

PRECURSOR DESCRIPTION AND ANALYSIS

LER No.: 413/85-043
Event Identifier: LOFW and Secondary-Side Relief Problems
Date of Event: June 22, 1985
Plant: Catawba 1

EVENT DESCRIPTION

Sequence

At 0104 h manual reactor shutdown was initiated following an automatic trip of MFW pump turbine 1B due to a loss of condenser vacuum. The three pressurizer PORVs opened and closed twice before the manual scram.

The loss of condenser vacuum was caused by an operator's opening a drain valve associated with MFW pump turbine 1A, which was in the process of being returned to service after a lengthy repair period. The operator had received instructions from his supervisor to reposition certain valves to support filling and warming of the nonoperating MFW pump. The AFW pumps started on low-level demand. The condenser dump valves opened as intended. A PORV on SGs "A" and "B" failed to open on demand. Two other SG PORVs and one SG SRV did open and close on demand.

Corrective Action

The B MFW pump was restarted. PORV set points were recalibrated. Procedures were revised.

Plant/Event Data

Systems Involved:

MFW and secondary-side relief

Components and Failure Modes Involved:

MFW pump — tripped off in operation
Two SG PORVs — failed to open on demand

Component Unavailability Duration: NA

Plant Operating Mode: 1 (64% power)

Discovery Method: Operational event

Reactor Age: 0.5 year

Plant Type: PWR

Comments

See LER 413/85-041 on June 13, 1985, for a similar event

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MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	Nonrecoverable
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Branches Impacted and Branch Nonrecovery Estimate

MFW	0.34	Recoverable but difficult to recover immediately because of the loss of vacuum
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Steam-side depressurization	0.34	Two SG PORVs only recoverable locally if at all, but condenser dump valves were available
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Plant Models Utilized

PWR plant Class F

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CONDITIONAL CORE DAMAGE CALCULATIONS

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INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	1.000E+00
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SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
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CV

TRANS	6.871E-06
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Total	6.871E-06
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CD

TRANS	6.698E-06
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Total	6.698E-06
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ATWS

TRANS	3.000E-05
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Total	3.000E-05
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DOMINANT SEQUENCES

End State: CV	Conditional Probability:	2.545E-06
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109 TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI

End State: CD	Conditional Probability:	1.289E-06
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127 TRANS -RT AFW MFW HPI(F/B) SS.DEPRESS

End State: ATWS	Conditional Probability:	3.000E-05
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128 TRANS RT

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SEQUENCE CONDITIONAL PROBABILITIES

	Sequence	End State	Seq. Prob	Non-Recov**
101	TRANS -RT -AFW PORV.OR.SRV.CHALL -PORV.OR.SRV.RESEAT SS.RELE AS.TERM HPI	CV	1.059E-07	1.765E-01
102	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI -SS.DEPRESS -LPR/-HPI.HPR	CV	5.433E-07	1.956E-03
103	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI -SS.DEPRESS LPR/-HPI.HPR	CD	1.103E-06	1.956E-03
104	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI SS.DEPRESS	CD	8.482E-07	1.008E-03
109	TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI	CV	2.545E-06 *	1.768E-01
119	TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS -COND/MFW	CV	3.750E-07	3.682E-02
120	TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS COND/MFW	CD	1.932E-07	1.897E-02
121	TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN SS.DEPRESS	CD	2.927E-07	2.874E-02
122	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI -SS.DEPRESS -COND/MFW	CV	1.628E-06	2.275E-03
123	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI -SS.DEPRESS COND/MFW	CD	8.389E-07	1.172E-03
124	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI SS.DEPRESS	CD	1.271E-06	1.776E-03
125	TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS -COND/MFW	CV	1.652E-06	1.826E-03
126	TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS COND/MFW	CD	8.509E-07	9.406E-04
127	TRANS -RT AFW MFW HPI(F/B) SS.DEPRESS	CD	1.289E-06 *	1.425E-03
128	TRANS RT	ATWS	3.000E-05 *	1.200E-01

* dominant sequence for end state

** non-recovery credit for edited case

Note:

Conditional probability values are differential values which reflect the added risk due to observed failures. Parenthetical values indicate a reduction in risk compared to a similar period without the existing failures.

MODEL: b:pwrmtree.cmp

DATA: b:catapro.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.030E-03	1.000E+00	
LOOP	2.280E-05	3.400E-01	
LOCA	4.170E-06	3.400E-01	
RT	2.500E-04	1.200E-01	
RT/LOOP	0.000E+00	1.000E+00	
EMERG.POWER	2.850E-03	5.100E-01	

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AFW	1.020E-03	2.700E-01	
AFW/EMERG.POWER	5.000E-02	3.400E-01	
MFW	2.000E-01 > 1.000E+00	3.400E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	2.000E-01 > Failed		
PORV.OR.SRV.CHALL	4.000E-02	1.000E+00	
PORV.OR.SRV.RESEAT	3.000E-02	5.000E-02	
PORV.OR.SRV.RESEAT/EMERG.POWER	3.000E-02	5.000E-02	
SS.RELEAS.TERM	1.500E-02	3.400E-01	
SS.RELEAS.TERM/-MFW	1.500E-02	3.400E-01	
HPI	1.000E-03	5.200E-01	
HPI(F/B)	1.000E-03	5.200E-01	4.000E-02
HPR/-HPI	3.000E-03	5.600E-01	4.000E-02
PORV.OPEN	1.000E-02	1.000E+00	
SS.DEPRESS	3.600E-02 > 1.000E+00	1.000E+00 > 3.400E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	3.600E-02 > Failed		
COND/MFW	1.000E+00	3.400E-01	
LPI/HPI	1.000E-03	3.400E-01	
LPR/-HPI.HPR	6.700E-01	1.000E+00	
LPR/HPI	1.000E-03	1.000E+00	

*** forced

Austin
08-13-1986
17:52:01

Event Identifier: 413/85-043