



LR-N16-0126

10 CFR 50.73

JUL 05 2016

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Salem Nuclear Generating Station Unit 1
Renewed Facility Operating License No. DPR-70
NRC Docket No. 50-272

SUBJECT: LER 272/2016-001-000
Unanalyzed Condition due to Degraded Reactor Baffle to Former Bolts

Licensee Event Report, "Unanalyzed Condition due to Degraded Reactor Baffle to Former Bolts" is being submitted pursuant to 10 CFR 50.73 (a)(2)(ii)(B), "The nuclear power plant being in an unanalyzed condition"

Should you have any questions or comments regarding the submittal, please contact Mr. Thomas Cachaza of Regulatory Affairs at 856-339-5038.

There are no regulatory commitments contained in this letter.

Sincerely,

A handwritten signature in black ink, appearing to read "Eric Carr", with a long horizontal line extending to the right.

Eric Carr
Plant Manager
Salem Generating Station

tjc

Enclosure – LER 272/2016-001-000

cc Mr. D. Dorman, Administrator – Region 1, NRC
 Ms. C. Parker, Licensing Project Manager – Salem, NRC
 Mr. P. Finney, USNRC Senior Resident Inspector, Salem (X24)
 Mr. T. Cachaza, Salem Commitment Tracking Coordinator
 Mr. L. Marabella, Corporate Commitment Tracking Coordinator



LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

Salem Generating Station – Unit 1

2. DOCKET NUMBER

05000272

3. PAGE

1 OF 3

4. TITLE

Unanalyzed Condition due to Degraded Reactor Baffle to Former Bolts

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	03	2016	2016	001	000	07	05	2016		05000
										05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
Defueled	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. POWER LEVEL 0%	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT Thomas J. Cachaza, Senior Regulatory Compliance Engineer	TELEPHONE NUMBER (Include Area Code) 856-339-5038
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	AB	RPV	W120	Y					

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

With Salem Unit 1 in a defueled condition during a planned refueling outage, anomalies were identified on baffle to former bolts while conducting a scheduled visual inspection of Reactor Vessel Internals. Due to the visual anomalies, PSEG commenced ultrasonic inspection of the baffle to former bolts to determine the extent of condition and determine a repair plan.

Based on initial results of the analysis of the ultrasonic inspection data received on May 03, 2016, this condition was determined to be reportable pursuant to 10 CFR 50.72(b)(3)(ii)(B), since the as-found conditions were not previously analyzed.

As a result of the inspection approximately 190 baffle to former bolts were identified as needing replacement.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET	6. LERNUMBER			3. PAGE
Salem Generating Station – Unit 1	05000272	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 3
		2016	- 001	- 000	

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

Westinghouse-Pressurized Water Reactor {PWR/4}

Reactor Coolant System / Reactor Vessel {AB/RPV}

IDENTIFICATION OF OCCURRENCE

Event Date: 05/03/2016

Discovery Date: 05/03/2016

CONDITIONS PRIOR TO OCCURRENCE

Salem Unit 1 was defueled

DESCRIPTION OF OCCURRENCE

With Salem Unit 1 in a defueled condition during a planned refueling outage, anomalies were identified on baffle to former bolts while conducting a scheduled visual inspection of Reactor Vessel Internals. Due to the visual anomalies, PSEG commenced ultrasonic inspection of the baffle to former bolts to determine the extent of condition and determine a repair plan.

As a result of the inspection approximately 190 baffle to former bolts were identified as needing replacement.

Based on initial results of the analysis of the ultrasonic inspection data received on May 03, 2016, this condition was determined to be reportable pursuant to 10 CFR 50.72(b)(3)(ii)(B), since the as-found conditions were not previously analyzed.

The Salem Unit 1 baffle structure includes 832 baffle to former bolts which attach the baffle plates to the former plates. Of the 832 baffle to former bolts, approximately 190 bolts were identified as needing replacement.

The number of failed bolts and the pattern of failure did not meet the acceptance criteria for plant startup from the 1R24 refueling outage which has been provided by Westinghouse.

During Salem Unit 1 1R24 refueling outage, the condition of the baffle to former bolting in the Reactor Vessel Internals was visually examined in which eighteen bolt heads were identified as either broken/missing or protruding from its counter bore. Ultrasonic testing (UT) was subsequently performed on baffle to former bolting, which identified an additional population of defective bolting. New baffle to former bolting defects were also identified due to the replacement efforts. The total number of defective baffle to former bolts identified within the visual and UT examinations as well as during the replacement efforts are described below.

Eleven baffle to former bolts were visually identified as severed at the bolt head-to-shank area. Nineteen baffle to former bolts were visually identified as protruding from their counter bore. One hundred thirty-five baffle to former bolts were identified as unsatisfactory through UT examination. Sixteen baffle to former bolts were identified as not able to be UT tested (assumed as unsat in analysis). Nine baffle to former bolts were identified having visually cracked lock bar welds.



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NARRATIVE

CAUSE OF EVENT

The failure mechanism of the described bolting is identified as irradiation assisted stress corrosion cracking (IASCC), a known industry issue that is inherent within designs that utilize Westinghouse-supplied stainless steel Type 347 baffle to former bolting. Exposure to high levels of fast neutrons results in embrittlement of the stainless steel bolting, evidenced by an increase in tensile strength and a decrease in ductility. As residual ductility is further reduced and embrittlement progresses, additional stresses via neutron irradiation can result in the formation and propagation of cracks. IASCC is a time related degradation that is associated to the operating life of the components. The significant factors that contribute to the initiation and propagation of IASCC degradation are neutron fluences, time of operation, fatigue inducing loading cycles on the baffle plates, pressure differentials across the baffle plates, and temperature. Failure analysis of selected removed bolts will be performed to confirm this cause.

SAFETY CONSEQUENCES AND IMPLICATIONS

Westinghouse performed an evaluation, which is based on sound engineering assumptions, concludes that Salem Unit 1 met the requirements for core coolability and safe shut-down in its "as-found" state during 1R24, considering both potential baffle bolt failures due to a LOCA and loose parts from degraded baffle-former bolts found during 1R24. On this basis, safe operation and safe shutdown of Salem Unit 1 was assured during Cycle 24.

SAFETY SYSTEM FUNCTIONAL FAILURE

This event is not being reported as a safety system functional failure. Westinghouse performed an evaluation, which is based on sound engineering assumptions, concludes that Salem Unit 1 met the requirements for core coolability and safe shut-down in its "as-found" state during 1R24, considering both potential baffle bolt failures due to a LOCA and loose parts from degraded baffle-former bolts found during 1R24. On this basis, safe operation and safe shutdown of Salem Unit 1 was assured during Cycle 24.

PREVIOUS EVENTS

A review of previous events for the past three years identified no similar events.

CORRECTIVE ACTIONS

Salem is taking the following actions:

- The degraded baffle to former bolts are being replaced.
- Failure analysis of selected removed bolts will be performed to confirm IASCC as the cause.
- An acceptable bolting pattern analysis was performed to determine the required bolting replacement scope.
- Required bolting was replaced for one cycle of operation while also relying on original baffle-former bolts that had no UT indications

COMMITMENTS

There are no regulatory commitments contained in this LER.