B.12 LER No. 278/83-009

Event Description: Two EDGs inoperable

Date of Event: September 8, 1983

Plant: Peach Bottom 3

B.12.1 Summary

During low-power operation on September 8, 1983, with one emergency diesel generator (EDG) out for maintenance, surveillance tests were being performed on the other EDGs. During the surveillance test, the breaker between EDG E-1 and bus E-13 failed to close. The estimated increase in core damage probability, or importance, over the duration of this event is 3.5×10^{-5}. The base-case core damage probability (CDP) over the duration of the event is 5.6×10^{-7}, resulting in an estimated conditional core damage probability (CCDP) of 3.5×10^{-5}.

B.12.2 Event Description

During low-power operation on September 8, 1983, with one emergency diesel generator out for maintenance, surveillance tests were being performed on the other EDGs. During the surveillance test, the breaker between EDG E-1 and bus E-13 failed to close. The breaker failure in conjunction with the inoperable EDG which was out for maintenance required the unit to be in cold shutdown within 24 hours. The breaker was removed, and immediate testing failed to reveal the problem. The breaker was successfully tested for operability several times and was returned to service within 30 minutes.

B.12.3 Additional Event-Related Information

Peach Bottom Units 2 and 3 receive offsite power from two separate sources. If both offsite sources are lost, auxiliary power is supplied to both Unit 2 and Unit 3 from four onsite EDGs which are shared between the units. Each EDG automatically starts, but requires battery power to do so. Each EDG starts automatically on total loss of offsite power, low reactor water level, or high drywell pressure coincident with low reactor pressure. Each diesel generator can be manually started and loaded locally.

B.12.4 Modeling Assumptions

Since it is unknown how long the first EDG was out for maintenance and how long the breaker was degraded before it was discovered, it was assumed that both EDGs were inoperable for the maximum allowable period allowed by the Technical Specifications (one EDG can be inoperable for up to seven days before requiring the unit to shut down). Thus, the event was modeled as the unavailability of two EDGs [(two trains of emergency power (EP)] during a postulated loss of offsite power (LOOP) for a duration of seven days. The third train of EP was set to unavailable to reflect the EDG which was out for maintenance. The first train of EP was set to

failed to reflect the failure of the EDG breaker to close (it was assumed that this failure could have also occurred on the remaining trains of emergency power). The potential for common cause failure exists, even when a component is failed. Therefore, the conditional probability of a common cause failure was included in the analysis for those components that were assumed to have been failed as part of the postulated event.

B.12.5 Analysis Results

The estimated increase in core damage probability over the duration of this event is 3.5×10^{-5}. The base-case CDP (not shown in calculation) is 5.6×10^{-7}, resulting in an estimated CCDP of 3.5×10^{-5}. The dominant sequence involved a LOOP with successful reactor shutdown, failure of emergency power (station blackout), and failure to recover offsite power prior to battery depletion, and is highlighted on the event tree in Figure B.12.1.
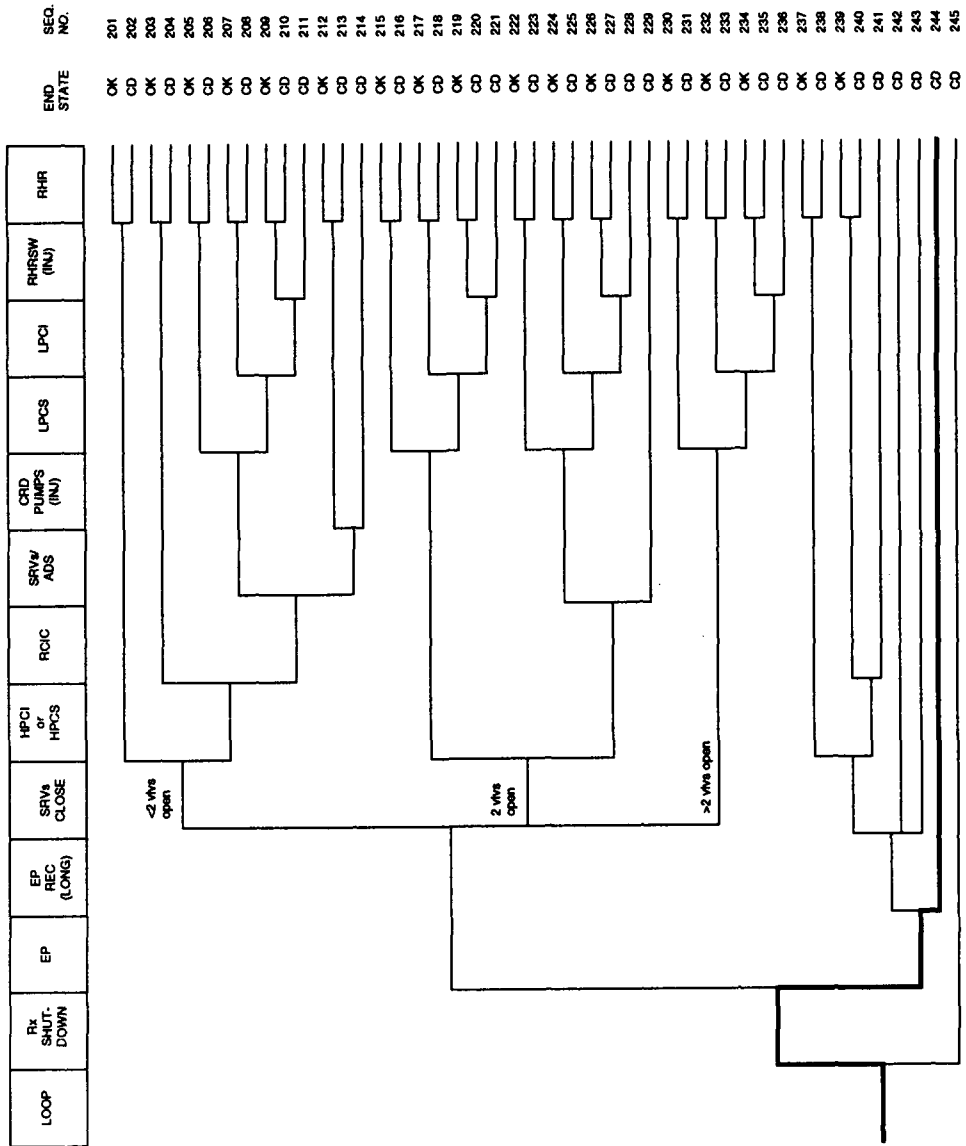
Figure B.12.1 Dominant core damage sequence for LER 278/83-009

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 278/83-009
Event Description: Two EDGs inoperable
Event Date: September.8. 1983
Plant: Peach Bottom 3

UNAVAILABILITY. DURATION= 168

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	8.1E-02
LOOP	6.4E-04
LOCA	3.7E-04

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
TRANS	0.0E+00
LOOP	3.5E-05
LOCA	0.0E+00
Total	3.5E-05

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

	Sequence	End State	Prob	N Rec**
244	loop -rx.shutdown EP ep.rec	CD	3.4E-05	2.1E-01

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

	Sequence	End State	Prob	N Rec**
244	loop -rx.shutdown EP ep.rec	CD	3.4E-05	2.1E-01

** non-recovery credit for edited case

Note: For unavailabilities. conditional probability values are differential values which reflect the added risk due to failures associated with an event. Parenthetical values indicate a reduction in risk compared to a similar period without the existing failures.

SEQUENCE MODEL:	d:\asp\models\bwrc8283.cmp
BRANCH MODEL:	d:\asp\models\peach3.82
PROBABILITY FILE:	d:\asp\models\bwr8283.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	4.8E-04	1.0E+00	
loop	1.6E-05	2.4E-01	
loca	3.3E-06	6.7E-01	
rx.shutdown	3.5E-04	1.0E-01	
pcs	1.7E-01	1.0E+00	
srv.ftc.<2	1.0E+00	1.0E+00	
srv.ftc.2	1.3E-03	1.0E+00	
srv.ftc.>2	2.2E-04	1.0E+00	
mfw	4.6E-01	3.4E-01	
hpci	2.9E-02	7.0E-01	
rcic	6.0E-02	7.0E-01	
srv.ads	3.7E-03	7.0E-01	1.0E-02
crd(inj)	1.0E-02	1.0E+00	1.0E-02
cond	1.0E+00	3.4E-01	1.0E-03
lpcs	1.7E-03	1.0E+00	
lpci	1.1E-03	1.0E+00	
rhrsw(inj)	2.0E-02	1.0E+00	1.0E-02
rhr	1.5E-04	1.6E-02	1.0E-05
rhr.and.pcs.nrec	1.5E-04	8.3E-03	1.0E-05
rhr/-lpci	0.0E+00	1.0E+00	1.0E-05
rhr/lpci	1.0E+00	1.0E+00	1.0E-05
rhr(spcool)	2.1E-03	1.0E+00	1.0E-03
rhr(spcool)/-lpci	2.0E-03	1.0E+00	1.0E-03
EP	7.5E-03 > 1.0E+00	8.7E-01	
Branch Model: 2.0F.3			
Train 1 Cond Prob:	5.0E-02 > Failed		
Train 2 Cond Prob:	5.7E-02		
Train 3 Cond Prob:	1.9E-01 > Unavailable		
ep.rec	6.1E-02	1.0E+00	
rpt	1.9E-02	1.0E+00	
slcs	2.0E-03	1.0E+00	1.0E-02
ads.inhibit	0.0E+00	1.0E+00	1.0E-02
man.depress	3.7E-03	1.0E+00	1.0E-02

* branch model file
** forced