

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-311/87-03

Docket Nos. 50-311

License Nos. DPR-75

Licensee: Public Service Electric and Gas Company
80 Park Plaza
Newark, New Jersey 07101

Facility Name: Salem Nuclear Generating Station - Unit 2

Inspection At: Hancock's Bridge, New Jersey

Inspection Conducted: January 12, 1987 - January 23, 1987

Inspectors: T. J. Kenny, Senior Resident Inspector
K. H. Gibson, Resident Inspector

Reviewed by: R. J. Summers, Project Engineer
Reactor Projects Section No. 2B, DRP

2/6/87
date

Approved by: L. J. Norrholm, Chief, Reactor Projects
Section No. 2B, Projects Branch No. 2, DRP

2/6/87
date

Inspection Summary:

Inspections on January 12, 1987 - January 23, 1987 (Inspection Report
Number 50-311/87-03)

Areas Inspected: This special report documents the resident inspectors' review of licensee actions taken as a result of the identification, by the licensee, of Salem Unit 2 operation outside the design basis analysis as described in IE Information Notice 87-01. The inspection involved 24 inspector hours by the resident NRC inspectors.

Results: One apparent violation was identified as described in paragraph 4 of this report.

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DETAILS

1. Introduction

- 1.1 The Residual Heat Removal (RHR) System at Salem serves in two capacities.

As an RHR System the system utilizes two pumps with two coolers and their associated valves to cool the reactor following a shutdown of the Reactor Coolant System (RCS). The system can be considered two separate subsystems.

As part of the Emergency Core Cooling System (ECCS) the RHR system utilizes two pumps (considered low head safety injection pumps) valves and piping to deliver water from the refueling water storage tank or containment sump to four cold legs of the RCS. The system cannot be considered two separate subsystems as far as injection into the four cold legs is considered. However, one RHR pump may be taken out of service in accordance with Technical Specifications.

- 1.2 On January 13, 1987, Salem Unit 2 was operating at 95% power with the RHR system available as ECCS when, following review of IE Information Notice 87-01, the licensee discovered that the RHR system alignment associated with an RHR pump and valves tagged for maintenance possibly placed the unit in a condition outside of the ECCS design basis analysis. This report discusses the licensee's actions and NRC followup.

2. Persons Contacted

Within this report period, interviews and discussions were conducted with members of licensee management and staff as necessary to support inspection activity.

3. Documents Reviewed

- Salem Unit 2 Technical Specifications
- Salem - UFSAR, Revision 5, dated July 25, 1986
- Control Room Operator's Logs January 12, 1987 to January 14, 1987
- Integrated Operating Procedure IOP-2 Cold Shutdown to Hot Standby
- SP(O)4.4.7.2.1(d) Emergency Core Cooling System - ECCS Subsystems
- Tagging Request No. 41273 dated January 13, 1987
- Temporary/Partial Release No. 41273-T0 dated January 13, 1987

- Temporary/Partial Release No. 41273-TI dated January 13, 1987
- Salem - FSAR, Amendment 43, dated March 6, 1980
- PSE&G Technical Training Manual
- Nuclear Network 1986 Summary dated October 3, 1986
- Operations Department Information Directive 87-02 dated January 14, 1987
- Fact Finder on IE Notice 87-01 (Draft, Compiled by Licensee task force)

4. Description of Event

On January 12, 1987, Salem Unit 2 was in Mode 1 and operating at 95% reactor power. No. 21 RHR pump was run in accordance with Operations Directive - 10 to prove the pump operable prior to removing the No. 22 RHR pump (redundant train) from service.

At 11:42 p.m. on January 12, 1987, the licensee removed the No. 22 RHR pump from service and entered Unit 2 Technical Specification 3.5.2.d Action (a) for inoperability of one of two RHR pumps. The Action Statement requires return to operability of the RHR pump within 72 hours or be in hot shutdown within the next 12 hours. The licensee's intent was to take advantage of the 72 hour time frame afforded by the action statement to perform preventive maintenance which consisted of repacking 28 valves in the No. 22 RHR flowpath with Chesterton packing. At approximately 8:00 a.m. on January 13, 1987, Group Tagging Request No. 41273 was completed which made certain valves in the RHR flowpath inoperable. Two of these were 22SJ49 (RHR discharge to Nos. 22 and 24 RCS cold legs) and 22RH19 (RHR loop crosstie valve). The maintenance department then commenced removing the packing from the valves designated to be repacked. From a production standpoint, it was decided to unpack all the valves first, then repack them with the Chesterton packing. Three crews of two people each were assigned to this work. At approximately 5:00 p.m. the Assistant General Manager (AGM) - Salem received in his mail IE Information Notice (IN) No. 87-01 "RHR Valve Misalignment Causes Degradation of ECCS in PWRs" dated January 6, 1987. The IN describes a lineup in which closure of certain valves in the RHR system would result in isolation of RHR flow to two of the four RCS cold legs. This lineup could put the facility in an unanalyzed condition if the licensing basis for ECCS analysis assumed that all four RCS cold legs are being supplied by at least one RHR pump.

Following review of the IN and recognizing that RHR work was being done in Unit 2, the AGM contacted Operations department personnel and directed them to determine the applicability of the IN to Salem Unit 2.

At 5:33 p.m., the licensee determined that Unit 2 RHR system was configured as described in the IN (i.e. RHR flow to two of the four RCS cold legs was isolated). However, the licensee did not know if the design bases assumed injection to all 4 cold legs. As a precautionary measure, the licensee commenced a load decrease of Unit 2 in accordance with Technical Specification 3.0.3 which requires placing the unit in a mode in which the specification does not apply when an LCO is not met and the condition is not provided for in the associated action statement(s). At 5:44 p.m. the licensee made a 1 hour notification to the NRC via ENS in accordance with 10 CFR 50.72(b)(1)(ii)(B) due to the plant being in a condition that is outside the design basis. The call was made as a precautionary measure in that the licensee did not know at the time whether the design bases analysis included RHR injection into all four loops.

In order to return the RHR system to a configuration which would provide flow to all four RCS cold legs (with one RHR pump tagged out), the licensee determined that valves 22SJ49 and 22RH19 and their associated breakers needed to be put back to their normal alignment. Valve 22RH14 was chosen as an alternate blocking point to 22SJ49 which needed to be realigned (opened). At this point, 20 of the 28 valves had been unpacked, six of which had to be repacked to return the valves and the RHR flowpath to operability. The maintenance crews (3 crews/2 people each) were redirected to install the Chesterton packing into these six valves in as timely a manner as possible.

At approximately 7:29 p.m., the repacking of the six valves was completed and Temporary/Partial Tagging Release No. 41273-T0 was approved by the Unit 2 Shift Supervisor to return valves 22SJ49, 22RH19, their associated breakers, and drain valve 22RH70 to their normal position returning the RHR flowpath to operable status.

By 8:40 p.m., the RHR flowpath to all four RCS cold legs was restored. The load reduction of Unit 2 (reactor power at 60%) was terminated and the licensee exited Technical Specification 3.0.3.

The inspector attended two licensee meetings regarding IN 87-01. One involved a conference call with Westinghouse engineers and the other was a plant staff meeting. Applicability of IN 87-01 to the Salem ECCS design bases was discussed along with followup actions to ensure future compliance once the design bases were confirmed. Following the meetings, the AGM formally notified the NRC via the resident inspector that Unit 2 had in fact operated outside of the design bases assumed in the Salem FSAR, while having RHR injection to two RCS loops isolated (injection to all four loops required) for the time period the 22SJ49 and 22RH19 valves were tagged closed. Further, the licensee notified the inspector that Technical Specification Surveillance 4.5.2 which demonstrates ECCS operability by verifying valve positions was also violated during this time period. The surveillance test, which involves in part verifying that valve 22SJ49 is open with power to the valve operator removed, was performed twice by two different reactor operators (RO). However, the valve

was closed and the breaker open as discussed previously. Both RO's, in performing the surveillance, noted in the logs that the valve was not in its required position. The two RO's and the SRO (Shift Supervisor) who originally authorized the tagging request failed to recognize that closing the 22SJ49 valve was in violation of the Technical Specifications.

Technical Specification Limiting Condition for Operation (LCO) 3.5.2 requires in Modes 1, 2, and 3 that two independent emergency core cooling system (ECCS) subsystems be operable with each subsystem comprised in part of a residual heat removal (RHR) pump and an operable flow path.

Technical Specification LCO 3.0.3 requires that when a Limiting Condition for Operation and/or associated action requirements cannot be satisfied, the reactor be placed in at least hot standby within one hour.

The operability for the RHR system flow path for a loss of coolant accident is described in Salem Updated Final Safety Analysis Report (FSAR) Section 6.3 which indicates that RHR flow will be injected into all four cold legs of the reactor coolant system.

On January 12 and 13, 1987 while in Mode 1, for twenty hours and fifty eight minutes, portions of two ECCS subsystems (the RHR system) were inoperable when valve 22SJ49 was closed. With valve 22SJ49 closed, the flow path for RHR cold leg injection is to only two of the four reactor coolant system cold legs.

This is an apparent violation of Technical Specifications (311/87-03-01).

5. Licensee Followup

The licensee identified the following items to investigate and resolve as necessary.

5.1 The licensee became aware of the problem as a result of receipt and review of IN 87-01. According to the IN, this problem was first identified in May, 1985 and occurred twice since then. Therefore, the licensee decided to investigate whether they may have received information earlier from other sources such as INPO or Westinghouse that could have alerted them to the problem.

A Nuclear Network 1986 Executive Summary dated October 3, 1986 listed Nuclear Department, Salem and Hope Creek management personnel for distribution. This document was distributed within the licensee's organization for informational purposes. The summary included an INPO Notepad description of an event which occurred on September 12, 1986 at D.C. Cook plant where intermediate head safety injection crosstie valves were closed in support of maintenance activities, isolating injection to 2 RCS cold legs and rendering the plant outside of its design basis. The document also addressed the RHR system as being in the same category. It appears that the licensee

did not recognize the D.C. Cook event as applicable to the Salem units. Following the Salem event, the licensee called the D.C. Cook plant and discussed the similarities of the events. As a result, the licensee is in the process of drafting a letter to NRR to take similar actions as D.C. Cook. These actions would allow certain of the isolation valves and crosstie valves to be closed for testing purposes provided they are re-opened within one hour.

The licensee also identified that injection into four loops is also required in Mode 4 operation.

- 5.2 The licensee reviewed operating and surveillance procedures relative to ECCS to determine whether performance of the procedures would result in misalignment of the RHR system valves and isolation of cold leg injection flow paths with the following results.

Every three months the RH19 and SJ49 valves are stroke time tested to meet the surveillance requirements for inservice testing of ASME components specified in Technical Specification 4.0.5. As a result, the valves are cycled closed for short periods of time. The valves are tested in Modes 1 through 4.

On twelve month (Unit 1) and nine month (Unit 2) intervals, during RCS pressure boundary check valve testing the SJ49 valves are closed to prevent the Refueling Water Storage Tank from draining to the waste system through the test lines while testing the SJ56 valves. Pressure boundary testing is normally performed in Mode 4, but had been done in Mode 3 in the past.

Verification of ECCS Subsystem valve alignment is performed prior to entering Mode 4. The procedure requires that one of the SJ49 valves be verified open and does not address the verification of the position of the RH19 valves. This indicates that misalignment of these valves could occur in Mode 4. Surveillance Procedure SP(O)4.5.3.1 was revised to require both RH19 and SJ49 valves be open prior to entry into Mode 4.

- 5.3 The licensee reviewed past maintenance or surveillance history records to determine how many times and for how long they may have been in the unanalyzed condition previously.

The licensee reviewed available Incident Reports and tagging computer records which indicate that the RHR system valves have been misaligned in the past. However, the records did not contain specific information as to the number and lengths of time the unanalyzed condition may have existed.

- 5.4 The licensee investigated operator understanding of the RHR system design basis as part of ECCS and the definition of operability relative to Technical Specification Surveillance 4.5.2.

SRO's and RO's questioned by both licensee management and the inspectors stated that they thought each "train" of RHR consisted of one pump, one heat exchanger, and injection into two RCS cold legs. RHR function as part of ECCS does not appear to be focused on in training as much as the residual heat removal function of the system for shutdown cooling where discharge can be into only two of the cold legs. Neither the UFSAR nor the Technical Specifications clearly state that a single RHR flowpath (i.e. one RHR pump) requires injection into all four cold legs.

The licensee issued an Operations Department Information Directive to all licensed operators which contained a copy of IN 87-01 and a Technical Specification interpretation defining the requirements for an operable flowpath for RHR as an ECCS subsystem. The directive is an interim measure until the Technical Specifications are clarified.

6. NRC Followup

The inspectors reviewed licensee documentation, held discussions with licensee personnel, and attended licensee meetings and conference calls with Westinghouse (NSSS) in followup of the event and licensee actions.

The following are items that have not yet been resolved by the licensee. The inspectors will follow licensee actions concerning these items as they are completed.

6.1 Address outstanding task force recommendations denoted in the Fact Finder report as follows:

- Engineering should review all Technical Specifications associated with ECCS flow paths. These Technical Specifications should be revised to clearly identify what is required and what action should be taken if one or more of the four injection paths become inoperable (311/87-03-02)
- Operations should issue an interpretation on Technical Specification 3.5.2 as an interim measure until the Technical Specification is changed. (Complete as discussed in Section 5.4)
- PS&G Licensing should pursue obtaining approval from the NRC to allow entry into Technical Specification 3.0.3 for testing purposes. (311/87-03-03)
- Engineering should review the UFSAR and revise as necessary to insure that it states clearly that each ECCS Subsystem must be capable of injecting to all four cold legs. (311/87-03-04)

6.2 Determine whether the Operating Experience Review Program encompassed the notepad notice concerning the D.C. Cook incident. (311/87-03-05)

- 6.3 Address the licensed operator training program relative to clarifying RHR design bases when functioning as an ECCS subsystem. (311/87-03-06)

The inspectors have no further questions at this time.

7. Exit Interview

At periodic intervals during the course of the inspection, meetings were held with senior facility management to discuss the inspection scope and findings. An exit interview was held with licensee management at the end of the reporting period. The licensee did not identify 2.790 material.

8. Attachments

1. Valves To Be Repacked With Chesterton Packing
2. Residual Heat Removal System Diagram

Attachment 1

Valves To Be Repacked With Chesterton Packing

22RH18	22RH44
22RH17	22RH56 .X
22RH15 .X	22RH16 .X
22RH13	22RH9 .X
22RH14 .X	22RH39 X
22RH10	22RH38 X
22RH32 X	22RH37 X
22RH11 X	22RH31 X
22RH6	22RH35 X
22RH55 X	22RH29
2RH78 X	22RH30 X
22RH70	22RH40
22RH7 X	22RH34 X
	2RH71

X Unpacked

. Repacked to restore RHR operability

Note: The valves shown on Attachment 2 RHR System Diagram are main line isolation valves. Vents, drains, and instrument line isolation valves that are listed above are not shown on the diagram.

ATTACHMENT 2

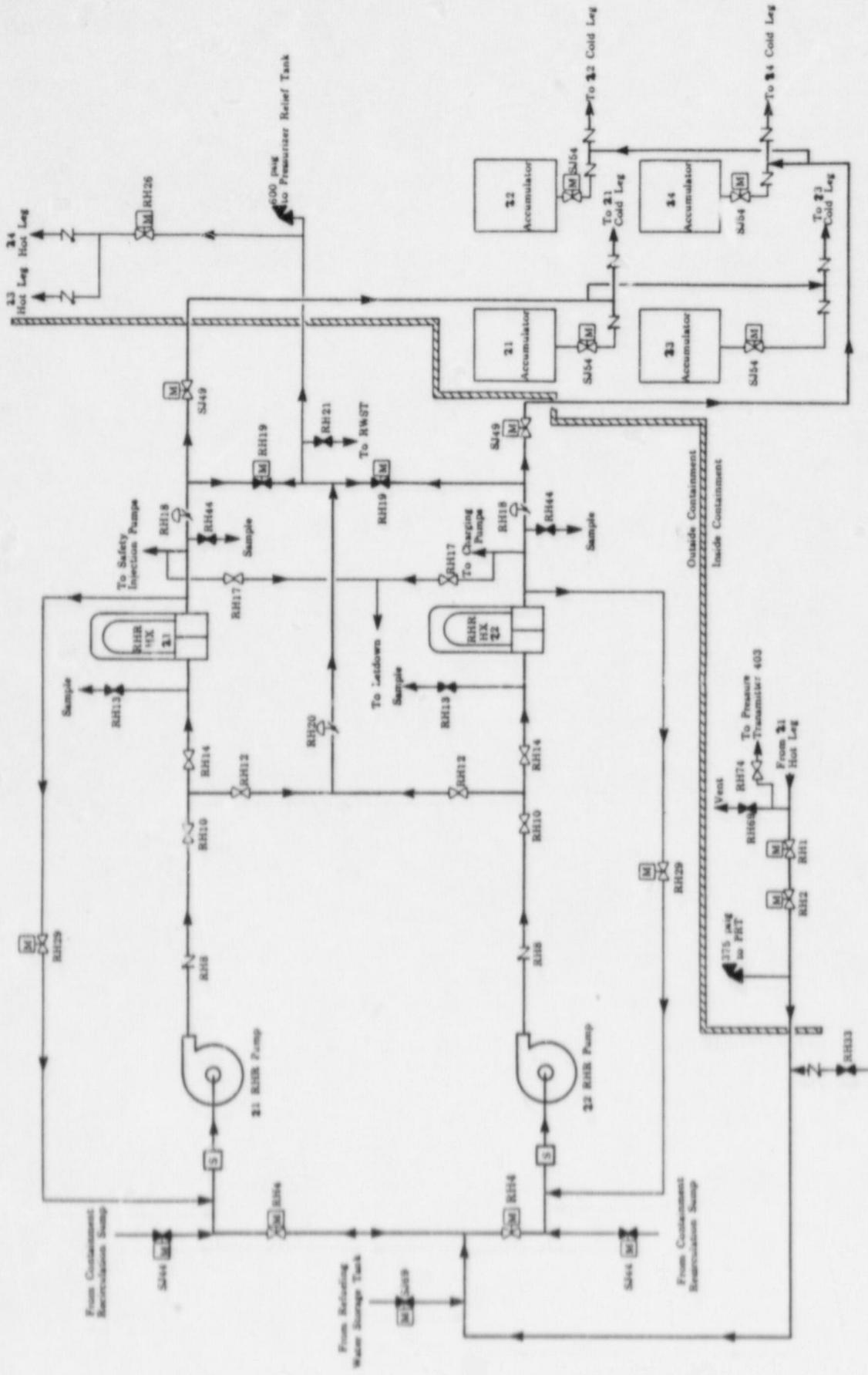


Figure 3-A-B-1
Residual Heat Removal