

Additionally, it was discovered that the speed increaser lube oil pumps (1800 rpm) had been mistakenly replaced with lower rated (900-rpm) pumps. These lower rpm pumps had two problems: 1) the type of gears used in the 900-rpm pumps might not be able to adequately pump the oil when being driven at 1800 rpm, causing potential cavitation, and 2) the compression packing seal used in these pumps requires occasional adjustment as the packing wears. If these adjustments are not made, the gland seal bolts will become loose, allowing air in-leakage and resulting in insufficient oil flow to the speed increaser unit.

Corrective action was taken to replace the 900-rpm pumps with the proper 1800-rpm pumps, and the speed increaser internals were inspected and replaced as necessary.

Event-Related Plant Design Information

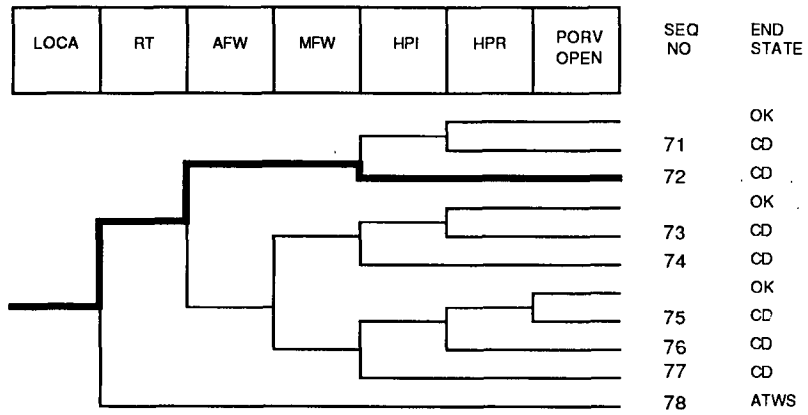
The centrifugal charging pumps are utilized in the emergency core cooling system for high-pressure safety injection, as well as for reactor coolant system makeup and reactivity control.

ASP Modeling Assumptions and Approach

This event has been modeled as an unavailability of both high head injection pumps for one-half of a surveillance period (360 h). The likelihood of not recovering the pumps in the short term has been assumed to be 1.0.

Analysis Results

The conditional probability associated with this event is 3.8×10^{-4} . This event is considered significant from an ASP standpoint. The dominant sequence involves a postulated small-break LOCA ($p = 3.7 \times 10^{-4}$ during the 360 h unavailability period) with HPI unavailability ($p = 1.0$). This sequence is highlighted on the following event tree.



Dominant Core Damage Sequence for LER 328/88-005 R1

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 328/88-005
 Event Description: High head injection system unavailable
 Event Date: 02/12/88
 Plant: Sequoyah 2

UNAVAILABILITY, DURATION= 360

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	2.8E-01
LOOP	3.1E-03
LOCA	3.7E-04

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
TRANS	3.8E-06
LOOP	1.1E-06
LOCA	3.7E-04
Total	3.8E-04

ATWS

TRANS	0.0E+00
LOOP	0.0E+00
LOCA	0.0E+00
Total	0.0E+00

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
72 loca -rt -afw HPI	CD	3.7E-04	4.3E-01

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

Sequence	End State	Prob	N Rec**
72 loca -rt -afw HPI	CD	3.7E-04	4.3E-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: a:\sealmod\pwrseal.cmp
 BRANCH MODEL: a:\sealmod\sequoyah.sll
 PROBABILITY FILE: a:\sealmod\pwr_bsll.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	7.7E-04	1.0E+00	
loop	1.6E-05	5.3E-01	
loca	2.4E-06	4.3E-01	
rt	2.8E-04	1.2E-01	
rt/loop	0.0E+00	1.0E+00	

Event Identifier: 328/88-005

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	1.0E+00	7.0E-02	
porv.or.srv.chall	4.0E-02	1.0E+00	
porv.or.srv.reset	2.0E-02	1.1E-02	
porv.or.srv.reset/emerg.power	2.0E-02	1.0E+00	
seal.loca	2.7E-01	1.0E+00	
ep.rec(sl)	5.7E-01	1.0E+00	
ep.rec	0.0E+00	1.0E+00	
HPI	1.0E-03 > 1.0E+00	8.4E-01 > 1.0E+00	
Branch Model: 1.OF.2			
Train 1 Cond Prob:	1.0E-02 > Failed		
Train 2 Cond Prob:	1.0E-01 > Failed		
HPI(F/B)	1.0E-03 > 1.0E+00	8.4E-01 > 1.0E+00	1.0E-02
Branch Model: 1.OF.2+opr			
Train 1 Cond Prob:	1.0E-02 > Failed		
Train 2 Cond Prob:	1.0E-01 > Failed		
hpr/-hpi	1.5E-04	1.0E+00	1.0E-03
porv.open	1.0E-02	1.0E+00	4.0E-04

* branch model file
** forced

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