

## B.34-1

### B.34 LER No. 335/82-040

Event Description: Reactor Trip and Loss of Grid Synchronization Due to Shorting of Generator Relay During Testing

Date of Event: September 2, 1982

Plant: St. Lucie 1

#### B.34.1 Summary

On September 2, 1982, personnel conducting a test of a generator trip relay short circuited it, which caused the generator breakers to open and a reactor/turbine trip. The spurious operation of the generator breakers allowed the unit to slip out of synchronization with the grid. Transfer of the vital buses to startup power did not occur and the emergency power system was actuated. The conditional core damage probability estimated for this event is  $3.1 \times 10^{-5}$ .

#### B.34.2 Event Description

During full power operation, a generator trip relay was briefly shorted while being tested. This caused the generator breakers to open and a synchronizing inhibit timer to start. By the time the reactor tripped due to a turbine overspeed trip, the timer had cycled, so transfer of the vital buses to startup power did not occur. The diesel generators started automatically and loaded properly. Offsite power and normal plant status were restored about 28 minutes after the short circuit occurred.

#### B.34.3 Additional Event-Related Information

A similar bus loss was reported in LER 335/79-028.

#### B.34.4 Modelling Assumptions

Since this event, in effect, isolated the plant from offsite power, it was modeled as a plant-centered loss of offsite power (LOOP). However, this is probably conservative since the event involved a failure to transfer only the vital buses. Changes to LOOP-related branch probabilities to reflect the plant-centered LOOP are shown in the following table:

### B.34-2

Branch	Description	Probability
SEAL.LOCA	Probability that an RCP seal LOCA will occur.	$4.0 \times 10^{-2}$
OFFSITE.PWR.REC/ -EP.AND-AFW	Probability of failing to recover offsite power within 2 hours given that EP and AFW are successful.	$1.4 \times 10^{-1}$
OFFSITE.PWR.REC/ -EP.AND.AFW	Probability of failing to recover offsite power within 6 hours given that EP is successful but AFW fails.	$9.9 \times 10^{-4}$
OFFSITE.PWR.REC/ SEAL.LOCA	Probability of failing to recover offsite power given the occurrence of an RCP seal LOCA.	$4.8 \times 10^{-1}$
OFFSITE.PWR.REC/ -SEAL.LOCA	Probability of failing to recover offsite power given that there is no RCP seal LOCA.	$2.2 \times 10^{-5}$

EP - emergency power  
AFW - auxiliary feedwater  
RCP - reactor coolant pump

### B.34.5 Analysis Results

The conditional core damage probability (CCDP) estimated for this event is  $3.1 \times 10^{-5}$ . The dominant core damage sequence, shown in Figure. B.34.1, involves the effective LOOP, successful reactor trip, failure of emergency power (EP), success of AFW, power-operated relief valve (PORV) challenge, and failure of the PORVs to reset.

B.34-3

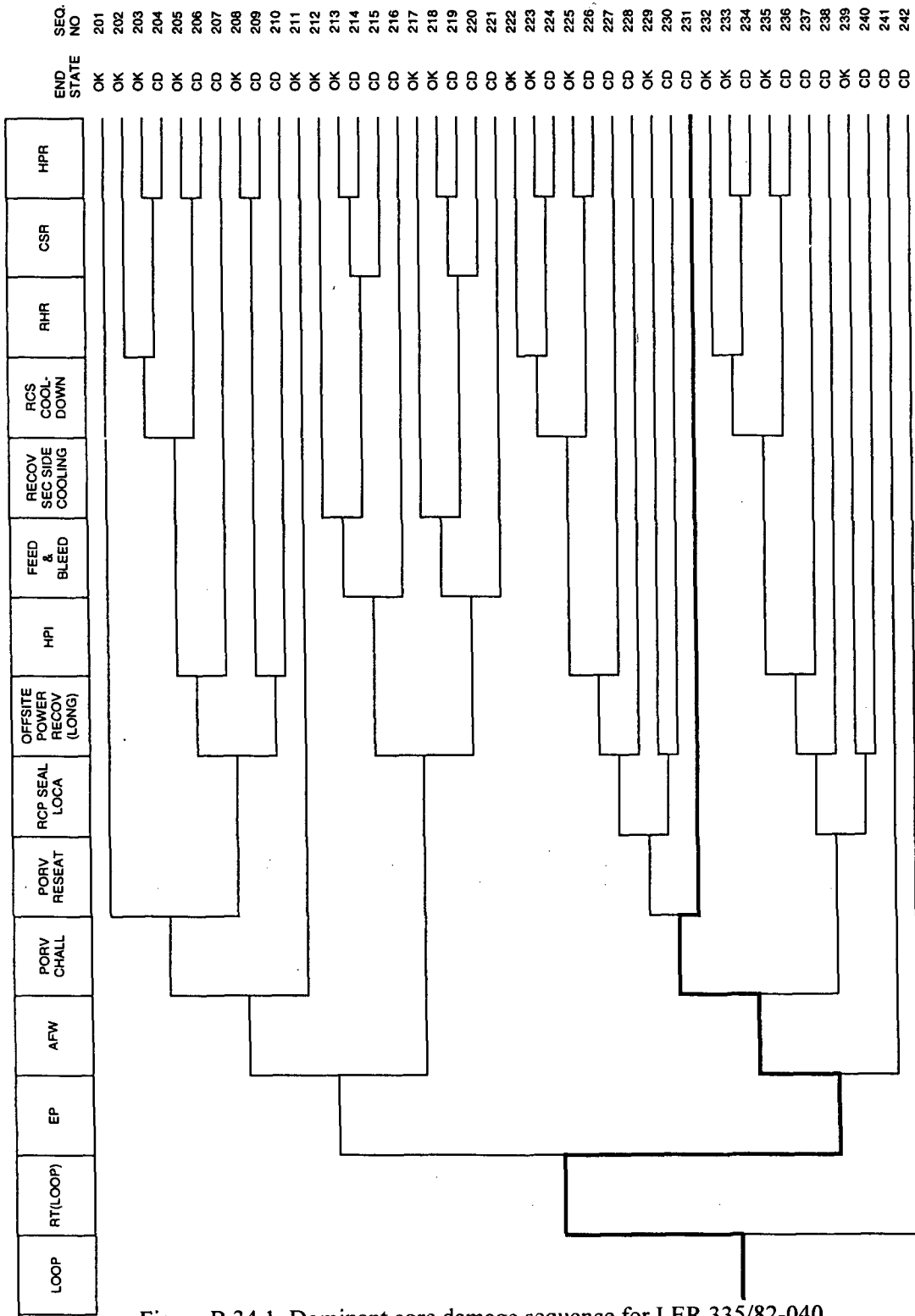


Figure B.34.1 Dominant core damage sequence for LER 335/82-040

LER No. 335/82-040

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 335/82-040  
 Event Description: Reactor trip due to shorted generator relay  
 Event Date: 9/2/82  
 Plant: St. Lucie 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

LOOP 2.1E-01

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
LOOP	3.1E-05
Total	3.1E-05

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
231 loop -rt(loop) ep -afw/ep porv.chall/sbo porv.reset/ep	CD	1.0E-05	1.8E-01
228 loop -rt(loop) ep -afw/ep porv.chall/sbo -porv.reset/ep	SEAL CD	9.9E-06	1.8E-01
.LOCA OFFSITE.PWR.REC/SEAL.LOCA			
241 loop -rt(loop) ep afw/ep	CD	9.1E-06	6.4E-02
216 loop -rt(loop) -ep afw -OFFSITE.PWR.REC/-EP.AND.AFW feed.bleed	CD	1.1E-06	9.4E-02

\*\* non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

Sequence	End State	Prob	N Rec**
216 loop -rt(loop) -ep afw -OFFSITE.PWR.REC/-EP.AND.AFW feed.bleed	CD	1.1E-06	9.4E-02
228 loop -rt(loop) ep -afw/ep porv.chall/sbo -porv.reset/ep	SEAL CD	9.9E-06	1.8E-01
.LOCA OFFSITE.PWR.REC/SEAL.LOCA			
231 loop -rt(loop) ep -afw/ep porv.chall/sbo porv.reset/ep	CD	1.0E-05	1.8E-01
241 loop -rt(loop) ep afw/ep	CD	9.1E-06	6.4E-02

\*\* non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\models\pwr8283.cmp  
 BRANCH MODEL: c:\asp\models\slucie1.82  
 PROBABILITY FILE: c:\asp\models\pwr8283.pro

No Recovery Limit

B.34-5

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	7.2E-04	1.0E+00	
loop	6.7E-05	2.1E-01	
loca	2.4E-06	5.4E-01	
sgtr	1.6E-06	1.0E+00	
rt	2.8E-04	1.0E-01	
rt(loop)	0.0E+00	1.0E+00	
afw	3.8E-04	4.5E-01	
afw/atws	4.3E-03	1.0E+00	
afw/ep	5.0E-02	3.4E-01	
mfw	1.9E-01	3.4E-01	
porv.chall	4.0E-02	1.0E+00	
porv.chall/afw	1.0E+00	1.0E+00	
porv.chall/loop	1.0E-01	1.0E+00	
porv.chall/sbo	1.0E+00	1.0E+00	
porv.reset	2.0E-02	1.1E-02	
porv.reset/ep	2.0E-02	1.0E+00	
srv.reset(atws)	1.0E-01	1.0E+00	
hpi	3.0E-04	8.9E-01	
feed.bleed	2.0E-02	1.0E+00	1.0E-02
emrg.boration	0.0E+00	1.0E+00	1.0E-02
recov.sec.cool	2.0E-01	1.0E+00	
recov.sec.cool/offsite.pwr	3.4E-01	1.0E+00	
rscs.cooldown	3.0E-03	1.0E+00	1.0E-03
rhr	8.0E-03	7.0E-02	1.0E-03
csr	4.0E-03	1.0E+00	1.0E-03
hpr	1.5E-04	1.0E+00	
ep	2.9E-03	8.9E-01	
SEAL.LOCA	4.8E-02 > 4.0E-02	1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	4.8E-02 > 4.0E-02		
OFFSITE.PWR.REC/-EP.AND.-AFW	2.5E-01 > 1.4E-01	1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	2.5E-01 > 1.4E-01		
OFFSITE.PWR.REC/-EP.AND.AFW	5.7E-02 > 9.9E-04	1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	5.7E-02 > 9.9E-04		
OFFSITE.PWR.REC/SEAL.LOCA	6.0E-01 > 4.8E-01	1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	6.0E-01 > 4.8E-01		
OFFSITE.PWR.REC/-SEAL.LOCA	1.1E-02 > 2.2E-05	1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	1.1E-02 > 2.2E-05		
sg.iso.and.rscs.cooldown	1.0E-02	1.0E-01	
rscs.cool.below.rhr	3.0E-03	1.0E+00	3.0E-03
prim.press.limited	8.8E-03	1.0E+00	

\* branch model file  
 \*\* forced