	
Branch Model: INITOR			
Initiator Freq:			
	1.6E-05		
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 > 6.8E-02	1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:			
	1.6E-01 > 6.8E-02		
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-03	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-04	3.4E-01	
sdc	2.1E-02	3.4E-01	1.0E-03
cc/sdc	1.0E-03	1.0E+00	
firewater	1.0E+00	1.0E+00	2.0E-03

* branch model file
 ** forced

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