Omaha Public Power District
444 South 16th Street Mall
Omaha, NE 68102-2247

LIC-13-0085
July 2, 2013

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

Reference: 1. Docket No. 50-285
2. Letter from D. J. Bannister (LIC-12-0043) to Document Control Desk dated May 1, 2012

Subject: Licensee Event Report 2012-002, Revision 1, for the Fort Calhoun Station

Please find attached Licensee Event Report 2012-002, Revision 1. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(B) and 10 CFR 50.73(a)(2)(i)(B).

If you should have any questions, please contact Terrence W. Simpkin, Manager, Site Regulatory Assurance, at (402) 533-6263.

Sincerely,

Louis P. Cortopassi
Site Vice President and CNO

LPC/rjr/epm

Attachment
c: A. T. Howell, NRC Regional Administrator, Region IV
J. M. Sebrosky, NRC Sr. Project Manager
L. E. Wilkins, NRC Project Manager
J. C. Kirkland, NRC Sr. Resident Inspector

Employment with Equal Opportunity

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

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 Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 205 55-0001, 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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Inadequate Qualifications for Containment Penetrations Renders Containment Inoperable

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
										05000
3	2	2012	2012	- 002 -	1	7	2	2013	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

5

10. POWER LEVEL

0

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☒ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Erick Matzke	402-533-6855

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

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On May 1, 2012, with Fort Calhoun Station (FCS) defueled, Event Notification (EN) 47884 initially reported that during a review of environmental qualification records for containment building electrical penetration feed-through subassemblies, Omaha Public Power District (OPPD) identified six that may not provide an adequate seal during worst-case design-basis accident conditions as required due to failure of the Teflon in the connectors. OPPD updated the EN June 26, 2012, to include the inboard and outboard seals of the penetration, which contain Teflon and updated it again July 17, 2012, to include the containment sump outlet valve submarine hull enclosures and the containment personnel airlock. The initial LER submittal, dated May 1, 2012 did not contain this updated information.

OPPD performed causal analyses to determine why Teflon was used at Fort Calhoun as a containment integrity seal and insulation on power and control cabling to environmentally qualified components. These analyses determined that a lack of managerial and technical oversight allowed Teflon and Teflon like materials to be used in containment penetration applications.

The Fundamental Performance Deficiencies are addressing the managerial and technical oversight causes. OPPD is replacing all containment penetrations where Teflon is used as sealant or conductor insulation and is capping unused penetrations prior to core reload.

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NARRATIVE

BACKGROUND

Fort Calhoun Station (FCS) Technical Specification (TS) 2.6(1)a states:

> Containment integrity shall not be violated unless the reactor is in a cold or refueling shutdown condition. Without containment integrity, restore containment integrity within one hour or be in at least hot shutdown within the next 6 hours, in at least subcritical and greater than 300 degrees Fahrenheit within the next 6 hours and in cold shutdown within the following 30 hours. Normally locked or sealed-closed valves (except for PCV-742A/B/C/D) may be opened intermittently under administrative control without constituting a violation of containment integrity.

FCS Updated Safety Analysis Report (USAR) Subsection 5.9.1 states in part that containment penetrations were designed to withstand normal environmental conditions prevailing during plant operation and to maintain their integrity following the design-basis accident (DBA).

The FCS USAR contains the following discussion on electrical penetrations:

> 5.9.3 Electrical Penetrations
> Containment electrical penetrations were of the canister type furnished by the manufacturer as fully assembled, factory tested units. Field installation only requires welding the canisters into penetration pipe stubs, and attachment of cables.
>
> 5.9.3.1 Design Bases
> Canister design and construction satisfy the following criteria: Forty-year service life; Leak testable in service from outside containment; Leak rate per canister including mounting gland not above 1.5×10^{-6} standard cubic centimeters per second of helium at 69 psig; Operating temperature range of 40°F to 125°F at 60 psig; and Capable of withstanding a temperature and pressure of 300°F and 60 psig for two hours.

Initial Containment Penetration Replacements:

OPPD/FCS initiated the Electrical Environmental Qualification (EEQ) Program in 1980 to meet the requirements of NRC Bulletin 79-01B and 10 CFR 50.49. In October 1984, a vendor test report indicated that the electrical penetration seals inside containment made from Teflon would leak under DBA conditions. After reviewing the vendor report and discussing the issue with the vendor, however, OPPD took the position that containment integrity was maintained. OPPD took this position because the outboard ends of the penetrations are in a mild environment after a DBA and consequently, do not suffer radiation-induced failures.

Subsequently between 1985 and 1986, OPPD replaced approximately 122 of the installed Teflon type containment electrical penetration (CEP) feed-through subassemblies (FS) associated with EEQ equipment with material that was qualified and more resilient to harsh environments. However, there were several CEPFSs associated with equipment not required to operate under post-accident harsh environmental conditions, which were exempted from replacement or deemed adequate as installed. These were the CEPFSs that resulted in the condition discussed below.

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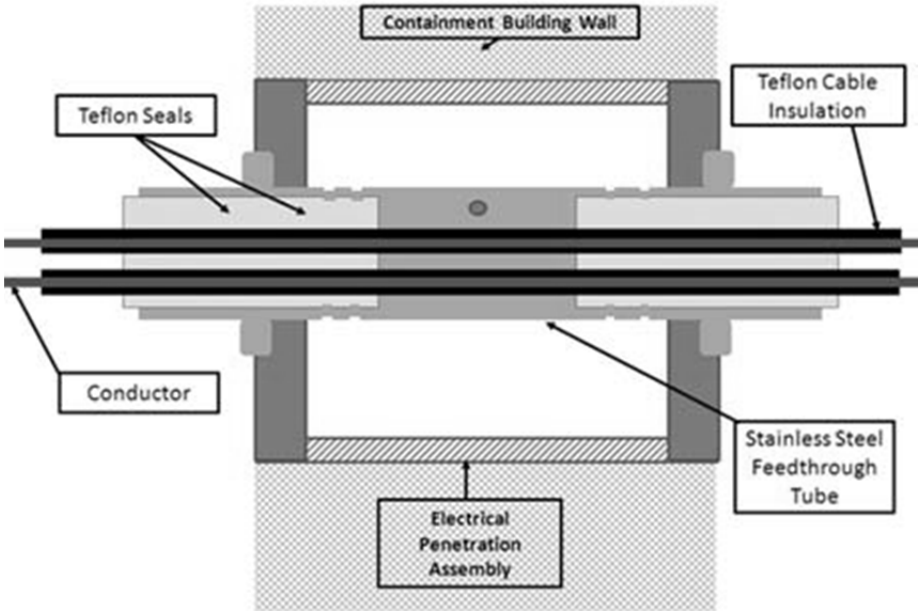
NARRATIVE



Typical Teflon Containment Electrical Penetration Feed-Through Subassembly Associated with EEQ Equipment

EVENT DESCRIPTION

On May 1, 2012, with the station defueled, OPPD initiated Event Notification (EN) 47884, which initially reported that during a review of environmental qualification records for CEPFSs, six were identified that may not provide an adequate seal during worst case DBA conditions as required due to failure of the Teflon in the connectors. OPPD updated the EN was on June 26, 2012, to include the inboard and outboard seals of the penetration, which contain Teflon and updated the EN again on July 17, 2012, to include the containment sump outlet valve submarine hull enclosures and the containment personnel airlock. The initial LER submittal, dated May 1, 2012 did not contain this updated information.

OPPD conducted causal analyses to determine why Teflon was used as a containment integrity seal and insulation on power and control cabling to environmentally qualified components. The results of these analyses are discussed in the Conclusion section below.

OPPD initially reported the condition identified on March 2, 2012 via EN 47884 as an unanalyzed condition (10 CFR 50.72(b)(3)(II)(B)) on May 1, 2012. OPPD determined that this notification should have been made no later than March 2, 2012; the failure to timely submit the EN has been entered into the station's corrective action program as Condition Report 2013-12131. OPPD made the initial LER submittal on May 1, 2012.

This report is being made pursuant to 10 CFR 50.73(a)(2)(ii)(B): any event or condition that resulted in the nuclear power plant being in an unanalyzed condition that significantly degraded plant safety, and 10 CFR 50.73(a)(2)(i)(B): any operation or condition which was prohibited by the plant's Technical Specifications.

NARRATIVE

CONCLUSION

OPPD performed the first causal analysis on the use of Teflon as a containment integrity seal. Several CEPFSs have a Teflon seal on the inboard end (inside of containment) and another Teflon seal on the outboard end (outside of containment). See the diagram on page 3.

Wyle Test Report 58681, Qualification Test Program on Conax Electrical Penetrations for Omaha Public Power District for Fort Calhoun Station, dated October 10, 1984, documented that the electrical penetration seals inside containment made from Teflon would leak under DBA conditions, but the outside seals would not fail. This resulted in the replacement of some CEPFSs as discussed in the BACKGROUND section.

Recently, the radiation dose under DBA conditions in the Auxiliary Building, including streaming through the penetrations, was re-calculated and the results indicated there would be a higher dose to the outer seal than previously documented. As a result, OPPD was concerned that the Teflon in the CEPFS outer seals may degrade and leak during a DBA due to the higher calculated dose. On this basis, OPPD conservatively declared the containment penetrations inoperable on March 2, 2012, and promptly initiated a project to replace or cap these penetrations.

Physical testing was completed in November of 2012, which documented the testing of a single CONAX 2325-7780-13 series CEPFS multi-conductor spare with Teflon seals and Teflon insulated conductors that was taken from FCS after 39 years of service. This CEPFS had been exposed to natural aging through normal plant operating conditions. This CEPFS was then subjected to environmental testing that included increased irradiation and DBA test profiles at a vendor facility. After the DBA environment testing, the outboard seal was tested and passed the 69 psig helium leak test criteria (FCS FSAR Section 5.9.3.1, Design Bases).

Additional testing was conducted in January and February of 2013 for two other CEPFSs, which were also subjected to environmental testing that included irradiation and DBA test profiles. Again the outboard seals were tested and found acceptable passing all Helium leak-rate testing. This testing provided additional and repeatable assurance that the originally-installed CEPFSs (CONAX 2325-7780-13 series) satisfied the USAR 5.9.1 design requirement for containment integrity. OPPD did not test any other additional configurations of penetrations prior to their replacement.

OPPD subsequently found these conditions extended to the containment personnel air lock electrical penetration subassemblies and containment sump outlet valve submarine hull enclosure penetrations that contain Teflon.

The second causal analysis was completed for the use of Teflon as insulation on power and control cabling to environmentally qualified components. See the diagram on page 3.

As discussed in the BACKGROUND section, not all of the CEPFSs supplying EQ components were replaced during 1985/1986. These CEPFSs were identified during reviews of EEQ component documentation. OPPD chose to replace these penetrations as part of the ongoing penetration replacement project.

Additionally, OPPD identified four subassemblies that have coaxial cables with Kapton insulation and Teflon jackets that are associated with equipment requiring environmental qualification. OPPD replaced these as well.

NARRATIVE

CORRECTIVE ACTIONS

The two causal analyses found that there was a lack of managerial and technical oversight to ensure the information associated with Teflon material used in EQ CEPFSs was applied to non-EQ CEPFSs. This lack of managerial and technical oversight is being addressed across the organization through the resolution of the Fundamental Performance Deficiencies.

The Teflon degradation issue will be resolved by replacing or capping the remaining CEPFSs containing Teflon seals or conductor insulation prior to plant startup.

The FCS USAR will be updated (post-restart) to describe the as-left replacement configuration of the electrical penetration assemblies.

SAFETY SIGNIFICANCE

The inboard Teflon seals on the Conax series 2325-7780 multi-conductor electrical penetrations would degrade in a DBA environment, which would reduce the safety margin and leak integrity would be dependent on the outside Teflon seals. However, recent testing showed that these CEPFSs satisfied the USAR 5.9.1 design requirement for containment integrity.

Under accident conditions, failure of the CEPFSs would challenge the operability of the following EEQ equipment (even though the insulation is held in place by the surrounding tube and it is very unlikely these feed-throughs would have failed to perform their design function):

a. Radiation monitors RM-091A and RM-091B, containment area high range radiation monitors. These monitors provide high-level radiation measurements, which would be required during accident conditions. These monitors extend the range of the containment area radiation monitoring system.

b. HCV-383-3 and HCV-383-4, containment sump recirculation isolation valves. The containment sump isolation valves provide isolation between the high pressure safety injection system and the containment sump. These valves automatically open when a recirculation actuation signal is generated.

SAFETY SYSTEM FUNCTIONAL FAILURE

This event does not result in a safety system functional failure in accordance with NEI-99-02.

PREVIOUS EVENTS

Three LERs with event dates since May 1, 2010, were identified discussing penetration issues. Only one LER, 2011-003-3, Inadequate Flooding Protection Due to Ineffective Oversight, identified a lack of oversight as a cause of the condition which resulted in unsealed abandoned penetrations exposing the intake structure to flooding. However the conditions discussed in the current LER are legacy issues that would not have been prevented by the corrective actions identified in LER 2011-003.