PRECURSOR DESCRIPTION AND ANALYSIS

LER No.: 373/85-045
Event Description: Loss of Circulating Water and Nonsafety Service Water Due to Expansion Joint Failure
Date of Event: May 31, 1985
Plant: LaSalle 1

EVENT DESCRIPTION

Sequence

Flooding caused by failure of the 1B circulating water pump discharge valve expansion joint rendered the circulating water pumps and plant SW pumps unavailable. Before the leak was discovered, the 1B pump tripped off (1822 h). At 1825 h standby pump 1C was started after several attempts. Pump 1A was not affected yet. When the leak (2000 gal/min) was first discovered at 1829 h, a load drop was initiated. At 1945 h and 65% power, the unit was manually scrammed in anticipation of loss of the circulating water system.

Cold shutdown of the reactor was initiated with a combination of RCIC and the SRVs. Use of the SRVs caused high temperatures in the drywell and suppression pool. Total loss of SW had occurred by 2045 h, placing operation of the plant instrument air, RBCCW, TBCCW, the plant computer, the drywell pneumatics compressor (necessary for operation of the SRVs), and primary containment air coolers at risk. The plant computer was finally shut down. The RHR steam condensing mode was considered inoperable because of the degraded condition of plant instrument air. The RWCU isolated because of cycling of the SRVs. Water in the pump house reached 675,000 gal.

Fire protection water was cross-tied to the RBCCW to cool the drywell pneumatics compressor to maintain operability of the SRVs for cooldown. The unit reached cold shutdown at 1027 h the next day.

Corrective Action

See LER for repair and restoration of circulating water and service pump equipment. The 1B pump valve was repaired.

Plant/Event Data

Systems Involved:
SW, circulating water, RHR, instrument air, RBCCW, TBCCW, and plant computer

Event Identifier: 373/85-045

Components and Failure Modes Involved:
The systems listed below were rendered unavailable during operation by flooding caused by the failed circulating water discharge valve.

SW System
TBCCW heat exchangers
RBCCW heat exchangers
TG all heat exchangers and other TG systems
Fuel pool heat exchangers
Auxiliary, service, and radwaste air conditioning systems
Containment coolers
Fire system
Circulating water screen wash
Other minor systems

RBCCW
RCP cooling
CRD feed pumps
RWCU heat exchangers
Other minor systems

TBCCW
TG electrohydraulic control cooling
Condenser vacuum coolers
MFW, condensate, and condensate booster pump coolers
Station air compressors
Other minor systems

Component Unavailability Duration: NA
Plant Operating Mode: 64% power
Discovery Method: During operation
Reactor Age: 2.86 years
Plant Type: BWR

Comments

None

Event Identifier: 373/85-045

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	Nonrecoverable

Branches Impacted and Branch Nonrecovery Estimate

PCS	1.0	Circulating water lost; cannot dump heat to the condenser
MFW	1.0	Cooling lost to feedwater, condensate, and condensate booster pumps
Condensate pumps	1.0	Cooling water lost to pumps
CRD cooling	1.0	Cooling water lost to pumps

Plant Models Utilized

BWR plant Class C

Event Identifier: 373/85-045

CONDITIONAL CORE DAMAGE CALCULATIONS

LER Number: 373/85-045
Event Description: Loss of Circ and Non-Safety Serv Water Due to Exp Jnt Fail
Event Date: 5/31/85
Plant: LaSalle 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	1.000E+00

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	1.847E-07
Total	1.847E-07
CD	
TRANS	7.182E-05
Total	7.182E-05
ATWS	
TRANS	2.034E-05
Total	2.034E-05

DOMINANT SEQUENCES

End State: CV Conditional Probability: 9.170E-08

138 TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS COND/FW.PCS -LPCS -RHR(SDC)

End State: CD Conditional Probability: 4.662E-05

102 TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW/PCS.TRANS -HPCI RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I.AND.V/RHR(SDC).RHR(SPCOOL)

End State: ATWS Conditional Probability: 2.034E-05

Event Identifier: 373/85-045

173 TRANS SCRAM SLC.OR.RODS

SEQUENCE CONDITIONAL PROBABILITIES

	Sequence	End State	Seq. Prob	Non-Recov‡‡
102	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW /PCS.TRANS -HPCI RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C. I.AND.V/RHR(SDC).RHR(SPCOOL)	CD	4.662E-05 ‡	1.151E-01
110	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW /PCS.TRANS HPCI RCIC/TRANS.OR.LOOP CRD SRV.ADS	CD	1.162E-05	2.996E-02
112	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA -HPCI RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I .AND.V/RHR(SDC).RHR(SPCOOL)	CD	1.756E-06	1.151E-01
119	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA HPCI RCIC/LOCA SRV.ADS	CD	1.146E-05	5.693E-02
138	TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS COND/FW.PCS -LPCS -RHR(SDC)	CV	9.170E-08 ‡	1.770E-01
159	TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS COND/FW.PCS -LPCS -RHR(SDC)	CV	9.044E-08	3.104E-01
173	TRANS SCRAM SLC.OR.RODS	ATWS	2.034E-05 ‡	2.181E-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:bwrctree.cmp
DATA: b:laslprob.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.142E-03	1.000E+00	
LOOP	1.305E-05	3.400E-01	
LOCA	3.250E-06	3.400E-01	
SCRAM	4.100E-04	1.000E+00	
SLC.OR.RODS	1.000E-02	1.000E+00	4.000E-02
PCS/TRANS	1.700E-01 > 1.000E+00	1.000E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	1.700E-01 > Failed		
PCS/LOCA	1.000E+00	1.000E+00	

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SRV.CHALL/TRANS.-SCRAM	1.000E+00		1.000E+00	
SRV.CHALL/TRANS.SCRAM	1.000E+00		1.000E+00	
SRV.CHALL/LOOP.-SCRAM	1.000E+00		1.000E+00	
SRV.CHALL/LOOP.SCRAM	1.000E+00		1.000E+00	
SRV.CLOSE	3.630E-02		1.000E+00	
EMER6.POWER	2.850E-03		5.100E-01	
FW/PCS.TRANS	4.600E-01	> 1.000E+00	3.400E-01	> 1.000E+00
Branch Model: 1.OF.1				
Train 1 Cond Prob:	4.600E-01	> Unavailable		
FW/PCS.LOCA	1.000E+00	> 1.000E+00	3.400E-01	> 1.000E+00
Branch Model: 1.OF.1				
Train 1 Cond Prob:	1.000E+00			
HPCI	2.000E-02		3.400E-01	
RCIC/TRANS.OR.LOOP	6.700E-02		5.700E-01	
RCIC/LOCA	1.000E+00		1.000E+00	
CRD	1.000E-02	> 1.000E+00	1.000E+00	4.000E-02
Branch Model: 1.OF.1+opr				
Train 1 Cond Prob:	1.000E-02	> Unavailable		
SRV.ADS	6.700E-03		1.000E+00	4.000E-02
COND/FW.PCS	1.000E+00	> 1.000E+00	3.400E-01	> 1.000E+00
Branch Model: 1.OF.1				
Train 1 Cond Prob:	1.000E+00			
LPCS	2.000E-02		3.400E-01	
LPCI(RHR)/LPCS	6.000E-04		3.400E-01	
RHRSW/LPCS.LPCI.TRANS	1.000E+00		1.000E+00	
RHRSW/LPCS.LPCI.LOOP	1.000E+00		1.000E+00	
RHRSW/LPCS.LPCI.LOCA	1.000E+00		1.000E+00	
RHR(SDC)	2.108E-02		3.400E-01	
RHR(SDC)/-LPCI	2.000E-02		3.400E-01	
RHR(SDC)/LPCI	1.000E+00		1.000E+00	
RHR(SPCOOL)/-LPCI.RHR(SDC)	2.000E-02		1.000E+00	
RHR(SPCOOL)/LPCI.RHR(SDC)	5.200E-01		1.000E+00	
C.1.AND.V/RHR(SDC).RHR(SPCOOL)	1.000E+00		3.400E-01	

forced

JD HARRIS
10-03-1986
10:21:35

Event Identifier: 373/85-045