PRECURSOR DESCRIPTION AND ANALYSIS

LER No.: 528/85-058
Event Description: Loss of Offsite Power Due to Multiplexer Failure
Date of Event: October 3, 1985
Plant: Palo Verde 1

EVENT DESCRIPTION

Sequence

At 1644 h, Unit 1 was at 52% power when a reactor trip occurred because of flow-projected, low departure from nucleate boiling ratio on all four core protection calculators. This was due to a LOOP that caused the speed of the RCP to decrease.

The LOOP was caused by switchyard breakers opening because of an apparent malfunction in the plant multiplexer (PMUX). Because of the LOOP, both emergency diesel generators (DGs) started and loaded, and the Engineered Safety Features system actuated.

The non-safety-grade steam turbine bypass system did not generate a quick open signal because of the LOOP. The LOOP resulted in a false low RCS average temperature input, which blocked the open permissive. Three SG MSRVs opened to relieve steam. The atmospheric steam dump valves were also opened. The RCPs could not be restarted because of operator failure to reset their lockout signal.

Power was restored in 25 min (1709 h). The "B" DG was unloaded too fast by error; alarms sounded, and it shut down. The DG was reset.

Corrective Action

To prevent recurrence of the reactor trip, the switchyard breakers that were affected by the apparent PMUX failure were hardwired, bypassing the PMUX.

Plant/Event Data

Systems Involved:
Switchyard breakers, DGs, RCPs, and turbine bypass

Components and Failure Modes Involved:
Multiplexer — failed in operation
DG — experienced problems during unloading
Turbine bypass valves — failed to open on demand
RCPs — failed to reset on demand

Component Unavailability Duration: NA
Plant Operating Mode: 1 (52% power)
Discovery Method: Operational event
Reactor Age: 0.4 year
Plant Type: PWR

Comments

See LER 528/85-076 on October 7, 1985, for a similar event

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

LOOP	0.12	Failure was recoverable within 30 min but was not routine

Branches Impacted and Branch Nonrecovery Estimate

None

Plant Models Utilized

PWR plant Class G

Event Identifier: 528/85-058

CONDITIONAL CORE DAMAGE CALCULATIONS

LER Number: 528/85-058
Event Description: Loss of Offsite Power Due to Multiplexer Failure
Event Date: 10/3/85
Plant: Palo Verde 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

LOOP	1.200E-01

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
LOOP	2.616E-07
Total	2.616E-07
CD	
LOOP	3.360E-05
Total	3.360E-05
ATWS	
LOOP	0.000E+00
Total	0.000E+00

DOMINANT SEQUENCES

End State: CV Conditional Probability: 1.628E-07

211 LOOP -RT/LOOP EMERG.POWER -AFW/EMERG.POWER -PORV.OR.SRV.CHALL SS.RELEAS.TERM

End State: CD Conditional Probability: 3.171E-05

207 LOOP -RT/LOOP -EMERG.POWER AFW -HPI(F/B) PORV.OPEN

SEQUENCE CONDITIONAL PROBABILITIES

Event Identifier: 528/85-058

	Sequence	End State	Seq. Prob	Non-Recov‡‡
204	LOOP -RT/LOOP -EMERG.POWER -AFW -PORV.OR.SRV.CHALL SS.RELEAS. TERM HPI	CV	9.351E-08	2.122E-02
207	LOOP -RT/LOOP -EMERG.POWER AFW -HPI(F/B) PORV.OPEN	CD	3.171E-05 ‡	3.110E-02
208	LOOP -RT/LOOP -EMERG.POWER AFW HPI(F/B)	CD	1.326E-06	1.351E-03
211	LOOP -RT/LOOP EMERG.POWER -AFW/EMERG.POWER -PORV.OR.SRV.CHALL SS.RELEAS.TERM	CV	1.628E-07 ‡	2.057E-02

‡ 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:pwrgtree.cmp
DATA: b:paloprob.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.030E-03	1.000E+00	
LOOP	2.280E-05 > 2.280E-05	3.400E-01 > 1.200E-01	
Branch Model: INITOR			
Initiator Freq:	2.280E-05		
LOCA	2.560E-02	3.400E-01	
RT	2.500E-04	1.200E-01	
RT/LOOP	0.000E+00	1.000E+00	
EMERG.POWER	5.415E-04	5.100E-01	
AFW	1.020E-03	2.700E-01	
AFW/EMERG.POWER	5.000E-02	3.400E-01	
MFW	2.000E-01	3.400E-01	
PORV.OR.SRV.CHALL	2.000E-02	1.000E+00	
PORV.OR.SRV.RESEAT	1.000E-02	1.200E-01	
PORV.OR.SRV.RESEAT/EMERG.POWER	1.000E-02	1.200E-01	
SS.RELEAS.TERM	1.500E-02	3.400E-01	
SS.RELEAS.TERM/-MFW	1.500E-02	3.400E-01	
SS.DEPRESS	3.600E-02	1.000E+00	
COND/MFW	1.000E+00	3.400E-01	
HPI	3.000E-04	5.200E-01	
HPI(F/B)	3.000E-04	5.200E-01	4.000E-02
PORV.OPEN	1.000E+00	1.000E+00	
HPR/-HPI	1.000E-03	1.000E+00	
CSR	2.000E-03	3.400E-01	

‡‡‡ forced

Event Identifier: 528/85-058