



Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Salem Generating Station

November 19, 1993

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

Dear Sir:

SALEM GENERATING STATION  
LICENSE NO. DPR-75  
DOCKET NO. 50-311  
UNIT NO. 2

LICENSEE EVENT REPORT 93-011-00

This Licensee Event Report is being submitted pursuant to the requirements of the Code of Federal Regulation 10CFR50.73, parts (a)(2)(i)(B) and (a)(2)(v)(C). This report is required to be issued within thirty (30) days of event discovery.

Sincerely yours,

A handwritten signature in cursive script that reads "Michael Mauri for Cal Vondra".

C. A Vondra  
General Manager -  
Salem Operations

MJPJ:pc

Distribution

9312020477 931118  
PDR ADDCK 05000311  
S PDR

Handwritten initials "TEPB" and the date "11/19" written below them.

The power is in your hands.

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Salem Generating Station - Unit 2	DOCKET NUMBER (2) 0 5 0 0 0 3 1 1 1	PAGE (3) OF 0 8
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TITLE (4)  
Inop. of Radioactive Liquid Eff. Monitors Due to Use of Incorrect Source Decay Table Values.

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
1	0	1993	93	011	00	11	18	93		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)									
POWER LEVEL (10) 0 7 5	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)						
	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)						
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)						
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)							
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							
<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)								

LICENSEE CONTACT FOR THIS LER (12)

NAME M. J. Pastva, Jr. - LER Coordinator	TELEPHONE NUMBER AREA CODE: 6 0 9 3 3 9 - 5 1 6 5
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

Radiation Monitoring System (RMS) channels 2R13 A,B,C were rendered inoperable due to their efficiency being adjusted to a reduced level. The channels' alarm setpoints remained unchanged. The reduced efficiency required up to 70% more activity to produce an alarm. This was caused by an incorrect half-life for Ba-133 used to generate standard source decay tables for these channels. 2R18, 2R19A,B,C,D, and 2R37 were also rendered inoperable in an identical manner (used same sources). 2R13A,B,C provide alarm function for the Service Water discharge from the cooling coils of the Containment Fan Coil Units. 2R18 monitors for automatic termination of release of the Liquid Radwaste Effluent Line; 2R19 A,B,C,D monitor for automatic termination of steam generator blowdown to the main condenser hotwells or to the Chemical Waste Basin; 2R37 provides alarm function for the Chemical Waste Basin (common to both Salem Units). Preliminary root cause is Management/Quality Assurance Deficiency. As presently understood, contributing factors involve inadequate corrective action to an event reported in LER 272/90-032-00, and communication between involved groups. 2R13A,B,C channels were calibrated using the correct source decay value and returned to service. Operability of the other subject channels was restored in 1991. Root cause analysis and development of corrective action is continuing. It is anticipated that by 12/31/93, this report will be supplemented to update the event causal analysis and corrective action.

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PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as {xx}

IDENTIFICATION OF OCCURRENCE:

Inoperability Of Radioactive Liquid Effluent Monitors Due To Use Of Incorrect Source Decay Table Value

Event Date: 10/19/93

Report Date: 11/18/93

This report was initiated by Incident Report No. 93-420. This event is reportable to the Nuclear Regulatory Commission (NRC) per 10CFR 50.73, parts (a)(2)(i)(B) and (a)(2)(v)(C).

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 75% - Unit Load 820 MWe

DESCRIPTION OF OCCURRENCE:

After two calibrations on August 9, 1988, and one on November 4, 1988, Radiation Monitoring System (RMS) channels 2R13 A, B, and C, were rendered inoperable due to their efficiency being adjusted to a reduced level. The channels' alarm setpoints remained unchanged. The reduced efficiency required up to 70% more activity to produce an alarm. This was caused by an incorrect half-life for Ba-133 (7.2 versus 10.66 years) used to generate standard source decay tables for these channels. The incorrect half-life value of 7.2 years was most likely obtained from the Radiological Health Handbook, published in 1970. These channels provide an alarm function only and monitor the Service Water {BI} discharge from the cooling coils of Containment Fan Coil Units (CFCUs) 21, 22, 23, 24, and 25. Technical Specification (TS) 3.3.3.8 requires that these channels be operable at all times with setpoints established in accordance with the Offsite Dose Calculation Manual (ODCM). At 0645 hours on October 19, 1993, the NRC was informed of this discovery through a four-hour notification, as per 10CFR 50.72(b)(2)(iii).

Investigation showed that during the same time frame, other RMS channels had also been rendered inoperable in an identical manner: 2R18 (October 4, 1988), 2R19 A, B, C, and D (all on July 26, 1988), and 2R37 (September 27, 1988). 2R18 monitors the Liquid Radwaste Effluent Line and 2R19 A, B, C, and D monitor steam generator

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DESCRIPTION OF OCCURRENCE: (cont'd)

blowdown. 2R37 has an alarm function only and monitors the Chemical Waste Basin Line. Implementation of design changes in 1991, restored operability of the following channels: 2R18 (August 22, 1991); 2R19 A (June 13, 1991), B (July 16, 1991), C (July 17, 1991), and D (August 27, 1991); and 2R37 (August 10, 1991).

ANALYSIS OF OCCURRENCE:

While reviewing calibration data for RMS channel 2R13A, (using a new trending program) the RMS System Engineer determined that the channel detector had been calibrated on November 4, 1988 using an incorrect secondary source value. Using this value, 2R13A efficiency was adjusted to a reduced level, which required up to 70% more activity to produce an alarm. Further investigation showed the same problem with RMS channels 2R13 B and C due to calibration on the following dates: 2R13B (August 9, 1988), and 2R13C (August 9, 1988). These channels have no interlock function (i.e., alarm function only) and monitor activity in the service water {BI} discharge from the cooling coils of Containment Fan Coil Units 21, 22, 23, 24, and 25.

Additional investigation revealed that in the same time frame, other RMS channels had also been rendered inoperable in an identical manner (use same sources): 2R18 (October 4, 1988), 2R19 A, B, C, and D (all on July 26 1988), and 2R37 (September 27 1988). 2R18 and 2R19 A, B, C, and D provide an interlock function (i.e., automatic termination of release), while 2R37 has no interlock function (i.e., alarms only). 2R18 monitors the Liquid Radwaste Effluent Line, while 2R19 A, B, C, and D monitor steam generator blowdown to the main condenser hotwells or to the Chemical Waste Basin. 2R37 monitors the Chemical Waste Basin (common to Salem Units 1 and 2).

Due to the resulting inoperability of these channels, the following TS required action applied:

2R13 A, B, and C

With 2R13 A, B, and C inoperable, ACTION 28 of TS Table 3.3-12 requires:

"With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that:

- a. At least once per 8 hours, local monitor readouts for the affected channels are verified to be below their alarm setpoints, or
- b. With a Service Water System leak on the Containment Fan Coil

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ANALYSIS OF OCCURRENCE: (cont'd)

Unit associated with the inoperable monitor either:

1. Grab samples are to be collected and analyzed for gross radioactivity (beta or gamma) at a limit of detection of at least  $10^{-7}$  uCi/gram at least once per 8 hours, or
  2. Isolate the release path.
- c. With no identified service water leakage on the Containment Fan Coil Unit associated with the inoperable monitor collect grab samples and analyze for gross radioactivity (beta or gamma) at a limit of detection of at least  $10^{-7}$  uCi/gram at least once per 24 hours."

2R37

With 2R37 inoperable, ACTION 31 of TS Table 3.3-12 requires:

"With the number of channels OPERABLE less than required by the Minimum Channels requirement, effluent releases via this pathway may continue provided that sampling is conducted in accordance with the following table:

<u>Frequency</u>	<u>Condition</u>
1/week	During normal operation (all MODES)
1/day	During operation with an identified primary to secondary leak on either Salem Unit."

2R18

With 2R18 inoperable, ACTION 26 of TS Table 3.3-12 requires:

"With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue provided that prior to initiating a release:

- a. At least two independent samples are analyzed in accordance with Specification 4.11.1.1.1, and
- b. At least two technically qualified members of the Facility Staff independently verify the release rate calculations and discharge line valving;

Otherwise suspend release of radioactive effluents via this

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ANALYSIS OF OCCURRENCE:(cont'd)

pathway."

2R19 A, B, C, and D

With 2R19 A, B, C, and D inoperable, ACTION 27 of TS Table 3.3-12 requires:

"With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for gross radioactivity (beta or gamma) at a limit of detection of at least  $10^{-7}$  microcuries/gram:

- a. At least once per 8 hours when the specific activity of the secondary coolant is greater than 0.01 microcuries/gram DOSE EQUIVALENT I-131."
- b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 microcuries/gram DOSE EQUIVALENT I-131.

Preliminary root cause of this event is Management/Quality Assurance Deficiency. As presently understood, contributing factors involve inadequate corrective action to an event reported in LER 272/90-032-00, and communication between involved groups.

As the result of design changes, the operability of 2R18, 2R19 A, B, C, and D, and 2R37 channels was reestablished in 1991: 2R18 (August 22, 1991); 2R19 A (June 13, 1991), B (July 16, 1991), C (July 17, 1991), and D (August 27, 1991); and 2R37 (August 10, 1991). These changes included vendor-supplied sources and calibration data for the detectors.

Following event discovery, 2R13 A, B, and C were calibrated using the appropriate source decay value and returned to service. The correct value of 10.66 years was obtained from the Table of Isotopes - 1978. On November 15 1993, the correct value of 10.66 years for Ba-133 was confirmed through the Radiochemistry Section Head of the National Institute of Science and Technology (NIST).

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APPARENT CAUSE OF OCCURRENCE:

Preliminary root cause is Management/Quality Assurance Deficiency. As presently understood, contributing factors involve inadequately implemented corrective action to an event reported in LER 272/90-032-00, and communication between involved groups. Root cause analysis and development of corrective action is continuing. It is anticipated that on or before December 31, 1993, this report will be supplemented to provide update of the event causal analysis and corrective action.

PREVIOUS OCCURRENCES:

As referenced in the "ANALYSIS OF OCCURRENCE" and "APPARENT CAUSE OF OCCURRENCE" sections, an event, which involved incorrect setpoints for Unit 1 RMS channels 1R13 A and B, was reported in LER 272/90-032-00.

SAFETY SIGNIFICANCE:

This event did not affect the health and safety of the public.

2R13 A, B, and C

Until event discovery, it was not recognized that the 2R13 channels were inoperable and therefore grab samples required by TS were not obtained. The Service Water (SW) System is not normally expected to be contaminated and operates at a pressure greater than Containment pressure. Any SW leakage involving the CFCUs would most likely be into Containment and the likelihood of releases to the environment via this pathway is relatively small.

Samples analyzed for potential gross activity during recognized periods of 2R13 inoperability have not indicated the presence of gross radioactivity. The results of the Radiological Environmental Monitoring Program, which involves sampling the Delaware River water, sediment, and marine life have not indicated abnormal trends during the subject period of 2R13 inoperability.

2R18

Liquid Radwaste (LRW) releases are performed in batch mode. In addition to the 2R18 monitor, each batch release is required to be sampled prior to release. The release authorization and release rate are based on sample results. This largely mitigates the 2R18 lower efficiency due to this event. Liquid Release (LR) tanks are recirculated in accordance with TS requirements for thorough tank mixing to ensure representative sampling prior to release. Sampling

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SAFETY SIGNIFICANCE: (cont'd)

analysis results are evaluated in accordance with Off-site Dose Calculation Manual methodology. These results are referenced to dilution flows and the 2R18 setpoint to determine the LRW allowable release rate and ensure Maximum Permissible Concentration (MPC) and dose criteria are satisfied prior to release. Because it was not known that 2R18 was inoperable, duplicate sample analyses, permit calculation verification, and LRW lineup verifications, required by TS, were not performed. When duplicate samples have been taken for other recognized periods of inoperability, these duplicate samples have indicated agreement. This means that the normal sampling regimen adequately characterizes batch releases.

Results of the Radiological Environmental Monitoring Program, which involves sampling the Delaware River water, sediment, and marine life have not indicated abnormal trends during the subject period of 2R18 inoperability.

2R19 A, B, C, and D

Steam Generator Blowdown (SGBD) releases are performed in batch mode. During routine plant operation, SGBD is routed to the main condenser hotwells and is not discharged to the environment. Discharge to the Chemical Waste Basin (CWB) is an infrequent evolution performed during certain maintenance, as required. Prior to discharge of SGBDs to the Chemical Waste Basin, the Steam Generators are sampled and analyzed prior to release permit generation in accordance with ODCM methodology. Grab sample results indicating positive radioactivity results typically represent a small fraction of allowable release limits. In addition, SGBD release permits are conservative because there is no allowance for decay of shorter-lived nuclides due to the transit time required to subsequently process the waste from the CWB to the environment. Results of the Radiological Environmental Monitoring Program have not indicated any abnormal trends during the period the 2R19 A, B, C, and D channels were inoperable.

These monitors also function as part of the enhanced steam generator leakage monitoring procedure to provide early warning of a tube rupture. This is not a TS required function. The 2R15 (air ejector) radiation monitor and routine weekly chemistry blowdown grab samples provide additional independent leakage monitoring capability. Had there been a steam generator tube leak which degraded and threatened to rupture, the response of the 2R19 A, B, C, D would have slowed. However, the 2R15 monitor and the chemistry grab samples would have provided the station personnel early warning of the leak.

In the event of a steam generator tube rupture or any accident



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SAFETY SIGNIFICANCE: (cont'd)

initiating containment isolation, the 2R19 A, B, C, D provide no safety function and the steam generator blowdown sample lines are isolated.

2R37

Because both Salem Units utilize SGBD recovery, secondary system radioactive materials originating from primary to secondary leakage accumulate on the condensate polisher resins during plant operation. This accumulation provides a release pathway via resin disposal or resin regeneration processes. During periods of primary to secondary leakage, grab sampling and analysis of CWB water is performed once per day in accordance with TS. Routine (weekly) grab samples obtained for the period of June 1989 through June 1991 indicate no detectable gross activity at an LLD of 1.E-07 micro-curies/ml. Results of the Radiological Environmental Monitoring Program have not indicated any abnormal trends during the period the 2R37 channel was inoperable.

CORRECTIVE ACTION:

2R13 A, B, and C were calibrated using the correct source decay value and returned to service.

Operability of 2R18, 2R19 A, B, C, and D, and 2R37 channels was reestablished as the result of design changes.

An internal notice has been issued to applicable PSE&G groups regarding the incorrect Ba-133 half-life found in the Radiological Health Handbook. The internal notice identified the proper reference document recommended by NIST, which is Table of Radioactive Isotopes by Browne, Edgardo and Firestone, Richard, published 1986. This event will be reviewed for applicability to 10CFR21.

It is anticipated that on or before December 31, 1993, this report will be supplemented to provide update of the event causal analysis and corrective action.

*Michael Maroni for Cal Vondra*

General Manager -  
Salem Operations