

PRECURSOR DESCRIPTION SHEET

LER No.: 269/86-001
Event Description: Trip, LOFW, and a stuck-open MSRV occur
Date of Event: January 31, 1986
Plant: Oconee 1

EVENT DESCRIPTION

Sequence

At 1546 h during troubleshooting, circuit breaker PCB-24 was manually closed without the reset of the generator lockout relays. When the breaker was closed, the relay logic was satisfied, causing a yellow bus lockout. Consequently, all the 230-kV yellow-bus tie breakers opened.

One of the breakers that opened was PCB-21, the generator to the yellow-bus tie breaker. When it opened, the only path for current flow from the generator to the switchyard was via PCB-20. PCB-20 faulted, undergoing an explosion, ~17 seconds after PCB-21 opened. At 1547 h the turbine/generator tripped, initiating an anticipatory reactor trip from 100% stable power conditions.

Following the reactor trip, both MFWPs tripped on high discharge pressure. A preliminary investigation showed that the MFWP speed demand did not run back as expected. All three EFW pumps started immediately to supply feedwater flow for DHR.

Following the reactor trip, one of the MSRVs (1MS-8) opened and stuck open for 11 min. It reseated when the SG pressure decreased to 975 psig, the minimum RCS pressure was 1750 psig.

Unit 1 was stabilized at hot shutdown conditions with no actuations of engineering safeguard systems or pressurizer relief valves, and no RCS leakage was induced.

Corrective Action

PCB-20 was repaired. The MFWP trip set points were reviewed. The MSRV (1MS-8) was repaired.

Plant/Event Data

Systems Involved:

MFW, main steam relief, electrical

Event Identifier: 269/86-001

Components and Failure Modes Involved:

MSRV — stuck open in operation
MFWPS — tripped off in operation

Component Unavailability Duration: NA

Plant Operating Mode: 1 (100% power)

Discovery Method: Operational event

Reactor Age: 12.8 years

Plant Type: PWR

Comments

None

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	No recovery
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Branches Impacted and Branch Nonrecovery Estimate

MFW	1.0	No recovery possible in the short term
SS release terminated	0.12	MSRV stuck open but closed on lower pressure

Plant Models Utilized

PWR plant Class D

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CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

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INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	1.0E+00
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SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	3.2E-05
Total	3.2E-05
CD	
TRANS	2.1E-06
Total	2.1E-06
ATWS	
TRANS	3.4E-05
Total	3.4E-05

DOMINANT SEQUENCES

End State: CV	Conditional Probability:	2.8E-05
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109 TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI

End State: CD	Conditional Probability:	1.0E-06
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103 TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HPR/-HPI -SS.DEPRESS LPR/-HP
 1.HPR

End State: ATWS	Conditional Probability:	3.4E-05
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Event Identifier: 269/86-001

128 TRANS RT

SEQUENCE CONDITIONAL PROBABILITIES

	Sequence	End State	Prob	N Rec**
101	TRANS -RT -AFW PORV.OR.SRV.CHALL -PORV.OR.SRV.RESEAT SS.RELE AS.TERM HPI	CV	2.4E-06	1.0E-01
103	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI -SS.DEPRESS LPR/-HPI.HPR	CD	1.0E-06 *	5.0E-02
104	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI SS.DEPRESS	CD	5.8E-08	5.0E-02
109	TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI	CV	2.8E-05 *	1.0E-01
123	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI -SS.DEPRESS COND/MFW	CD	4.2E-07	3.0E-02
124	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI SS.DEPRESS	CD	4.7E-08	8.8E-02
125	TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS -COND/MFW	CV	8.6E-07	4.9E-02
126	TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS COND/MFW	CD	4.4E-07	2.5E-02
127	TRANS -RT AFW MFW HPI(F/B) SS.DEPRESS	CD	4.9E-08	7.4E-02
128	TRANS RT	ATWS	3.4E-05 *	1.2E-01

* dominant sequence for end state

** non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\newmodel\pwrmtree.cap
BRANCH MODEL: c:\asp\newmodel\locone.txt
PROBABILITY FILE: c:\asp\newmodel\pwr_b.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	4.8E-04	1.0E+00	
LOOP	4.6E-06	3.9E-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: 1.0F.1			
Train 1 Cond Prob:			
PORV.OR.SRV.CHALL	2.0E-01 > Failed		
PORV.OR.SRV.RESEAT	8.0E-02	1.0E+00	
PORV.OR.SRV.RESEAT/EMERG.POWER	1.0E-02	5.0E-02	
SS.RELEAS.TERM	1.0E-02	1.0E+00	
	1.5E-02 > 1.0E+00	3.4E-01 > 1.2E-01	

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Branch Model: 1.0F.1			
Train 1 Cond Prob:	1.5E-02 > Failed		
SS.RELEAS.TERM/-MFW	1.5E-02 > 1.0E+00	3.4E-01 > 1.2E-01	
Branch Model: 1.0F.1			
Train 1 Cond Prob:	1.5E-02 > Failed		
HPI	3.0E-04	8.4E-01	
HPI(F/B)	3.0E-04	8.4E-01	4.0E-02
HPR/-HPI	1.5E-04	1.0E+00	4.0E-02
SS.DEPRESS	3.6E-02	1.0E+00	
COND/MFW	1.0E+00	3.4E-01	
LPI/HPI	1.5E-04	3.4E-01	
LPR/-HPI.HPR	6.7E-01	1.0E+00	
LPR/HPI	1.5E-04	1.0E+00	

* branch model file
 ** forced

Austin
 09-11-1987
 11:25:59