



Public Service Electric and Gas Company P.O. Box E Hancocks Bridge, New Jersey 08038

Salem Generating Station

February 5, 1987

U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION  
LICENSE NO. DPR-70  
DOCKET NO. 50-311  
UNIT NO. 2  
REPORT 86-11  
SPECIAL REPORT

This Special Report describes the circumstances surrounding resin intrusion into the reactor cavity during refueling. Since the resin intrusion represented an abnormal situation, this report is being submitted for informational purposes.

Sincerely yours,

J. M. Zupko, Jr.  
General Manager-  
Salem Operations

RKH:pc

Distribution

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The Energy People

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PLANT IDENTIFICATION:

Salem Generating Station - Unit 2  
Public Service Electric & Gas Company  
Hancock's Bridge, New Jersey 08038

IDENTIFICATION OF OCCURRENCE:

RESIN INTRUSION INTO THE REACTOR CAVITY DURING REFUELING

Event Date: 10/15/86

Report Date: 02/05/87

This report was initiated by Incident Report No. 86-449

CONDITIONS PRIOR TO OCCURRENCE:

Mode V Reactor Power 0% - Unit Load 0 MWe

DESCRIPTION OF OCCURRENCE:

On October 15, 1986, the Unit No. 2 Refueling Cavity was filled from the Refueling Water Storage Tank (RWST) in preparation for fuel movement. After the fill was completed, ion exchange resin was identified in the reactor cavity. Resin was subsequently discovered inside of the Reactor Vessel, the RWST, No. 21 Steam Generator Hot Leg, the Spent Fuel Transfer Pool (SFP), and the fuel assemblies themselves.

Extensive resin cleanup activities were conducted to clean the resin out of the Reactor Coolant System (RCS) and out of the the fuel assemblies to the maximum extent practical.

APPARENT CAUSE OF OCCURRENCE:

The "root cause" could not be clearly identified since the resin appeared to be from a previous charge. The resin had apparently collected in the RWST, or the 20" Emergency Core Cooling System (ECCS) header for an indeterminate period of time prior to the refueling outage. The Refueling Cavity was filled from the RWST using both Residual Heat Removal (RHR) pumps. As a result, it is believed that sufficient flow velocities were created to carry resin into the RHR system and subsequently into the RCS itself.

A water balance was performed on the demineralizers in question. As the results did not indicate a deficiency in the resin volume in any of the demineralizers, it has been concluded that the resin must have originated from a prior resin sluicing operation or backwashing of resin out of the SFP Demineralizer vessel during certain valve manipulations.

ANALYSIS OF OCCURRENCE:

There are only two potential flowpaths for resin intrusion into the RWST.

ANALYSIS OF OCCURRENCE: (cont'd)

The first flowpath involves backflow of resin out of the Spent Resin Storage Tank (SRST) into the primary water makeup system during a resin sluice operation from any radioactive demineralizer vessel.

This backflow may be possible due to an absence of check valves in the primary water system. A pressure differential may exist between the SRST and the primary water system if the primary water pumps are not in service before, during, and after certain valve manipulations are performed during the resin flushing procedure.

The second flowpath involves backwashing resin out of the SFP Demineralizer Vessel during valve manipulations associated with the Spent Fuel Demineralizer.

This path is feasible because it is possible to impose a pressure on the underdrain of the SFP Demineralizer, which is sufficient to backwash resin out of the vessel. Local radiation surveys in the vicinity of the SF37 Valve have substantiated the backflushing of resin into the SFP Demineralizer inlet or refueling water purification pump discharge line. If this situation were to occur, and either the refueling water purification filter or refueling water purification check valve failed, resin could be backflushed into the RWST. It should be noted however, that the check valve and the filter were inspected and found to be satisfactory.

For both Primary and Secondary Water Chemistry, the concern over sulfate concentration is its deleterious effect on Inconel 600 Steam Generator Tubes. Sulfates are produced when the resin decomposes in the presence of sufficient heat.

At Ringhals in Kronenberg, where a similar event is cited in Westinghouse Memo, E-EC/93-TR-269, November 1986, personnel set a maximum sulfate limit of 1500 ppb during startup. This value was based on their Technical Specification limiting condition for chloride and assumed that sulfate ions would be no worse than chloride. At Salem, a more conservative value of 1000 ppb was used. This is the same sulfate value that is recommended by the Electric Power Research Institute (EPRI) in its publication "EPRI Secondary Water Chemistry Guidelines, Rev. 1, Steam Generator Owner's Group", as a maximum value for Secondary Water Chemistry. EPRI further recommends an expected sulfate concentration of less than or equal to 100 ppb for continued power operation.

During startup, the RCS was sampled and analyzed for sulfates and the samples were inspected for resin. As expected, the sulfate concentration did increase during heatup. However, the sulfate levels were less than 400 ppb, well within the previously established chemistry limitations.

CORRECTIVE ACTION:

Extensive resin cleanup activities were conducted to clean the resin out of the RCS and the fuel to the maximum extent practical

CORRECTIVE ACTION: (cont'd)

Conservative chemistry limits were established and followed during heatup with excellent results. The Chemical and Volume Control System (CVCS) mixed bed demineralizers maintained the RCS chemistry well within the specified limits.

Radiation surveys of the resin sluicing lines, primary water flush lines, and other applicable lines were performed prior to startup of the reactor. These surveys will be performed after the operation of sluicing resins from all demineralizer vessels, and other valve manipulations associated with the Spent Fuel Pool Demineralizer and sluicing operations.

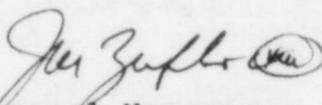
As part of the evaluation process, the potential for a retention element failure in the demineralizer tanks was considered. Although no problems with the retention elements were discovered as part of this investigation, appropriate procedure changes will be considered to preclude against this possibility.

We are currently evaluating several possible design changes to prevent the backwashing of resins out of the SFP Demineralizer or the flushing of resins out of the SRST.

As an additional preventive measure, the RWST will be inspected before it is used to fill the reactor cavity.

Prior to the installation of a design change, samples will be taken and inspected for the presence of resin following sluicing resin from any radioactive demineralizer. Appropriate cautions will be added to the procedures for manipulating valves associated with the SFP Demineralizer.

This report will be reviewed by the Nuclear Training Center for possible incorporation into existing or future operator training programs.

  
General Manager -  
Salem Operations

RKH:pc

SORC Mtg. 87-009