

PRECURSOR DESCRIPTION AND DATA

NSIC Accession Number: 164149

Date: February 12, 1981

Title: Isolable Small Break LOCA at Robinson 2

The failure sequence was:

1. With the plant at 100%, the "A" electrohydraulic control oil pump developed a seal leak and a plant shutdown was begun. The "B" EHC pump was already out of service because of vibration problems.
2. The "B" feedwater and condensate pumps were stopped due to erratic feedwater pump behavior.
3. Immediately following the opening of the generator output breakers (6% power), the turbine governor valve spiked open (apparently due to the electrohydraulic problems) and generated a momentary high steam flow signal. This, in combination with an existing low T signal resulted in train B safeguards initiation. (Train A did not initiate nor did the MSIVs close, apparently because of the short duration of the high steam flow signal). The SI signal tripped the reactor.
4. The "A" SI train was manually actuated and the MSIVs were closed.
5. The "A" containment fire alarm was received shortly after the SI actuation.
6. During the automatic isolation of the letdown line on safety injection, relief valve CVC-RV-203 bellows ruptured, either because of the relatively slower closure of valves upstream of the relief valve compared with those downstream of it, or because of leakage past the upstream valves. In addition, a pressure surge due to the isolation valves closing caused a drain cap on a partially open drain valve to be blown off.
7. Having determined that a spurious SI had occurred and unaware of the above failure, the operators reset SI and feedwater isolation and restored letdown.
8. Containment pressure and dewpoint increased and RCS pressure decreased. Letdown was secured approximately 15 min later. A containment entry was made in an attempt to determine the leakage path. Approximately 3000 gallons of water were in the containment sump at that time.
9. After letdown was isolated, pressurizer pressure continued to decrease. A second safety injection occurred on low pressure. Both trains of safeguards equipment actuated.
10. Four hours after the first containment entry a second entry was made and the leaking drain line identified. The two upstream level control valves were leaking at approximately 5-7 gpm. The drain valve was closed.

11. After the drain valve was closed RCS pressure still continued to decrease in part as a result of a partially opened pressurizer spray valve. (The pressurizer spray valve position is indicated by demand in lieu of stem position, which delayed identification of the cause of the depressurization.)
12. The leak rate could not be accurately determined but it was estimated to have been approximately 100 gpm while letdown was unisolated. A total of about 4500 to 6000 gallons of water was leaked to the containment sump during the event.

Corrective action:

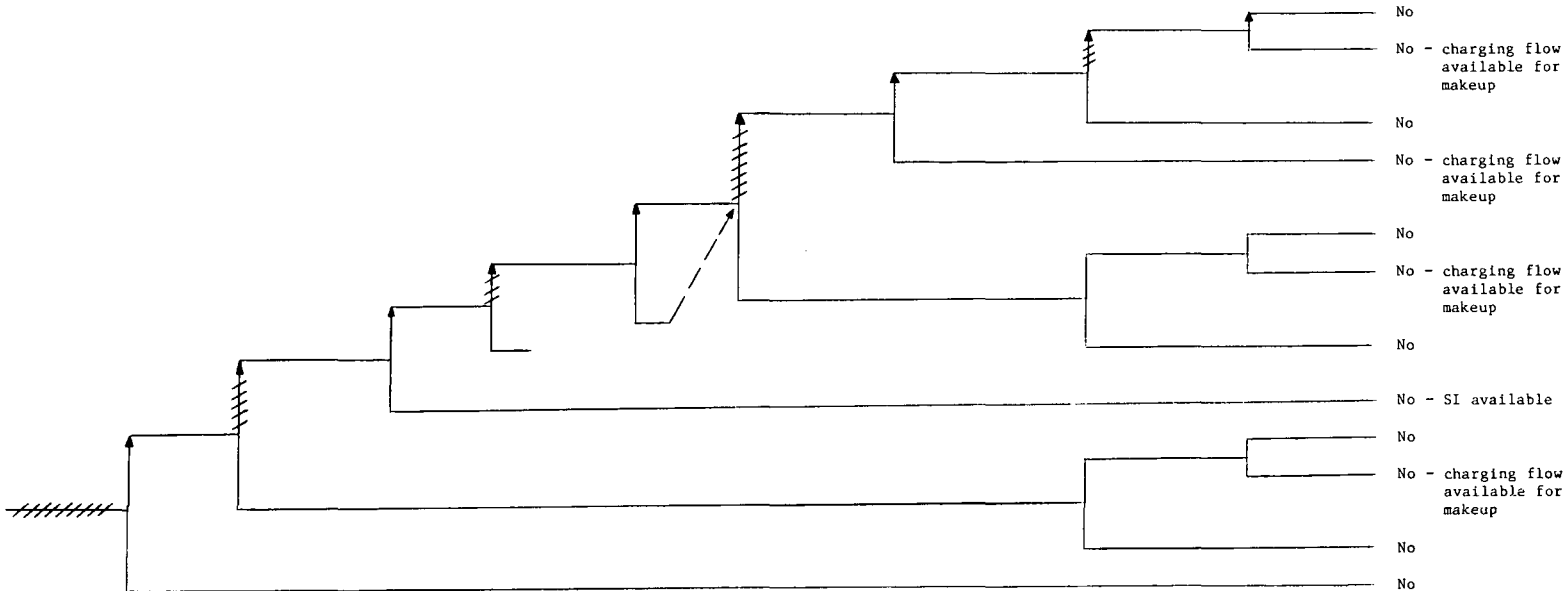
1. The leaking drain valve was closed and a new pipe cap installed. All other similar valve/pipe cap combinations were verified closed.
2. Corrective action concerning the failed relief valve was not identified.

Design purpose of failed system or component:

The reactor coolant system transfers heat generated in the core to the steam generators. The letdown line provides a means of removing reactor coolant from the RCS for boron concentration changes and for purification.

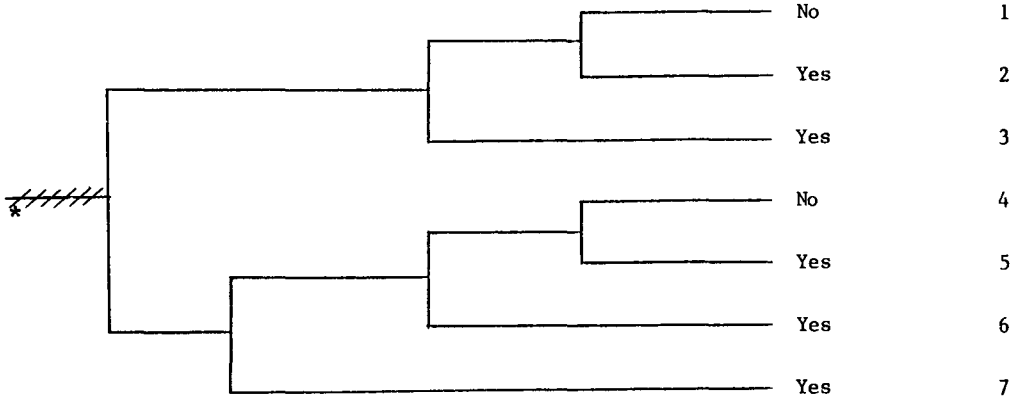
Reactor at 100% power and secondary side problems result in train B SI signal and reactor trip	Train A safety injection initiated and MSIVs closed	CVCS pressure surges and slow valve closures result in CVCS relief valve bellows failure and drain valve pipe cap failure	SI reset and letdown restored	RCS pressure decrease due to unisolated CVCS leakage paths (~3000 gal in 15 min)	Letdown isolated	Pressurizer pressure continues to decrease due to leakage flow through closed CVCS valves, second safety injection	Second containment entry made and failed relief valve and open drain line identified; drain line closed; additional letdown isolation valve closed	Continued reduction in RCS pressure due in part to leaking pressurizer spray valve	Leaking pressurizer spray valve identified by stopping RC pumps B and C
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Potential Severe Core Damage



NSIC 164149 - Actual Occurrence for Isolable Small Break LOCA at Robinson 2

Small LOCA	Reactor Trip	Auxiliary Feedwater and Secondary Heat Removal	High Pressure Injection	Low Pressure Recirculation and LPR/HPI Cross-Connect	Potential Severe Core Damage	Sequence No.
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NSIC 164149 - Sequence of Interest for Isolable Small Break LOCA at Robinson 2

*auto isolation on safety injection closure of upstream valves

CATEGORIZATION OF ACCIDENT SEQUENCE PRECURSORS

NSIC ACCESSION NUMBER: 164149

LER NO.: 81-005

DATE OF LER: February 12, 1981

DATE OF EVENT: January 29, 1981

SYSTEM INVOLVED: Containment chemical volume control system

COMPONENT INVOLVED: Relief valve, drain valve, pipe cap, pressurizer
spray valve

CAUSE: Bellows rupture, drain valve vibrated open, pipe cap blew off,
leaking spray valve

SEQUENCE OF INTEREST: Small break LOCA

ACTUAL OCCURRENCE: Small break LOCA

REACTOR NAME: H. B. Robinson 2

DOCKET NUMBER: 50-261

REACTOR TYPE: PWR

DESIGN ELECTRICAL RATING: 700 MWe

REACTOR AGE: 10.4 years

VENDOR: Westinghouse

ARCHITECT-ENGINEERS: Ebasco

OPERATORS: Carolina Power & Light

LOCATION: 5 miles NW of Hartsville, South Carolina

DURATION: N/A

PLANT OPERATING CONDITION: 100% power (6% at time of trip)

TYPE OF FAILURE: Small LOCA

DISCOVERY METHOD: Operational event

COMMENT: Additional information: "Engineering Evaluation of the H. B.
Robinson Reactor Coolant System leak on January 29, 1981,"
Office for Analysis and Evaluation of Operational Data, March
23, 1981.