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U. S. Nuclear Regulatory Commission
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Washington, DC 20555

LER 311/04 – 004 – 00
Salem Generating Station Unit 2
Facility Operating License DPR- 75
Docket No. 50-311

This Licensee Event Report entitled "Technical Specification Required Plant Shutdown Following Loss of 2B 230-Volt Vital Bus" is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(A). The attached LER contains no commitments.

Should there be any questions regarding this matter please contact Howard Berrick at 856-339-1862.

Sincerely,

A handwritten signature in black ink, appearing to read "C. Fricker", written over a horizontal line.

C. Fricker
Salem Plant Manager

Attachment

HGB

C Distribution
 LER File 3.7

Handwritten initials "IE22" in black ink, slanted upwards to the right.

LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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 Unit 2 Generating Station

2. DOCKET NUMBER

05000311

3. PAGE

1 OF 4

4. TITLE

Technical Specification Required Plant Shutdown Following Loss of 2B 230-Volt Bus

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	21	2004	2004	004	00	07	20	2004	FACILITY NAME	DOCKET NUMBER
9. OPERATING MODE		1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 50. (Check all that apply)							
10. POWER LEVEL		93	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)	
			20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)	
			20.2203(a)(1)		50.36(c)(1)(i)(A)		50.73(a)(2)(iv)(A)		73.71(a)(4)	
			20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)	
			20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER	
			20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A	
			20.2203(a)(2)(iv)		x 50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)			
			20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)			
			20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)			
			20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)			

12. LICENSEE CONTACT FOR THIS LER

NAME

Howard Berrick, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

856-339-1862

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	ED	XFMR	043I	Yes					

14. SUPPLEMENTAL REPORT EXPECTED

YES (If yes, complete EXPECTED SUBMISSION DATE) X NO

15. EXPECTED
SUBMISSION
DATE

MONTH DAY YEAR

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

On May 21, 2004, at 1147, a fault on a Salem Unit 2 4160/230V transformer caused a 4kV load breaker to trip open on instantaneous over-current, resulting in the loss of the 2B 460V and 230V Vital buses. A Service Water isolation valve supplying the Turbine Generator lost the ability to isolate the Turbine loads. This resulted in the entry into Salem Unit 2 Technical Specification (TS) 3.6.1.1, 'Primary Containment Integrity', Limiting Condition for Operation (LCO) to restore in 1 hour or be in Hot Shutdown in 6 hours. Operators were unable to restore the valve to operable within one hour and therefore commenced a controlled shutdown. All plant systems responded as expected to the conditions.

A failure analysis of the event indicates that the root cause of the transformer fault originated in the 2nd phase of the 3-phase transformer due to high voltage winding insulation breakdown caused during initial fabrication of the transformer. Corrective actions included replacing the 2B 4160/230 Volt transformer.

This event is reportable per the requirements of 10 CFR 50.73(a)(2)(i)(A), Plant Shutdown Required by Technical Specifications.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Salem Unit 2 Generating Station	05000311	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		2004	- 0 0 4 -	00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

PLANT AND SYSTEM IDENTIFICATION

Westinghouse – Pressurized Water Reactor (PWR/4)

Low Voltage Power System, Class 1E / 4160/230 V Transformer {ED/XFMR} *

* Energy Industry Identification System {EIIIS} codes and component function identifier codes appear as {SS/CCC}

IDENTIFICATION OF OCCURRENCE

Event Date: May 21, 2004

Discovery Date: May 21, 2004

CONDITIONS PRIOR TO OCCURRENCE

The plant was in Mode 1 at 93% power at the time of the event. The only safety related equipment out of service was 23 Service Water pump for planned maintenance. There were no effects on this event due to the out of service equipment.

DESCRIPTION OF OCCURRENCE

On May 21, at 1147, a fault on a Salem Unit 2 4160/230V transformer {ED/XFMR} caused a 4kV load breaker to trip open on instantaneous over-current, resulting in the loss of the 2B 460V and 230V Vital buses.

As a result of the loss of the 2B 230 Volt bus, a Service Water isolation valve supplying the Turbine Generator lost the ability to isolate the Turbine loads in the event of a design basis accident. The inability to isolate Turbine Building service water causes flow to be diverted from the Containment Fan Coil Units (CFCU) during a design basis accident (DBA), which creates the potential for service water in the CFCUs to flash during a DBA, with a potential for water hammer and breach of containment integrity as discussed in PSEG response to NRC Generic Letter (GL) 96-06. This resulted in the entry into Salem Unit 2 Technical Specification (TS) 3.6.1.1; Primary Containment Integrity, that requires restoration within 1 hour or be in Hot Shutdown in 6 hours. Operators were unable to restore the valve to operable within 1 hour; therefore Salem Unit 2 commenced a controlled shutdown. All plant systems responded as expected to the conditions.

Station Fire Protection immediately responded to the location of the faulted transformer in the 84' Elevation Switchgear Room and secured the area. After the immediate area was secured and released by Fire Protection, the area was quarantined to allow Engineering to begin investigation of the 'as-found' conditions.

The fault on the 4160/230V transformer caused instantaneous over-current relay to pick-up and trip open the 4kV load breaker to clear the fault as designed. The load breaker isolates the 4160-volt bus from the 4kV/230V transformer and 4kV/460V transformer {ED/XFMR}. The loss of both of these transformers resulted in the loss of the vital 2B-230V and 2B-460V electrical busses. Equipment affected by the transformer loss included 2B Emergency Diesel Generator, 22 Chiller, Nos. 22 and 24 Containment Fan Coil Units, equipment supporting operation of Nos. 23 and 24 Service Water pumps, as well as Residual Heat Removal (RHR) and Safety Injection (SJ) motor operated valves.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

CAUSE OF OCCURRENCE

The Technical Specification shutdown of Salem Unit 2 was the result of the failure of the 2B 4160/230-volt transformer. A failure analysis of the transformer indicated that the fault originated in the 2nd phase of the 3-phase transformer due to high voltage winding insulation breakdown. This breakdown was a result of initial fabrication of the transformer. This resulted in a turn-to-turn short of the outermost windings of the 2nd phase. This short led to further damage on phase 2 of the transformer and eventually caused the outer winding to mechanically break creating a phase-to-phase short between phase 2 and phases 1 and 3. This failure is considered to be isolated and random.

PREVIOUS OCCURRENCES

A review of LERs at Salem and Hope Creek Generating Stations for the years 2001 through present was conducted, looking for transformer failures that led to Technical Specification related shutdowns. There were no prior occurrences of transformer related shutdowns that were related to this type of event.

SAFETY CONSEQUENCES AND IMPLICATIONS

At Salem Unit 2, a loss of the 230 Volt bus in Modes 1 through 4 results in the entrance of Technical Specification 3.6.1.1, 'Primary Containment Integrity' due to the loss of power to a Turbine Building Service Water Header isolation valve. Technical Specification 3.6.1.1 states that "without primary CONTAINMENT INTEGRITY, restore CONTAINMENT INTEGRITY within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours."

The loss of the 2B 230 Volt and 2B 460 volt buses during a design basis accident is analyzed at Salem as part of the loss of a 4160 volt bus, which supplies the power to the 230 volt and 460 volt buses. Salem has been designed and is capable to mitigate the consequences of a design basis accident with the loss of one train of vital power. The 2A and 2C vital buses were unaffected during this event.

This event does not constitute a Safety System Functional Failure (SSFF) as defined in Nuclear Energy Institute (NEI) 99-02, Regulatory Assessment Performance Indicator Guideline. This was not an SSFF because the loss of power to 2B vital buss did not impact the redundant vital busses. The ability of safety related systems to fulfill their intended function was not impacted, as the redundant systems to mitigate an accident, including Turbine Building isolation, were available.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

CORRECTIVE ACTIONS:

1. The 2B 4160/230 Volt transformer was replaced.
2. Preventive maintenance procedures will be reviewed and as necessary, revised/enhanced to ensure all necessary work is aligned with industry standards for the maintenance and testing of all dry-type transformers. An enhancement being considered is describing or providing examples of what indications might indicate localized heating of windings is occurring. Additionally, lessons learned from the 2B 4kV/230V transformer failure will be incorporated into Maintenance training.
3. System Engineering Performance Monitoring notebooks will be revised to record and evaluate transformer testing for transformers within the 460/230 System boundaries for megger, Doble, PF and insulation testing.

COMMITMENTS

The corrective actions cited in this LER are voluntary enhancements and do not constitute commitments.