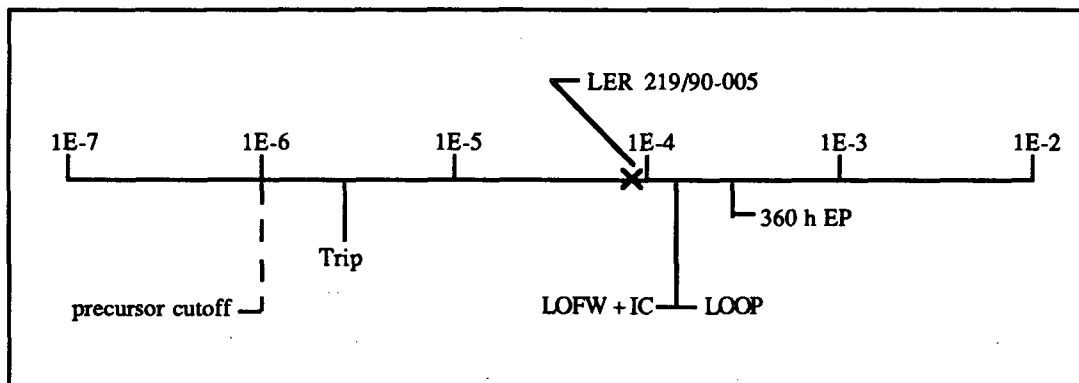


## ACCIDENT SEQUENCE PRECURSOR PROGRAM EVENT ANALYSIS

LER Number: 219/90-005  
 Event Description: "B" ESF 480-V feeder and isolation condenser "A" failure  
 Event Date: April 21, 1990  
 Plant: Oyster Creek

### Summary

A ground fault in the feeder to 480-V bus 1B2 caused a loss of power to the bus and its loads, rendering a number of "B" train safety systems inoperable. The "B" 125-V battery chargers were deenergized, and the battery was forced to carry the "B" train DC loads. After about 11 h, battery voltage declined sufficiently that it was decided to initiate a manual scram. After the reactor was scrammed, "A" isolation condenser was found to be inoperable when a DC isolation valve failed. The conditional core damage probability estimated for this event is  $8.8 \times 10^{-5}$ . The relative significance of this event compared to other postulated events at Oyster Creek is shown below.



### Event Description

The plant was operating at 100% power when a ground fault in the feeder to 480-V bus 1B2 occurred. The bus supply breaker opened, deenergizing the bus and its loads. These included motor control centers 1B2, 1B24, 1B23, 1B22, 1B21, 1B21B, and 1B21A. Equipment affected included the drywell equipment drain tank pumps, "B" train battery chargers, containment spray system train 2, isolation condenser "B", "B" control rod drive pump, and standby gas treatment train "B". One booster pump in each train of core spray was also affected.

Loss of control of the drywell equipment drain tank pumps caused the drywell equipment

drain tank to overflow to the drywell floor drain sump, increasing “unidentified” leakage to the floor drain sump to greater than 5 gpm. This condition created a Limiting Condition for Operation (LCO) requiring that the plant be shut down within 12 h.

Loss of the battery chargers transferred the “B” train 125-V DC loads to the battery. Batteries at Oyster Creek are rated for 1.5 h of operation under accident loading. Under the lighter demands of normal operations, the “B” battery carried its loads for 11 h before battery voltage dropped to a level that concerned plant operators. At that point, they initiated a manual scram.

Three hours later, the “A” isolation condenser was declared inoperable when one of its associated DC-powered valves experienced thermal binding and could not be operated. Twelve hours after scram, the electrical fault on bus 1B2 was isolated, and the bus was repowered via a cross-tie to bus 1A2. Shortly after that, the plant was placed in cold shutdown.

### **Additional Event-Related Information**

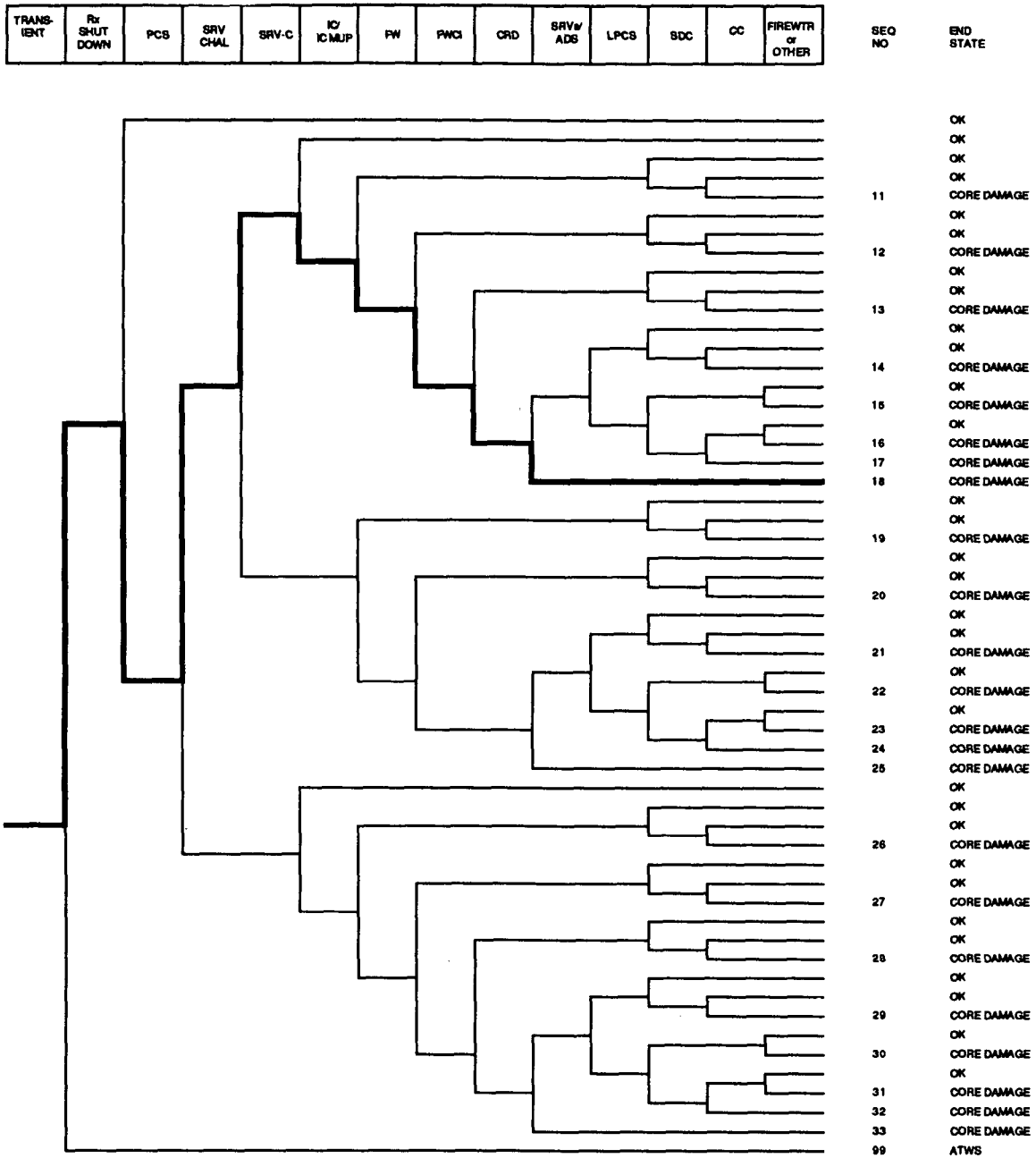
Many of the plant’s major DC loads may be switched to feed from either “A” or “B” battery. However, the Oyster Creek Final Safety Analysis Report indicates that all chargers for the “A” and “B” batteries are fed through bus 1B2. It therefore appears that only the “C” battery would be unaffected by the loss of bus 1B2.

### **Modeling Assumptions and Approach**

This event has been modeled as a reactor trip with unavailable isolation condenser (assumed operable locally, non-recovery likelihood = 0.34), unavailable reactor vessel (RV) makeup via the control rod drive (CRD) system, an unavailable containment spray train, degraded core spray, and degraded shutdown cooling. DC power was assumed available during trip mitigation.

### **Analysis Results**

The conditional probability of severe core damage estimated for this event is  $8.8 \times 10^{-5}$ . The dominant core damage sequence, highlighted on the following event tree, involves the observed trip with failure of high-pressure cooling and failure to depressurize using the automatic depressurization system (ADS).



Dominant core damage sequence for LER 219/90-005

# B-56

## CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 219/90-005  
 Event Description: Trip with ESF 480VAC feeder B and IC train A failure  
 Event Date: 04/21/90  
 Plant: Oyster Creek

### INITIATING EVENT

#### NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS 1.0E+00

#### SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
TRANS	8.8E-05
Total	8.8E-05
ATWS	
TRANS	3.0E-05
Total	3.0E-05

#### SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

	Sequence	End State	Prob	N Rec**
18	trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close ISOL .COND fw/pcs.trans fwc1/fw.trans CRD srv.ads	CD	7.1E-05	8.2E-02
12	trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close ISOL .COND fw/pcs.trans -fwci/fw.trans SDC CC/SDC	CD	9.2E-06	1.1E-01
15	trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close ISOL .COND fw/pcs.trans fwc1/fw.trans CRD -srv.ads LPCS -SDC fir ewater	CD	3.7E-06	3.9E-02
25	trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p cs.trans fwc1/fw.trans srv.ads	CD	2.5E-06	2.4E-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**
12	trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close ISOL .COND fw/pcs.trans -fwci/fw.trans SDC CC/SDC	CD	9.2E-06	1.1E-01
15	trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close ISOL .COND fw/pcs.trans fwc1/fw.trans CRD -srv.ads LPCS -SDC fir ewater	CD	3.7E-06	3.9E-02
18	trans -rx.shutdown pcs srv.chall/trans.-scram -srv.close ISOL .COND fw/pcs.trans fwc1/fw.trans CRD srv.ads	CD	7.1E-05	8.2E-02
25	trans -rx.shutdown pcs srv.chall/trans.-scram srv.close fw/p cs.trans fwc1/fw.trans srv.ads	CD	2.5E-06	2.4E-01
99	trans rx.shutdown	ATWS	3.0E-05	1.0E+00

Event Identifier: 219/90-005

\*\* non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\1989\bwrseal.cmp  
 BRANCH MODEL: c:\asp\1989\oyster.sll  
 PROBABILITY FILE: c:\asp\1989\bwr\_csl1.pro

No Recovery Limit

# BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
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-03 > 1.0E+00	1.0E+00 > 3.4E-01	
Branch Model: 1.OF.2			
Train 1 Cond Prob:	1.0E-02 > Unavailable		
Train 2 Cond Prob:	1.0E-01 > Failed		
CRD	1.0E-02 > 1.0E+00	1.0E+00	1.0E-02
Branch Model: 1.OF.1+opr			
Train 1 Cond Prob:	1.0E-02 > Unavailable		
srv.ads	3.7E-03	7.1E-01	1.0E-02
LPCS	3.0E-04 > 2.0E-03	3.4E-01	
Branch Model: 1.OF.2			
Train 1 Cond Prob:	3.0E-03 > 2.0E-02		
Train 2 Cond Prob:	1.0E-01		
SDC	2.1E-02 > 4.9E-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 > Unavailable		
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  
 08-06-1991  
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Event Identifier: 219/90-005