PRECURSOR DESCRIPTION AND DATA

NSIC Accession Number: 103077

Date: May 12, 1975

Title: Reactor Coolant Pump Seal System Fails at Robinson 2

The failure sequence was:

1. The plant was at power and diluting for xenon control. The number 1 seal for the "C" RCP was exhibiting gradual flow variations with all additions of RCS makeup water.
2. The "C" RCP No. 1 seal leakoff spiked several times, oscillated full range several times, then stabilized with a seal flow greater than 6 gpm.
3. Plant load was reduced at 10%/minute to 36% power and the "C" pump idled.
4. Reactor trip occurred due to turbine trip on high steam generator level, resulting from the rapid load reduction and use of steam dump for cooldown.

(See additional page)

Corrective action;

1. New seals were installed on RCP "C".

Design purpose of failed system or component:

1. The RCP seals provide a barrier at the point at which the pump shaft enters the RCS which prevents reactor coolant from escaping into the containment.

Unavailability of system per WASH 1400:

Unavailability of component per WASH 1400:* not considered in WASH-1400.

*Unavailabilities are in units of per demand D^{-1}. Failure rates are in units of per hour HR^{-1}.

The failure sequence was: (Continued)

5. The flow control valve in the combined return line from the three RCP thermal barrier cooling lines closed due to high flow caused by cooling water flashing in the "C" RCP thermal barrier. The flashing was caused by hot primary coolant flowing upward through the "C" RCP thermal barrier. Closure of the flow control valve resulted in loss of thermal barrier cooling in all three RCPs.

6. Reactor coolant pumps "A" and "B" were stopped because flashing in the seal return line threatened to cause loss of seal flow due to pressure surges. The flashing was caused by the high primary flow rate through the No. 1 seal of RCP "C".

7. The RCP "C" No. 1 seal return flow isolation valve was closed to decrease pressure surges in the letdown line.

8. Seal flow was lost on RCP "A" and "B".

9. Leakage through RCP "C" No. 2 seal resulted in high Reactor Cooldown Drain Tank (RCDT) pressures. The RCDT was drained to the containment sump.

10. The flow control valve in the combined return line from the three RCP thermal barriers was blocked open, restoring thermal barrier cooling on all three RCPs.

11. Reactor coolant pump "C" was started with increased seal flow and RCS cooldown was started using condenser dump.

12. A high standpipe alarm was received for RCP "C" and the pump was stopped.

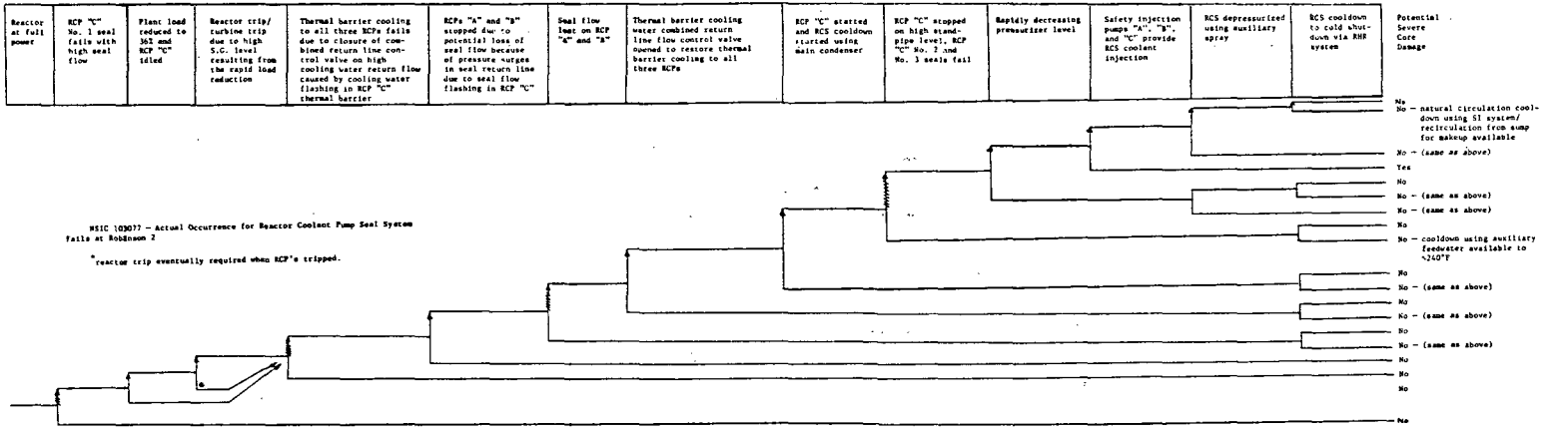
13. Rapidly falling pressurizer level indicated failure of RCP "C" No. 2 and No. 3 seals.

14. Safety injection pumps "A", "B", and "C" were started to makeup for rapidly decreasing pressurizer level. Pressurizer level stabilized and SI pump "C" was stopped.

15. Auxiliary pressurizer spray was used to reduce plant pressure to the operating pressure of the RHR system. During this pressure reduction, the SI Accumulators partially discharged into the RCS before their isolation valves were closed.

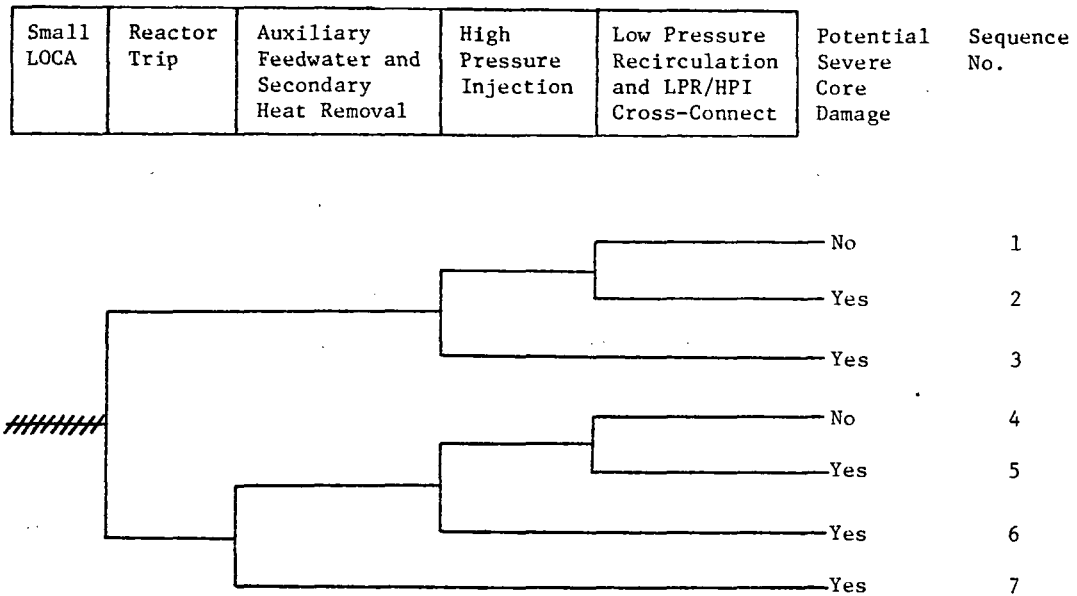
16. Cooldown via the RHR system was used to achieve cold shutdown. Final conditions were: RCS pressure — 0 psig; RCS temperature — <200°F; Containment temperature — 100°F; 132,500 gallons of water in containment.

NOTE: Based on system response to the use of auxiliary spray, CP&L concluded that a second steam bubble existed in the system, probably in the steam generator tubes, since little gas or steam escaped when the vessel head was later vented.



NSIC 103077 — Actual Occurrence for Reactor Coolant Pump Seal System Fails at Robinson 2

* reactor trip eventually required when RCP's tripped.



NSIC 103077 — Sequence of Interest for Reactor Coolant Pump Seal System Fails at Robinson 2

CATEGORIZATION OF ACCIDENT SEQUENCE PRECURSORS

NSIC ACCESSION NUMBER: 103077

DATE OF LER: May 12, 1975

DATE OF EVENT: May 1, 1975

SYSTEM INVOLVED: Reactor Coolant System

COMPONENT INVOLVED: RCP seals

CAUSE: Seal failure due to a defective seal

SEQUENCE OF INTEREST: Small LOCA

ACTUAL OCCURRENCE: RCP Seal Failure

REACTOR NAME: H. B. Robinson 2

DOCKET NUMBER: 50-261

REACTOR TYPE: PWR

DESIGN ELECTRICAL RATING: 700 MWe

REACTOR AGE: 4.9 yr

VENDOR: Westinghouse

ARCHITECT-ENGINEERS: Ebasco

OPERATORS: Carolina Power & Light Co.

LOCATION: 5 miles NW of Hartsville, SC

DURATION: N/A

PLANT OPERATING CONDITION: At full power

SAFETY FEATURE TYPE OF FAILURE: (a) inadequate performance; (b) failed to start; (c) made inoperable; (d) failed to function

DISCOVERY METHOD: during operation

COMMENT: —