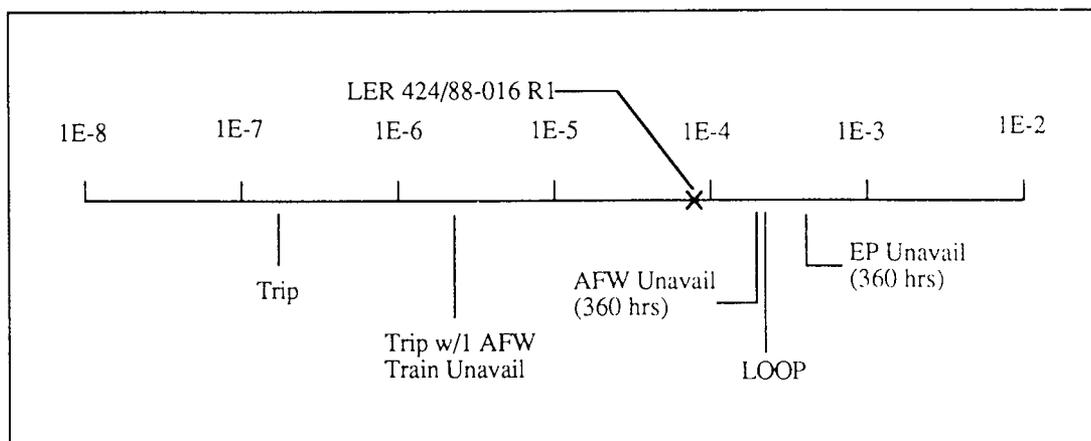


Accident Sequence Precursor Program Event Analysis

LER No: 424/88-016 R1
 Event Description: Water leakage into control room causes spurious PORV lift
 Date of Event: June 3, 1988
 Plant: Vogtle 1

Summary

Water from a leak-off valve associated with a spuriously activated fire header flowed through unsealed control room penetrations and dripped on control room cabinets, resulting in a spurious PORV lift. The core damage probability estimated for the event is 8.0×10^{-5} . The relative significance of this event compared with other potential events at Vogtle 1 is shown below.



Event Description

During the course of air balancing, an outside air damper was opened. It is believed that the cooler outside activated a thermostatically controlled heater. The initial burnoff of accumulated dust and debris from the heater generated enough smoke to activate the area smoke detectors and charge the sprinkler system headers. Although the sprinklers did not actuate, water collected on the floor via leakage through 3/8-in. leakoff valves located immediately downstream of the deluge valves. A high point in the hall floor caused water to flow into the upper cable spreading room instead of the area floor drain. The water subsequently flowed around unsealed cable penetrations in the floor and seeped through the ceiling of the control room, where it

dripped into various process panel cabinets. About 25 min after the smoke alarms were received, the control room received a pressurizer high-level deviation alarm, and the pressurizer backup heaters began to cycle. Operators responded by placing the pressurizer backup heaters in manual control. Nineteen minutes later, a power-operated relief valve spuriously opened for 5 s until it was manually closed. Operators subsequently closed the corresponding PORV block valve and declared the PORV inoperable. About an hour after the smoke alarms were received, operators recognized that water was leaking into the process panels and directed technicians to cover the panels with plastic and dry the affected areas.

The event was caused by ~1/2 to 1 gal of water leaking under embedded angles and past the foam in penetrations in the ceiling of the control room. Silicon sealant was placed to block the seepage path.

Event-Related Plant Design Information

The as-built floor design assumed that embedded steel angles would maintain a watertight seal with the concrete floor slab after being seal-welded to the penetration's upper angle iron assembly. A series of tests was performed to determine the effectiveness of the newly sealed penetrations. Even after sealing, some leakage (several drops per minute) was still observed through the inside of the cable bundle.

ASP Modeling Assumptions and Approach

This event has been modeled as a loss of coolant accident initiated by the spurious PORV lift. The likelihood of nonrecovery was assumed to be 0.04. If the PORVs had not been quickly closed, a plant trip and safety injection would have been expected to occur.

Analysis Results

The conditional probability of core damage is estimated to be 8.0×10^{-5} . Two sequences, involving the potential loss of high-pressure injection and recirculation, contribute to this event. In the first sequence (highlighted on the following event tree), the open PORV is not closed and results in a small-break LOCA requiring mitigation ($p = 0.04$). Following this, high-pressure recirculation fails ($p = 1.5 \times 10^{-4}$) following successful high-pressure injection. The second sequence is similar but involves failure of high-pressure injection ($p = 8.4 \times 10^{-4}$). [It should be noted that Georgia Power Co. experienced a similar problem at its Hatch 1 facility (see LER 321/85-018).]

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 424/88-016
 Event Description: Water leakage into control room causes PORV lift
 Event Date: 06/03/88
 Plant: Vogtle 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

LOCA 4.0E-02

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
LOCA	8.0E-05
Total	8.0E-05

ATWS

LOCA	1.3E-06
Total	1.3E-06

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
71 LOCA -rt -afw -hpi hpr/-hpi	CD	4.6E-05	4.0E-02
72 LOCA -rt -afw hpi	CD	3.4E-05	3.4E-02
78 LOCA rt	ATWS	1.3E-06	4.8E-03

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

Sequence	End State	Prob	N Rec**
71 LOCA -rt -afw -hpi hpr/-hpi	CD	4.6E-05	4.0E-02
72 LOCA -rt -afw hpi	CD	3.4E-05	3.4E-02
78 LOCA rt	ATWS	1.3E-06	4.8E-03

** non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\sealmod\pwrseal.cmp
 BRANCH MODEL: c:\asp\sealmod\vogtle.s11
 PROBABILITY FILE: c:\asp\sealmod\pwr_bs11.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	1.8E-03	1.0E+00	
loop	1.6E-05	5.3E-01	
LOCA	2.4E-06 > 2.4E-06	4.3E-01 > 4.0E-02	
Branch Model: INITOR			
Initiator Freq:			
rt	2.4E-06	1.2E-01	
rt/loop	2.8E-04	1.0E+00	
emerg.power	0.0E+00	8.0E-01	
afw	2.9E-03	2.6E-01	
afw/emerg.power	3.8E-04	3.4E-01	
mfw	5.0E-02	7.0E-02	1.0E-03
	1.0E+00		

Event Identifier: 424/88-016

porv.or.srv.chall	4.0E-02	1.0E+00	
porv.or.srv.reset	2.0E-02	1.1E-02	
porv.or.srv.reset/emerg.power	2.0E-02	1.0E+00	
seal.loca	2.7E-01	1.0E+00	
ep.rec(sl)	5.7E-01	1.0E+00	
ep.rec	3.7E-02	1.0E+00	
hpi	1.0E-03	8.4E-01	
hpi(f/b)	1.0E-03	8.4E-01	1.0E-02
hpr/-hpi	1.5E-04	1.0E+00	1.0E-03
porv.open	1.0E-02	1.0E+00	4.0E-04

* branch model file
** forced

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