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Nuclear Licensing

April 11, 2011

10 CFR 50.4
10 CFR 50.90

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

Browns Ferry Nuclear Plant, Units 1, 2, and 3
Facility Operating License Nos. DPR-33, DPR-52, and DPR-68
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **Response to Request for Additional Information Regarding Technical Specifications Change TS-474 - TS 3.7.3, "Control Room Emergency Ventilation System," dated March 10, 2011**

References:
1. Letter from TVA to NRC, "Technical Specifications Change TS-474 - Request to Add a TS 3.7.3, "Control Room Emergency Ventilation (CREV) System," Action to Address Two CREV Subsystems Inoperable Due to Inoperable CREV System High Efficiency Particulate Air (HEPA) Filter and/or Charcoal Adsorbers," dated August 27, 2010

2. NRC Letter to TVA, "Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Request for Additional Information Regarding Technical Specification Change TS-474 (TAC Nos. ME4668, ME4669, and ME4670)," dated March 10, 2011

On August 27, 2010, the Tennessee Valley Authority (TVA) submitted Technical Specifications (TS) Change TS-474, TS 3.7.3, "Control Room Emergency Ventilation (CREV) System," requesting approval of a change for the condition when both CREV subsystems are inoperable due to an inoperable High Efficiency Particulate Air (HEPA) filter, or when one or more CREV subsystems are inoperable due to an inoperable

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charcoal adsorber. TVA also requested a completion time of 90 days to restore the HEPA filter and charcoal adsorber to operable status (Reference 1). On March 10, 2011, TVA received a Request for Additional Information (RAI) letter from the NRC (Reference 2) applicable to TS Change TS-474. The NRC requested the response within 30 days, i.e., by April 9, 2011. Since April 9, 2011 is a Saturday, the response due date is no later than April 11, 2011.

The enclosure to this letter provides the TVA response to the NRC RAI. Additionally, an error was identified in TVA's submittal on March 10, 2010, in the second paragraph on page E-5 of Enclosure 1, and a corresponding error in the response to Question 3 of Section 4.3 (i.e., the Significant Hazards Determination) on page E-7 of Enclosure 1 (Reference 1). TVA is providing the corrected text in the enclosure.

This letter does not include any new regulatory commitments. Please direct any questions concerning this matter to Tom Matthews at (423) 751-2687.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on the 11th day of April, 2011.

Respectfully,

R. M. Krich

Enclosure:

TVA Response to NRC Request for Additional Information

cc (Enclosure):

NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Browns Ferry Nuclear Plant
Alabama State Department of Public Health

**ENCLOSURE**

**Browns Ferry Nuclear Plant**

**Units 1, 2, and 3**

**Technical Specifications Change TS-474 - TS 3.7.3, "Control Room Emergency Ventilation System"**

**TVA Response to NRC Request for Additional Information**

**ENCLOSURE**

**Browns Ferry Nuclear Plant**

**Units 1, 2, and 3**

**Technical Specifications Change TS-474 - TS 3.7.3, "Control Room Emergency Ventilation System"**

**TVA Response to NRC Request for Additional Information**

***NRC Request for Additional Information (RAI) Question***

*"The current design basis LOCA radiological consequence analysis assumes credit for the CREV HEPA filter. The application changes this assumption in the LOCA analysis by removing the credit taken for the HEPA filtration. Provide additional information describing all the basic parameters used in the LOCA dose consequence analyses. For each parameter, please indicate the current licensing basis (CLB) value, the revised value where applicable, as well as the basis for any changes to the CLB. Also describe any methodologies that may have changed based on the proposed amendment. In addition, provide the resulting change to the calculated radiological consequence of the design basis LOCA. The staff requests that the information be presented in a table as was done for the Browns Ferry alternative source term amendment request."*

**TVA Response**

As part of the TS-405 License Amendment Request, dated July 31, 2002 (ML022200382) to adopt the Alternate Source Term (AST) methodology, TVA provided a table of inputs to be used with RADTRAD Computer Code (NUREG/CR-6604, April 1998) to calculate the radiological consequences of the design basis loss-of-coolant accident (LOCA). Table 1 of this enclosure contains the current licensing basis (CLB) values, revised values and the basis for the revised value.

Based on the inputs provided in Table 1, the revised radiological consequences of the design basis LOCA results in a control room dose of 1.94 rem. The CLB control room dose from a design basis LOCA is 1.62 rem. The revised design basis LOCA control room dose was calculated using the same methodology approved as part of the AST amendment issued by NRC letter dated September 27, 2004.

**Corrected Text**

The revised wording in the second paragraph on page E-5 of Enclosure 1 of the August 27, 2010, letter is provided below.

> "The recent analyses show that the post-LOCA 30-day control room dose with no credit for either the HEPA filters or the charcoal adsorbers results in a minimal

increase in dose consequences **(9.5% decrease in margin)**, with the final dose of 1.94 rem. This remains well below the regulatory limit of 5 rem."

TVA's response to Question 3 of Section 4.3 (Significant Hazards Determination) on page E-7 of Enclosure 1 of the August 27, 2010, letter contained the same error identified above. The revised wording is provided below.

"Analyses associated with the prior approval of Alternate Source Term methodology for design basis accident dose consequences previously did not credit the CREV System charcoal adsorbers. Recent analyses have been performed to assess the post-accident 30-day control room dose removing credit for the CREV System HEPA filter. The results indicate a minimal increase in dose consequences **(9.5% decrease in margin)** due to removing credit for the CREV System HEPA filter. Even with no credit for either the CREV System HEPA filter or CREV System charcoal filter, the resultant control room dose maintains more than 60 percent margin to the regulatory limit of 5 rem TEDE. As such there is no reduction in a margin of safety for any duration of inoperability of the CREV System HEPA filter or charcoal adsorbers. While the HEPA filter and charcoal adsorbers are not credited for accident mitigation, they remain required by the BFN TS for compliance with the LCO 3.7.3, "Control Room Emergency Ventilation (CREV) System," further minimizing any potential reduction in a margin of safety."

**TABLE 1**
**Loss-of-Coolant Accident (LOCA) Radiological Consequence Analysis Inputs**

| Parameter | Current Licensing Basis (CLB) Value | Revised Value | Basis for Revision |
|---|---|---|---|
| Control Room Emergency Ventilation (CREV) Intake Flow Rate | 6717 scfm | | |
| CREV Makeup Filtered Flow Rate | 3000 scfm | 0 | Changes made to eliminate credit for the HEPA filter in the CREV System |
| CREV Unfiltered Inleakage Rate | 3717 scfm | 6717 | |
| CREV High Efficiency Particulate Air (HEPA) Filter Efficiency | 90% Particulate | No credit taken | |
| CREV Charcoal Adsorption Efficiency | No credit taken | | |
| Control Room Volume | 210,000 $ft^3$ | | |
| Standby Gas Treatment (SGT) Flow Rate | 24,750 scfm | | |
| SGT HEPA Filter Efficiency | 90% Particulate | | |
| SGT Charcoal Adsorption Efficiency | No credit taken | | |
| Environment Breathing Rate | 0-8 hours: 3.5E-04 $m^3$/sec<br>8-24 hours: 1.8E-04 $m^3$/sec<br>1-30 days: 2.3E-04 $m^3$/sec | | |
| Control Room Breathing Rate | 3.5E-04 $m^3$/sec | | |
| Control Room Occupancy Factors | 0-1 day: 1.0<br>1-4 days: 0.6<br>4-30 days: 0.4 | | |
| Fission Products Release Fractions | Regulatory Guide 1.183 (Revision 1) Table 1<br>BWR Core Inventory Fraction Released Into Containment<br>Group / Gap Release Phase / Early In-vessel Phase / Total<br>Noble Gases 0.05 0.95 1.0<br>Halogens 0.05 0.25 0.3<br>Alkali Metals 0.05 0.20 0.25<br>Tellurium Metals 0.00 0.05 0.05<br>Ba, Sr 0.00 0.02 0.02<br>Noble Metals 0.00 0.0025 0.0025<br>Cerium Group 0.00 0.005 0.0005<br>Lanthanides 0.00 0.0002 0.0002 | | |
| Fission Product Release Timing | Regulatory Guide 1.183 (Revision 1) Table 4<br>LOCA Release Phases BWR<br>Phase / Onset / Duration<br>Gap Release 2 min 0.5 hr<br>Early In-vessel 1.5 hr 0.5 hr | | |
| Fission Product Iodine Chemical Form | Particulate 95%<br>Elemental 4.85%<br>Organic 0.15% | | |

| TABLE 1<br>Loss-of-Coolant Accident (LOCA) Radiological Consequence Analysis Inputs | | | |
|---|---|---|---|
| **Parameter** | **Current Licensing Basis (CLB) Value** | **Revised Value** | **Basis for Revision** |
| Control Room Isolation/CREV Initiation | 10 minutes | | |
| Emergency Core Cooling System (ECCS) Leakage Release Fractions | Ten percent of the radioiodine in the leaked coolant is assumed to become airborne in the reactor building (secondary containment). Of this activity, 97% is assumed to be elemental iodine and 3% is assumed to be organic iodine. | | |
| **Flow Rates** | | | |
| Primary Containment Leak Rate (30 days) | 2% containment air weight/day | | |
| Secondary Containment Bypass Leak Rate (30 days) | Hardened Wet Well Vent Release = 10 scfh beginning at t>8 hours | | |
| Assumed ECCS Leak Rate (30 days) | 5 gpm | 20 gpm | Revised to provide additional margin. The CLB Control Room Dose was increased from 1.25 REM to 1.62 REM, in accordance with 10 CFR 50.59. |
| ECCS Leakage Temperature | <212°F | | |
| Main Steam Isolation Valve (MSIV) Leak Rate at Test Pressure of 25 psig | 150 scfh total<br>100 scfh maximum for one line | | |
| Leakage at Base of Stack (stack bypass) | 10 scfm | 20 scfm | Revised to provide additional margin for damper testing |
| MSIV Leakage that Bypasses Main Condenser | 0.5%<br>(percentage of total MSIV leakage) | | |
| Containment Atmosphere Dilution Vent Rate | 139 scfm for 24 hrs<br>@ 10 days, 20 days, 29 days | | |
| **Volumes** | | | |
| Drywell Airspace | 159,000 $ft^3$<br>(Min value used for dose calculation) | | |
| Torus Airspace | 119,400 $ft^3$ (Minimum) | | |
| Suppression Pool | 121,500 $ft^3$ (Minimum) | | |
| Reactor Building Free Volume | 1,931,502 $ft^3$<br>(50% of this value used due to incomplete mixing) | 1.1311E6 $ft^3$<br>(50% of this value used due to incomplete mixing) | Unit 1 Volume used for conservatism |

| TABLE 1<br>Loss-of-Coolant Accident (LOCA) Radiological Consequence Analysis Inputs | | | | |
|---|---|---|---|---|
| **Parameter** | **Current Licensing Basis (CLB) Value** | | **Revised Value** | **Basis for Revision** |
| Stack Room | 69,120 $ft^3$<br>(50% of this value used due to incomplete mixing) | | | |
| High Pressure Turbine | 568.6 $ft^3$ **(No credit taken)** | | | |
| Low Pressure Turbine | 51,000 $ft^3$ **(No credit taken)** | | | |
| **Removal Inputs** | | | | |
| Drywell Natural Deposition | Particulate: Power's Model, 10th percentile values (conservative compared to SRP 6.5.2 $\lambda_w$<br><br>Elemental: Same as particulate. | | | |
| Drywell Accident Conditions (maximum) | P = 48.5 psig, T = 295.2 Degrees F | | | |
| Surface Area for Elemental Iodine Deposition in Drywell | 3409 $m^2$ | | | |
| **Steam Line and Main Condenser Removal Efficiencies** | | | | |
| Condenser Volume | 90% of 136,000 $ft^3$ or 122,400 $ft^3$ | | | |
| Steam Line Conditions | Saturated Conditions at 1050 psia | | | |
| Steam Line Volume: Inboard to Outboard MSIV | 53.7 $ft^3$ | | | |
| Steam Line Volume: Outboard MSIV to Drain Line | 173.1 $ft^3$ | | | |
| Sedimentation Height | 27.2 ft | | | |
| | Removal Efficiency for Aerosol Particles | Removal Efficiency for Elemental Iodine | | |
| Steam Line Leakage (Drywell to Main Condenser) (These removal efficiencies applied to a leakage entering the main condenser volume include removal in the condenser downstream) | 99.87% | 99.01% | | |
| Main Condenser Bypass (Drywell to Environment) | 89.33% | 16.37% | | |