

May 24, 2005

10 CFR 54

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

Gentlemen:

In the Matter of)	Docket Nos. 50-259
Tennessee Valley Authority)	50-260
		50-296

**BROWNS FERRY NUCLEAR PLANT (BFN) - UNITS 1, 2, AND 3 -
LICENSE RENEWAL APPLICATION (LRA) - RESPONSE TO NRC REQUEST
FOR ADDITIONAL INFORMATION ON CLARIFICATION ON SECTION 3.3
(TAC NOS. MC1704, MC1705, AND MC1706)**

By letter dated December 31, 2003, TVA submitted, for NRC review, an application pursuant to 10 CFR 54, to renew the operating licenses for the Browns Ferry Nuclear Plant, Units 1, 2, and 3. As part of its review of TVA's LRA, the NRC staff, through a series of informal requests from March 21, 2005, through May 10, 2005, identified additional information needed for clarification on Section 3.3.

The enclosure to this letter contains the specific NRC request(s) for additional information and the corresponding TVA response(s).

U.S. Nuclear Regulatory Commission
Page 2
May 24, 2005

If you have any questions regarding this information, please contact Ken Brune, Browns Ferry License Renewal Project Manager, at (423) 751-8421.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 24th day of May, 2005.

Sincerely,

Original signed

T. E. Abney
Manager of Licensing
and Industry Affairs

Enclosure:
cc: See page 3

U.S. Nuclear Regulatory Commission
Page 3
May 24, 2005

Enclosure

cc (Enclosure):

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(Via NRC Electronic Distribution)

Enclosure

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cc: continued page 4

U.S. Nuclear Regulatory Commission
Page 4
May 24, 2005

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U.S. Nuclear Regulatory Commission
Page 5
May 24, 2005

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ENCLOSURE

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3
LICENSE RENEWAL APPLICATION (LRA)

RESPONSE TO NRC REQUESTS FOR ADDITIONAL INFORMATION (RAI)
ON SECTION 3.3

(SEE ATTACHED)

**TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3
LICENSE RENEWAL APPLICATION (LRA)**

**RESPONSE TO NRC REQUESTS FOR ADDITIONAL INFORMATION (RAI)
ON SECTION 3.3**

By letter dated December 31, 2003, TVA submitted, for NRC review, an application pursuant to 10 CFR 54, to renew the operating licenses for the Browns Ferry Nuclear Plant, Units 1, 2, and 3. As part of its review of TVA's LRA, the NRC staff, through a series of informal requests from March 21, 2005, through May 10, 2005, identified additional information needed for clarification on Section 3.3. This enclosure contains the specific NRC request(s) for additional information and the corresponding TVA response(s).

NRC Requested Clarification on Section 3.3

The NRC staff, through an e-mail on March 21, 2005, requested additional clarification on Section 3.3 AMR items returned from audit team. The requested clarification was that the answer to the first question is for the system (82) which is Diesel Generator but not for (86) Diesel Generator Starting Air that is the original question. Could you please provide the answer for system (86)?

NRC Follow-up Question on Section 3.3 (NRC Unresolved Issue 3.3.2.30-1)

Depending on the environmental conditions such as temperature, ultraviolet radiation, and aggressive chemicals, there is the potential for elastomers to experience aging effects and require aging management. The applicant was asked to clarify the environment to justify that there are no aging effects or provide appropriate aging management for these components (as they have done for numerous other systems); however, the applicant discussed the diesel generator system instead.

Clarification concerning the diesel generator starting air flexible connectors determined that there are no aging effects for the rubber flexible connectors and only the system monitoring program would be applied to manage degradation of the external surfaces due to ultraviolet radiation. The applicant is requested to address the basis for concluding that there are no aging effects for these

elastomers and the basis for applying external inspections to manage potential degradation from a different internal environment. The response should consider the following factors in evaluating degradation of elastomers:

Environment

The applicant indicates that rubber may crack when exposed to air and sunlight mainly due to reaction with ozone. The applicant also states that cracking due to ultraviolet radiation is not considered an applicable aging effect for rubber compounds in an air/gas environment since the ultraviolet radiation to the internal surfaces of the components is negligible. The staff is concerned that elastomers may degrade even under a controlled environment such as during storage. Industry documents such as DoD handbook MIL-HDBK-695D "Rubber Products: Recommended Shelf Life", identify the age resistance of elastomers as 20 years for silicon, 5-10 years for neoprene and 5-10 years or 3-5 years for nitrile depending on the type. The applicant is requested to justify why degradation from exposure to ozone or other environmental factors do not apply to internal surfaces for the required sixty year period.

Temperature

The applicant indicates that, based on EPRI TR-114881, thermal aging may be considered not significant if the ambient temperature is less than 95F. The applicant indicates the temperature of the flexible connectors within the diesel generator starting air system (internally and externally) is less than 130F. Since the temperature of the flexible connectors may exceed 95F, the applicant is requested to explain why there are no aging effects for the flexible connectors due to temperature.

Operating Experience

Industry and plant specific operating experience should be considered in evaluating aging effects and the service life for elastomers. The applicant is requested to review and submit operating experience (nuclear and non-nuclear) to determine if elastomers may be susceptible to internal degradation that may not be detected by an external inspection.

Manufacturer's Recommendations

The manufacturer's recommendations for degradation, service life and appropriate inspections should be considered in determining appropriate aging effects and aging management programs. The applicant should clarify if manufacturer's recommendations were considered in determining appropriate aging effects and inspections for elastomers.

TVA Response to Requested Clarification on Section 3.3 and Related Follow-up Items

Diesel Generator Starting Air System (System 86):

Line 21 of Table 3.3.2.30 shows elastomer flexible connectors in air/gas and inside air (external) environment. Rubber is identified as the elastomer material for the flexible connectors used in the Diesel Starting Air System.

Rubber is decomposed by exposure to ultraviolet radiation. Ultraviolet radiation includes solar radiation and ultraviolet or fluorescent lamps. Rubber may crack when exposed to air and sunlight mainly due to reaction with ozone and is considered an applicable aging effect in an inside air (external) environment. The Systems Monitoring Program will be used to age manage the external surface. Cracking due to ultraviolet radiation is not considered an applicable aging effect for rubber compounds in an air/gas (internal) environment since the ultraviolet radiation to the internal surfaces of the flexible connectors is negligible (the internal environment of the flexible connectors are not exposed to solar radiation and fluorescent lamps).

Thermal exposure of elastomers can result in decreased tensile strength or ultimate elongation, cracking, chain scission, or cross-linking. Elastomers are tested for short-term and long-term temperature durability. EPRI TR-114881 provides a maximum temperature rating for rubber of 130°F. EPRI TR-114881 also states that in general, if the ambient temperature is less than about 95°F, thermal aging may be considered not significant (for any elastomer material) for the period of extended operation. While the normal temperature of the Diesel Starting Air would be in equilibrium with the external room temperature and thus less than 95°F, the Diesel Starting Air System Modes of Operation calculation indicates that the rubber flexible connector can be exposed to a maximum temperature of about 115°F. Therefore, taking the conservative approach, degradation of material due to thermal stress is considered an applicable

aging effect. The Systems Monitoring Program will be used to age manage the external surface and the internal surface will be managed by the One-Time Inspection Program.

Ionizing radiation can profoundly alter the molecular structure and macroscopic properties of elastomers. Effects of radiation-induced degradation of elastomers may include embrittlement, cracking or crazing, swelling, discoloration, and melting. Rubber ultimately becomes harder, stiffer, and eventually brittle when exposed to radiation. The lowest reported dose threshold for radiation degradation of rubber is 10^6 rads (per EPRI 114881). The ionizing radiation the flexible connectors receive in the Diesel Starting Air System is negligible (much less than 10^6 rads); therefore, degradation from this mechanism is not significant.

For Table 3.3.2.30, line item 21 should be revised as follows:

Flexible Connectors	PB	Elastomer (Rubber)	Air/Gas (internal)	Elastomer degradation due to thermal exposure	One-Time Inspection Program (B.2.1.29)	None	None	J, 4
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A new line item should be added to Table 3.3.2.30 to reflect degradation due to ultraviolet radiation for elastomer in an inside air (external) environment as follows:

Flexible Connectors	PB	Elastomer (Rubber)	Inside air (external)	Elastomer degradation due to ultraviolet radiation and thermal exposure	System Monitoring Program (B.2.1.39)	None	None	J, 4
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The life expectancy of an item depends on the plant conditions and is usually established based on material aging and qualification test data. No specific recommendations were provided by the manufacturer regarding service life and appropriate inspections. Based on the above aging management evaluations, the external surface of the flexible connectors will be managed by the Systems Monitoring Program and the internal surface of the flexible connectors will be managed by the One-Time Inspection Program.