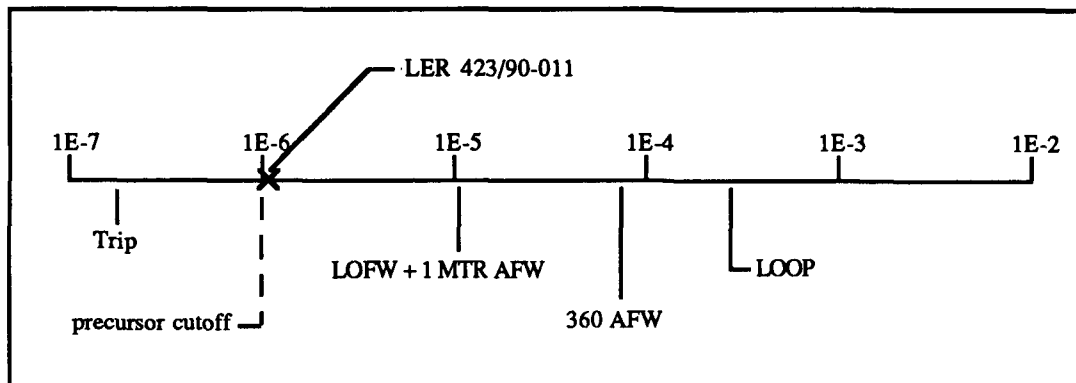


ACCIDENT SEQUENCE PRECURSOR PROGRAM EVENT ANALYSIS

LER No.: 423/90-011
 Event Description: Reactor trip and one containment spray recirculation pump unavailable
 Date of Event: March 30, 1990
 Plant: Millstone 3

Summary

The reactor was manually tripped in anticipation of a loss of main condenser vacuum while the automatic screen wash system was unavailable because of maintenance. One containment recirculation pump was out of service at the time. The conditional core damage probability estimated for this event is 1.1×10^{-6} . The relative significance of this event compared to other postulated events at Millstone 3 is shown below.



Event Description

In early March 1990 the automatic circulating water inlet screen wash system was taken out of service for repairs. At this time of the year, Long Island Sound undergoes a significant increase in its seaweed loading. On March 30, 1990, Millstone 3 was at 100% power when the plant initiated manual screen washing to clean the seaweed from the screens on the intake structure, since not all the repairs were completed on the automatic system. The manual cleaning dumped the seaweed back into the Sound away from the plant; however, a tide change brought the seaweed back into the circulating water intake. Operations began decreasing power in an attempt to get below the power level where a turbine trip causes a scram, which was anticipated if the seaweed clogged the intake structure and caused a loss of vacuum in the main condenser. Since two circulating water pumps tripped on intake screen high differential pressure before power

got below this point, the operators manually scrammed the reactor from 80% power. One containment recirculation pump was out of service for a high oil level problem in its lower motor bearing.

Response to the trip was complicated when thermal relief valves for two feedwater heaters separated at the point where the relief valve piping connected to the heaters. The turbine building was evacuated for ~30 min following the piping failures until it could be determined that no personnel hazard existed.

Additional Event-Related Information

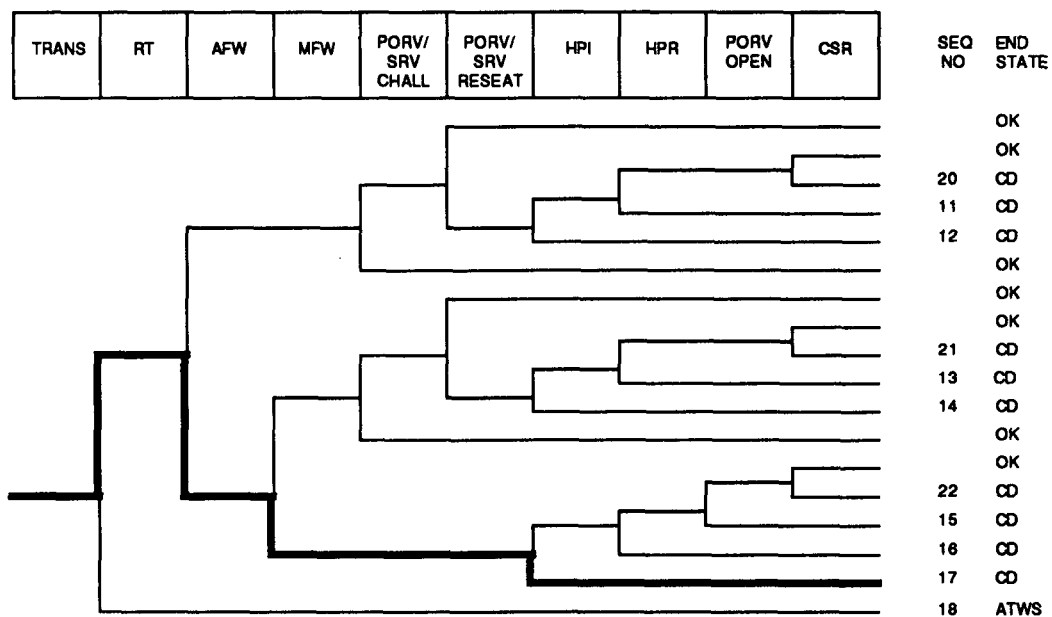
The containment recirculation system is comprised of two identical subsystems each containing two 3950-gpm capacity pumps and two recirculating coolers. The two subsystems share two 360°F containment spray headers. The containment recirculation system provides for decay heat removal following a loss-of-coolant accident (LOCA). Operability of two of four pumps is required for system success.

ASP Modeling Assumptions and Approach

This event has been modeled as a reactor scram and loss of feedwater due to loss of condenser vacuum with one containment recirculation pump out of service.

Analysis Results

The conditional probability of severe core damage estimated for this event is 1.1×10^{-6} . The dominant sequence to core damage, highlighted on the following event tree, involves failure of secondary-side cooling and failure of feed and bleed.



Dominant core damage sequence for LER 423/90-011

B-333

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 423/90-011
 Event Description: Reactor trip and one CSR pump unavailable.
 Event Date: 03/30/90
 Plant: Millstone 3

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS 1.0E+00

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
TRANS	1.1E-06
Total	1.1E-06
ATWS	
TRANS	3.4E-05
Total	3.4E-05

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
17 trans -rt afw MFW hpi(f/b)	CD	3.6E-07	7.4E-02
15 trans -rt afw MFW -hpi(f/b) -hpr/-hpi porv.open	CD	3.5E-07	8.8E-02
22 trans -rt afw MFW -hpi(f/b) -hpr/-hpi -porv.open CSR	CD	2.7E-07	8.8E-02
20 trans -rt -afw porv.or.srv.chall porv.or.srv.reseat -hpi -hpr/-hpi CSR	CD	7.2E-08	1.1E-02
16 trans -rt afw MFW -hpi(f/b) hpr/-hpi	CD	3.8E-08	8.8E-02
18 trans rt	ATWS	3.4E-05	1.2E-01

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

Sequence	End State	Prob	N Rec**
20 trans -rt -afw porv.or.srv.chall porv.or.srv.reseat -hpi -hpr/-hpi CSR	CD	7.2E-08	1.1E-02
22 trans -rt afw MFW -hpi(f/b) -hpr/-hpi -porv.open CSR	CD	2.7E-07	8.8E-02
15 trans -rt afw MFW -hpi(f/b) -hpr/-hpi porv.open	CD	3.5E-07	8.8E-02
16 trans -rt afw MFW -hpi(f/b) hpr/-hpi	CD	3.8E-08	8.8E-02
17 trans -rt afw MFW hpi(f/b)	CD	3.6E-07	7.4E-02
18 trans rt	ATWS	3.4E-05	1.2E-01

** non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\1989\pwrseal.cmp
 BRANCH MODEL: c:\asp\1989\millstn3.sll
 PROBABILITY FILE: c:\asp\1989\pwr_bsll.pro

Event Identifier: 423/90-011

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	4.6E-04	1.0E+00	
loop	1.8E-05	3.3E-01	
loca	2.4E-06	4.3E-01	
rt	2.8E-04	1.2E-01	
rt/loop	0.0E+00	1.0E+00	
emerg.power	2.9E-03	8.0E-01	
afw	3.8E-04	2.6E-01	
afw/emerg.power	5.0E-02	3.4E-01	
MFW	2.0E-01 > 1.0E+00	3.4E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	2.0E-01 > Unavailable		
porv.or.srv.chall	4.0E-02	1.0E+00	
porv.or.srv.reseat	2.0E-02	1.1E-02	
porv.or.srv.reseat/emerg.power	2.0E-02	1.0E+00	
seal.loca	3.5E-01	1.0E+00	
ep.rec(sl)	7.6E-01	1.0E+00	
ep.rec	1.5E-01	1.0E+00	
hpi	1.0E-03	8.4E-01	
hpi(f/b)	1.0E-03	8.4E-01	1.0E-02
porv.open	1.0E-02	1.0E+00	4.0E-04
hpr/-hpi	1.5E-04	1.0E+00	1.0E-03
CSR	9.3E-05 > 7.2E-03	1.0E+00	
Branch Model: 2.OF.4			
Train 1 Cond Prob:	1.0E-02 > Failed		
Train 2 Cond Prob:	3.0E-02		
Train 3 Cond Prob:	1.0E-01		
Train 4 Cond Prob:	3.0E-01		

* branch model file
** forced

Minarick
08-06-1991
17:30:22

Event Identifier: 423/90-011