

PRECURSOR DESCRIPTION SHEET

LER No.: 412/87-036
Event Description: Trip and subsequent loss of offsite power
Date of Event: 11/17/87
Plant: Beaver Valley 2

EVENT DESCRIPTION

Sequence

An I&C technician bumped and tripped the power supply switch to the turbine thrust-bearing circuit supervisory instrument. The resultant spike caused a turbine trip followed by a reactor trip. A fast bus transfer from the unit station service transformers (USST) to the system station service transformers (SSST) was automatically initiated. After the transfer, the USST breakers immediately reclosed since the trip signal was not designed to seal-in. This resulted in an overcurrent condition that tripped the A, B, C, and D 4-kV buses and resulted in an effective loss of offsite power. Both emergency diesel generators started and energized the emergency buses. The supply breaker for the A and B 4-kV buses reclosed, and RCP A and B were restarted.

Corrective Action

To ensure that the turbine-thrust bearing trip signal is maintained to the circuit after a trip signal has occurred, the self reset relays were to be replaced with lockout type relays. To prevent the USST breakers from reclosing on a transfer from onsite to offsite power, a reclosure blocking scheme was added to the circuit (knife switches were added, which are administratively controlled).

Plant/Event Data

Systems Involved:
Electrical

Components and Failure Modes Involved:

Relay cycles opened then closed in operation

Component Unavailability Duration: 4 min

Plant Operating Mode: 1 (98%)

Discovery Method: Operational event

Reactor Age: 0.3 y

Plant Type: PWR

Comments

None.

MODELING CONSIDERATION AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

LOOP	0.04	Recoverable from the control room
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Event Identifier: 412/87-036

Branches Impacted and Branch Nonrecovery Estimate
None

Plant Models Utilized
PWR plant Class A

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

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INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

LOOP 4.0E-02

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
LOOP	1.7E-05
Total	1.7E-05
CV	
LOOP	4.3E-07
Total	4.3E-07
ATWS	
LOOP	0.0E+00
Total	0.0E+00

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
217 LOOP -rt/loop emerg.power ep.rec	CD	1.6E-05	5.4E-03
216 LOOP -rt/loop emerg.power -ep.rec afw/ep	CD	1.3E-06	9.0E-03
215 LOOP -rt/loop emerg.power -ep.rec -afw/ep -porv.or.srv.chall s	CV	3.6E-07	8.9E-03
s.releas.term			
209 LOOP -rt/loop -emerg.power -afw -porv.or.srv.chall ss.releas.te	CV	4.9E-08	1.1E-02
rm hpl			
213 LOOP -rt/loop emerg.power -ep.rec -afw/ep porv.or.srv.chall -p	CV	1.5E-08	8.9E-03
orv.or.srv.reseat/emerg.power ss.releas.term			

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

Sequence	End State	Prob	N Rec**
209 LOOP -rt/loop -emerg.power -afw -porv.or.srv.chall ss.releas.te	CV	4.9E-08	1.1E-02
rm hpl			
213 LOOP -rt/loop emerg.power -ep.rec -afw/ep porv.or.srv.chall -p	CV	1.5E-08	8.9E-03
orv.or.srv.reseat/emerg.power ss.releas.term			
215 LOOP -rt/loop emerg.power -ep.rec -afw/ep -porv.or.srv.chall s	CV	3.6E-07	8.9E-03
s.releas.term			
216 LOOP -rt/loop emerg.power -ep.rec afw/ep	CD	1.3E-06	9.0E-03
217 LOOP -rt/loop emerg.power ep.rec	CD	1.6E-05	5.4E-03

** non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\newmodel\pwr_anew.cmp
 BRANCH MODEL: c:\asp\newmodel\beaver2.new
 PROBABILITY FILE: c:\asp\newmodel\pwr_bnew.pro

Event Identifier: 412/87-036

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	4.8E-04	1.0E+00	
LOOP	4.6E-06 > 4.6E-06	3.9E-01 > 4.0E-02	
Branch Model: INITOR			
Initiator Freq:			
loca	4.6E-06	4.3E-01	
rt	2.4E-06	1.2E-01	
rt/loop	2.8E-04	1.0E+00	
emerg.power	0.0E+00	8.0E-01	
ep.rec	2.9E-03	1.7E-01	
afw	1.0E+00	2.6E-01	
afw/ep	3.8E-04	3.4E-01	
mfw	5.0E-02	3.4E-01	
porv.or.srv.chall	2.0E-01	1.0E+00	
porv.or.srv.reseat	4.0E-02	1.1E-02	
porv.or.srv.reseat/emerg.power	3.0E-02	1.0E+00	
ss.releas.term	3.0E-02	3.4E-01	
ss.depress	1.5E-02	1.0E+00	
cond/mfw	3.6E-02	3.4E-01	1.0E-02
hpi	1.0E+00	8.4E-01	
hpi (f/b)	3.0E-04	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	1.0E-02	1.0E+00	
lpi/hpi	1.0E-02	3.4E-01	
lpr/-hpi	1.5E-04	1.0E+00	
lpr/hpi	6.7E-01	1.0E+00	

* branch model file
 ** forced

Minarick
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