Omaha Public Power District
1623 Harney Omaha, Nebraska 68102
402/536-4000

April 3, 1984
LIC-84-093

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Reference: Docket No. 50-285

Dear Mr. Denton:

Environmental Qualification of
Safety-Related Electrical Equipment

Pursuant to the requirements of 10 CFR 50.49, paragraph (g), the Omaha Public Power District has been working toward the final environmental qualification of the referenced electrical equipment by the end of the second refueling outage after March 31, 1982. The Fort Calhoun Station is presently shut down for the second refueling outage after March 31, 1982, with a scheduled startup date of May 2, 1984.

Recently, the District has identified that additional time will be required to complete documentation review, verify accuracy, and complete similarity studies on a set of Foxboro transmitters installed at the Fort Calhoun Station. Attachment 1 provides more specific details on these efforts.

Attachment 2 discusses the work required in order to complete the environmental qualification of electrical penetration assemblies manufactured by Conax Corporation. This attachment also provides a summary of the history for testing the penetration assemblies over the past two years. Significant progress has been made toward demonstrating environmental qualification of these penetration assemblies; however, the completion of the remaining testing and documentation will extend beyond the end of the current refueling outage.

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For the reasons stated above, as further discussed in Attachments 1 and 2, and pursuant to the provisions of 10 CFR 50.12, the District hereby requests an exemption from the scheduled requirements of 10 CFR 50.49, paragraph (g), for the electrical components identified in the referenced attachments. Specifically, the District requests an approximate five-month extension beyond the scheduled May 2, 1984 date to September 30, 1984.

Sincerely,

W. C. Jones
Division Manager
Production Operations

WCJ/KJM:jmm

Attachments

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036

Mr. E. G. Tourigny, Project Manager
Mr. L. A. Yandell, Senior Resident
Inspector

ATTACHMENT 1

Foxboro Transmitters
History and Justification for Continued Operation
for Franklin TER Items 1, 2, 3 and 4

The Fort Calhoun Station is equipped with 62 Foxboro transmitters (See Table 1) which fall within the scope of 10 CFR 50.49. Some of these transmitters were reviewed by FRC as noted in Table 1. Transmitters without FRC item numbers were added to the scope of 10 CFR 50.49 mostly because of TMI requirements, and have not been reviewed by the FRC. These transmitters were procured from 1979 to 1982 to meet IE Bulletin 79-01B or TMI requirements. At the time of procurement, these were required to be qualified to IEEE 323-1971 with IEEE 323-1974 qualification pending. Testing on these transmitters to IEEE 323-1974 was completed on August 10, 1983. The District received the test reports from the vendor on March 16, 1984. Presently, the District is in the process of reviewing these test reports and have concluded that because of the complexity of testing, it will take significant effort on the District's part to complete this review to resolve any anamolies, prove qualification by similarity and to verify accuracy.

JUSTIFICATION FOR CONTINUED OPERATION

For the purpose of this justification, transmitters listed in Table 1 are divided in the following categories:

Category 1: 4-20 mA output Foxboro Model N-E13DM and N-E11GM Transmitters.

Category 2: 10-50 mA output Foxboro Model N-E11GM, N-E13DH, and N-E13DM Transmitters shipped after Dec. 1981.

Category 3: 10-50 mA output Foxboro Model N-E13DM, N-E11GH, N-E13DH Transmitters shipped prior to Jan. 1982.

Category 1 Transmitters:

There are a total of 20 transmitters which fall within this category. At the time of procurement, these transmitters were qualified to IEEE 323-1971 per Foxboro Test Report #1 TI-1059, Q9-6005, T3-1068, and T3-1097.

Subsequently, a group of utilities and Foxboro Co. have qualified these transmitters to IEEE 323-1974 Specification. The District has received a copy of this test report prepared by Wyle Labs. It has been confirmed by the vendor that Fort Calhoun transmitters falling within this category are similar to the transmitters tested (same model number). The District needs to review the test report and evaluate the test results including post accident accuracies. However, we believe that the transmitters as installed can be considered as fully qualified. This conclusion is justified because of the following:

- These transmitters were tested by a reputable test company and the testing was intended to envelop requirements for several nuclear power plants.

- The testing was done under 10 CFR 50 Appendix B QA Program and has been accepted by several utilities.

- The vendor, Foxboro Co., per their letter dated January 6, 1984, has confirmed that no hardware modifications are required to achieve full qualifications.

- These transmitters were purchased as qualified to IEEE 323-1971.

Based on the above, it can be concluded that there is adequate evidence of these transmitters being qualified. Continued operation is, therefore, justified.

Category 2 and 3 Transmitters:

There are a total of 42 transmitters which fall in Category 2 and 3. Like Category 1 transmitters, these transmitters were also procured as qualified to IEEE 323-1971. Subsequently, these transmitters have also been tested to IEEE 323-1974. The District has decided to upgrade these transmitters and has received a copy of the Test Report prepared by Wyle Labs. It has been confirmed that Fort Calhoun transmitters falling within Category 2 are identical to the transmitters tested. The vendor has also confirmed that these transmitters can be upgraded without any hardware changes.

For transmitters which fall within Category 3, the vendor has informed us that these transmitters will require some hardware changes to fully qualify to IEEE 323-1974. These hardware changes are currently in progress and are expected to be completed before plant startup from the current refueling outage. Upon completion of these hardware changes these transmitters will be identical to the one tested by Foxboro.

In the process of qualifying these transmitters by similarity and in reviewing the test report, it has been discovered that the test data needs to be supplemented by an analysis to justify full qualification for these transmitters. This is because the transmitters were tested with 65-93VDC power supplies. The existing power supplies for 36 of these transmitters is 52.5 Volts DC. A preliminary analysis has been completed and it has been concluded that these transmitters will be able to perform their intended function during normal and DBE environment with a 52.5 Volt power supply.

The vendor has already confirmed that a 52.5 Volt power supply is acceptable for normal operation. In discussions with the vendor it has been concluded that with the exception of very high radiation (10^7R), the transmitters' hardware is insensitive to anticipated post accident environmental conditions. For the Fort Calhoun Station the integrated dose for the duration for which these transmitters are required to be functional is expected to be less than 10^7R. Therefore, considering that the hardware is not expected to degrade due to post accident environment and use of a 52.5 Volt power supply is acceptable for normal operation, the District is justified in concluding that these transmitters will be able to perform their intended function during normal and DBE accident environment.

Based on the above, it can be concluded that there is adequate evidence of these transmitters being qualified. Continued operation is, therefore, justified in accordance with 10 CFR 50.49.

rh/N

TABLE 1

FOXBORO TRANSMITTERS

Transmitter	FRC#	Category
FT-313	1	2
FT-316	1	2
FT-319	1	2
FT-322	1	2
A/B/C/D PT-102	2	2
PT-103X	2	2
PT-103Y	2	2
A/B/C/D PT-902	2	2
A/B/C/D PT-905	2	2
LT-101X	3	3
LT-101Y	3	3
A/B/C/D LT-901	4	3
A/B/C/D LT-904	4	3
FT-416	-	2
FT-417	-	2
FT-418	-	2
FT-419	-	2
FT-328	-	2
FT-330	-	2
FT-332	-	2
FT-334	-	2
FT-1109	-	3
FT-1110	-	3
LT-1183	-	3
LT-1188	-	3
PT-105	-	3
PT-115	-	3
PT-783	-	1
PT-784	-	1
PT-785	-	1
PT-786	-	1
A/B/C/D LT-911	-	1
A/B/C/D LT-912	-	1
A/B/C/D PT-913	-	1
A/B/C/D PT-914	-	1

ATTACHMENT 2

Electrical Penetration Testing History
and
Justification for Continued Operation
for Franklin TER Items 85, 86, 87, 88, 89, 92, 99, 103

History:

The Fort Calhoun Station is equipped with approximately 400 electrical penetration subassemblies which are used to provide electrical paths for instrumentation, control, and power for normal plant operation, and certain accident and post-accident functions. These electrical penetration subassemblies were manufactured by the Conax Corporation using TFE teflon for the seal, and FEP teflon for the lead wire insulation. As part of the preparation of the response to IE Bulletin 79-01B, testing information as described in Section 5.9 of the USAR was reviewed.

Upon completion of a re-review of the available vendor-supplied documentation in February 1981, the District concluded that additional testing was necessary to meet a strict interpretation of the DOR Guidelines. A separate radiation test was done on the assemblies, and was not done in sequence as part of a LOCA test. This was not in full compliance the DOR Guidelines which require sequential testing if a material is known to degrade severely under a stress parameter (in this case radiation). Therefore, a purchase order for testing was issued to Wyle Laboratories on August 31, 1981.

The time between purchase order issuance and the beginning of actual testing was used to determine what fixes (RTV or Raychem sleeving) could potentially be tested and for preparing the test fixture and test samples. In preparation for final testing by Wyle, in March of 1982, a test sample consisting of seal and lead wire was irradiated to 9.9×10^6R gamma at Iowa State University. Although some material degradation was noted, the sample showed no leakage, the lead wire insulation remained flexible, and the insulation withstood a 500 VDC insulation resistance test while immersed in salt water. NOTE: After experimentation with the fixes (RTV or Raychem sleeving) it was determined that the fixes could not be acceptably implemented and were subsequently dropped.

The initial testing at Wyle Laboratories began in the fall of 1982, and consisted of the 40-year accelerated aging test. At the end of this testing, excessive leakage was found. This was reported to the Commission in a letter dated December 30, 1982. This seemed to be contrary to information contained in the District's surveillance test program which indicated no leakage.

The District then began a research effort to identify the failure mechanism. A test sample was aged using the original criteria with leakage testing conducted at more frequent intervals. Failure was found to occur between 20 and 30 years of qualified life. This was reported to the Commission in a letter dated March 8, 1983.

Contact was then made with Conax and DuPont. The problem was identified as a cold flow problem due to high accelerated aging temperatures in which the seal material "flowed" in the subassembly tubing. Conax then developed a new aging criteria to more accurately model this "cold flow". This was completed in August of 1983. A second test sample was then aged, and no leakage was measured.

The District restarted the test program with a modification such that the penetrations would be aged at the new temperature and then spliced on the already aged penetration lead wires, splice, and cable system. However, due to a communications problem, the aged cable splices were destroyed in mid-February, 1984.

Subsequent to mid-February, the District attempted to locate parts, construct new assemblies, and evaluate the impact on the schedule to determine if the overall commitment date could be met. It then became necessary to age the lead wire, splice, and cable assembly. The aging began on March 20, 1984. Testing, issuance and review of the final report, will be completed by September 30, 1984. This is after the District's commitment date of the end of the present refueling outage (early May 1984). Thus, an exemption from this deadline is requested. Continued safe operation is justified as discussed below.

Justification for Continued Operation: (Franklin TER Items 85, 86, 87, 88, 89, 92, 99, 103)

The District elected to resolve specific qualification deficiencies in the above noted Franklin TER items by testing.

Specifically, Items 85 through 89, Rockbestos Pyrotrol III cable, were cited for deficiencies related to aging, qualified life, and radiation. Item 92, cable splices at electrical penetrations, were cited for deficiencies related to aging, qualified life, radiation, and test sequence. Item 99, Conax electrical penetrations in containment, were cited for deficiencies related to radiation, test sequence, aging, and qualified life. Item 103, Raychem cable splices, lacked adequate similarity.

To summarize, the Conax penetrations (Item 99) are being re-tested to insure the proper test sequence (an elimination of separate effects) is completed. Items 92 and 103 are being tested to insure the penetration/splice system under proper test sequence is accounted for. The cables, Items 85 through 89, are being tested to account for radiation and aging in proper test sequence.

It is the District's engineering judgement that safe operation is justified until the test is completed and evaluated. Based on the information supplied by the vendor, the District believes the Pyrotrol III cable is similar to the qualified Firewall III which has a 40-year qualified life at 90°C. Since the cable is similar and operates at significantly lower than 90°C (qualification level of the Firewall III), the District expects little aging degradation.

It should be noted that the Pyrotrol III has successfully completed several LOCA tests, including radiation up to 1.79×10^8R. Based on similarity to Firewall III and the several tests, the District believes that continued operation with Pyrotrol III is justified.

The District also believes operation with the splice and penetration teflon interface is justified for Items 92 (original plant splices) and 103 (Raychem). The teflon provides a smooth surface to shrink on and seal. Both splices have completed a LOCA test. The original plant splices have been qualified by analysis for aging and radiation. The Raychem has been qualified by test.

It should also be noted that the District has irradiated a penetration sample to 9.9×10^6R at Iowa State University. The lead wire insulation was found to have degraded but should remain strong enough to insure the splice interface does not degrade.

The District believes safe continued operation is justified for the electrical penetrations, Item 99. As discussed earlier, a test sample was irradiated to 9.9×10^6R (approximate accident dose). The sample functioned properly under the limited testing. No leakage was measured at 60 psig, the insulation did not break down at 500 VDC with the lead wires immersed in salt water, and although there was some loss of structural strength, the insulation still required physical effort to remove from the wire and did not exhibit cracking when bent sharply. The District has also completed a successful aging test in which no leakage was measured after the equivalent of 40 years life. It should also be noted that the penetrations have successfully passed a LOCA test without aging or radiation.