



Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

February 18, 2009

TVA-BFN-TS-418  
TVA-BFN-TS-431

10 CFR 50.90

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Mail Stop OWFN, P1-35  
Washington, D. C. 20555-0001

In the Matter of )  
Tennessee Valley Authority )

Docket Nos. 50-259  
50-260  
50-296

**BROWNS FERRY NUCLEAR PLANT (BFN) – UNITS 1, 2, AND 3 – TECHNICAL SPECIFICATIONS (TS) CHANGES TS-418 AND TS-431 – EXTENDED POWER UPRATE (EPU) – RESPONSE TO ROUND 23 REQUEST FOR ADDITIONAL INFORMATION (RAI) EMCB.204/168 REGARDING STEAM DRYER ANALYSES (TAC NOS. MD5262, MD5263, AND MD5264)**

By letters dated June 28, 2004 and June 25, 2004 (ADAMS Accession Nos. ML041840109 and ML041840301), TVA submitted license amendment applications to NRC for the EPU of BFN Unit 1 and BFN Units 2 and 3, respectively. The proposed amendments would change the operating licenses to increase the maximum authorized core thermal power level of each reactor by approximately 14 percent to 3952 megawatts.

Enclosure 1 provides the response for draft Round 23 RAI EMCB.204/168. Previous responses to the draft Round 23 RAIs were provided by letters dated January 9, 2009, January 16, 2009, and January 23, 2009. Additionally, two issues with the steam dryer stress analyses which were discussed during the teleconference with the NRC staff on January 12, 2009 are described in Enclosure 1.

Enclosure 1 discusses a recently identified technical issue associated with signal filtering which affects only Unit 2 and will likely require development of additional modifications to the Unit 2 dryer beyond those needed on Unit 1. TVA understands that this issue could impact the schedule for completion of an EPU safety evaluation for Unit 2 which, as the review is presently being conducted, would impact the schedule for Unit 1. The major modifications for EPU have already been implemented on Unit 1 and it is physically ready for EPU license and power ascension, whereas the Unit 2 modifications are not scheduled until Spring of 2011. Therefore, we request that priority should be placed on the Unit 1 review in order to meet the tentative ACRS subcommittee schedule of May 21-22, 2009.

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Note that Enclosure 1 contains information that Continuum Dynamics, Inc. (CDI) considers to be proprietary in nature and subsequently, pursuant to 10 CFR 2.390(a)(4), CDI requests that such information be withheld from public disclosure. Enclosure 3 provides an affidavit from CDI supporting this request. Enclosure 2 contains the redacted version of the proprietary enclosure with the CDI proprietary material removed, which is suitable for public disclosure.

TVA has determined that the additional information provided by this letter does not affect the no significant hazards considerations associated with the proposed TS changes. The proposed TS changes still qualify for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

No new regulatory commitments are made in this submittal. If you have any questions regarding this letter, please contact me at (256)729-2636.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 18<sup>th</sup> day of February, 2009.

Sincerely,



F. R. Godwin  
Manager of Licensing  
and Industry Affairs

Enclosures:

1. Response to Round 23 Request for Additional Information (RAI) EMCB.204/168 Regarding Steam Dryer Analyses (Proprietary Version)
2. Response to Round 23 Request for Additional Information (RAI) EMCB.204/168 Regarding Steam Dryer Analyses (Non-proprietary Version)
3. CDI Affidavit

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Enclosures

cc (Enclosures):

State Health Officer  
Alabama State Department of Public Health  
RSA Tower - Administration  
Suite 1552  
P.O. Box 303017  
Montgomery, Alabama 36130-3017

Ms. Eva Brown, Project Manager  
U.S. Nuclear Regulatory Commission  
(MS 08G9)  
One White Flint, North  
11555 Rockville Pike  
Rockville, Maryland 20852-2739

Ms. Heather J. Gepford, Branch Chief  
U.S. Nuclear Regulatory Commission  
Region II  
Sam Nunn Atlanta Federal Center  
61 Forsyth Street, SW, Suite 23T85  
Atlanta, Georgia 30303-8931

NRC Resident Inspector  
Browns Ferry Nuclear Plant  
10833 Shaw Road  
Athens, Alabama 35611-6970

NON-PROPRIETARY INFORMATION

**NRC RAI EMCB.204/168 (Units 1 and 2)**

TVA utilized Continuum Dynamics Incorporated (CDI) Acoustic Circuit Model (ACM) Revision 4 for the steam dryer analyses. This model was provided in CDI Report 07-09P, *Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements, with Inclusion of a Low Frequency Hydrodynamic Contribution*. Based on comparisons to Quad Cities measurements, this model (ACM Rev. 4) [[

]]

Use of this negative bias is acceptable provided there are no significant loads, or no significant dryer stress components in [[

]] There are also strong loads on the Unit 2 dryer (see Figure 4.6 of CDI Report 08-05P, Revision. 3, *Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 2 Steam Dryer to 250 Hz*) and at least one critical location with high stresses between 60 and 70 Hz (node 101376, shown in Figure 15a of CDI Report 08-20P, Revision. 0, *Stress Assessment of Browns Ferry Nuclear Unit 2 Steam Dryer with Outer Hood and Tie-Bar Reinforcements*).

Provide justification for the application of the [[

]] on the dryer stresses is not significant."

**TVA Response to EMCB.204/168 (Units 1 and 2)**

[[

]] The impact on steam dryer stresses depends upon the frequency content of the alternating stresses for the limiting steam dryer nodes,

**Assessment of steam dryer stress with revised bias and uncertainty frequency intervals**

To determine the effect of adjusting the bias and uncertainty frequency intervals, BFN has performed assessments of the existing Units 1 and 2 steam dryer stresses at EPU conditions. These assessments, discussed below, show that adjusting the bias and uncertainty frequency intervals [[

]] however, the stress results remain acceptable due to other conservatism within the methodology and criteria.

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]] Filtering issues in the safety relief valve resonance range on Unit 2 are discussed separately below.

Those nodes that were determined to have SR-a < 2.0 for Unit 1 at EPU conditions are listed in Table EMCB.204/168-1.

**Table EMCB.204/168-1: BFN1 Assessment Results**

Location	node	EPU SR-a Using Existing Bias	EPU SR-a Using Positive Bias 60 - 70 Hz	Stress Reduction Factor for Weld	Impact on SR-a
1. Middle Closure Plate/Inner Hood	94004	2.35	1.64	1.8/1.4	2.11
2. Mid Bottom Perf Exit/Mid Top Perf Exit/Tie Bar	104411	2.22	1.80	0.5	3.60
3. Hood Support/Inner Hood	93484	2.76	1.93	0.77	2.51
4. Mid Bottom Perf Exit/Mid Top Perf Exit/Tie Bar	105753	2.30	1.97	0.5	3.94

These results indicate that four locations on the Unit 1 steam dryer would have an alternating stress ratio of less than 2.0 at EPU. All of these nodes occur at welds which are simply modeled as connections of beam and shell elements. For welded joints, this method yields conservative results relative to a solid model which includes weld joint geometry. Stress reduction factors (SRF) based on submodeling for other welds in BFN dryer stress analyses range from 0.58 to 0.82.

The weld at Location 1 is a full penetration weld which would allow the use of a weld factor of 1.4 versus the standard weld factor of 1.8 for fillet welds that is currently applied to all BFN welds generically. The applicability for weld factors (1.4 for full penetration welds and 1.8 for fillet welds) for BFN was presented in Section 6.7 (and summarized in Figure 6.46) of GE-NE-0000-0053-7413-R4-P, "Browns Ferry Nuclear Plant Units 1, 2, and 3 Steam Dryer Stress, Dynamic, and Fatigue Analyses for EPU Conditions," Enclosure 1 of the submittal dated October 3, 2006, "Steam Dryer Stress Report, Revision 4" (ML062790230). Full penetration weld factors of 1.4 have also been used by previous EPU licensees in steam dryer stress analyses.

CDI submodels, using the method described in Appendix A of CDI Report No. 08-20P (Enclosure 2 of the submittal dated November 14, 2008, "Supplemental Response to Rounds 19 and 22 RAI Regarding Steam Dryers," ML083250114), were performed for the welds at Locations 2, 3, and 4. The calculated SRFs were 0.5 at Locations 2 and 4 and 0.77 at Location 3. An issue with the Unit 1 support beam is discussed separately below.

Conclusion

There is sufficient overall conservatism in the stress analysis [[

]] which is confirmed by

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quantitative analysis of Unit 1 and 2 dryers. Therefore, continued use of the bias and uncertainties given in ACM Revision 4 is justified for application to BFN dryers.

### **Additional Issues**

During the teleconference with the NRC staff on January 12, 2009, TVA discussed two issues that have been identified regarding the stress analyses for the Units 1 and 2 steam dryers. These issues have been documented in the BFN corrective action program and actions are in progress to resolve the issues.

#### **Unit 1 Support Beams**

During the recent stress assessment for the Unit 1 steam dryer, it was identified that the determination of stress associated with the weld on the support beams may not be appropriate for the installed weld configuration. The support beams consist of two T shaped beams attached to the bottom of the dryer banks by stitch welding with 1/4 inch fillet welds. Although the support beams do not serve a primary structural purpose, the support beams should remain in position. TVA is performing additional analyses to ensure that the support beams are adequately analyzed for their purpose. The schedule for completing this analysis is being developed and will be discussed with the NRC staff.

#### **Unit 2 Filtering in Safety Relief Valve Resonance Range**

During a review of the Unit 2 steam dryer stress analysis for EPU conditions, it was identified that exclusion filters for the recirculation pump vane passing frequencies were used in the frequency range where safety relief valve resonance would be expected if it occurs. This could cause the steam dryer load to be under-predicted in this frequency range when the EPU bump-up factors are applied. Consequently, this would affect the Unit 2 stress analysis results that were reported in CDI Report No. 08-20, "Stress Assessment of Browns Ferry Nuclear Unit 2 Steam Dryer with Outer Hood and Tie-Bar Reinforcements," provided as Enclosure 2 of the submittal dated November 14, 2008, "Supplemental Response to Rounds 19 and 22 RAI Regarding Steam Dryers." To address the increased steam dryer load, additional modifications are being evaluated to reduce the stress at certain steam dryer locations. The schedule for completing this evaluation is being developed and will be discussed with the NRC staff.

**ENCLOSURE 3**

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

**TECHNICAL SPECIFICATIONS (TS) CHANGES TS-431 AND TS-418  
EXTENDED POWER UPRATE (EPU)**

**CDI AFFIDAVIT**

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Attached is the CDI affidavit for the proprietary information contained in Enclosure 1.



# Continuum Dynamics, Inc.

(609) 538-0444 (609) 538-0464 fax

34 Lexington Avenue Ewing, NJ 08618-2302

## AFFIDAVIT

Re: BROWNS FERRY NUCLEAR PLANT (BFN) – UNITS 1, 2, AND 3 – TECHNICAL SPECIFICATIONS (TS) CHANGES TS-418 AND TS-431 – EXTENDED POWER UPRATE (EPU) – RESPONSE TO ROUND 23 REQUEST FOR ADDITIONAL INFORMATION (RAI) EMCB. 204/168 REGARDING STEAM DRYER ANALYSES (TAC NOS. MD5262, MD5263, AND MD5264)

I, Barbara A. Agans, being duly sworn, depose and state as follows:

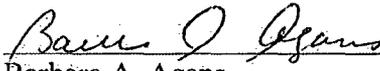
1. I hold the position of Director, Business Administration of Continuum Dynamics, Inc. (hereinafter referred to as C.D.I.), and I am authorized to make the request for withholding from Public Record the Information contained in the documents described in Paragraph 2. This Affidavit is submitted to the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 2.390(a)(4) based on the fact that the attached information consists of trade secret(s) of C.D.I. and that the NRC will receive the information from C.D.I. under privilege and in confidence.
2. The Information sought to be withheld, as transmitted to TVA Browns Ferry as attachment to C.D.I. Letter No. 09013 dated 5 February 2009, BROWNS FERRY NUCLEAR PLANT (BFN) - UNITS 1, 2, AND 3 – TECHNICAL SPECIFICATIONS (TS) CHANGES TS-418 AND TS-431 – EXTENDED POWER UPRATE (EPU) – RESPONSE TO ROUND 23 REQUEST FOR ADDITIONAL INFORMATION (RAI) EMCB. 204/168 REGARDING STEAM DRYER ANALYSES (TAC NOS. MD5262, MD5263, AND MD5264).
3. The Information summarizes:
  - (a) a process or method, including supporting data and analysis, where prevention of its use by C.D.I.'s competitors without license from C.D.I. constitutes a competitive advantage over other companies;
  - (b) Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
  - (c) Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs 3(a), 3(b) and 3(c) above.

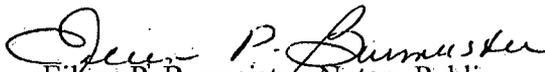
4. The Information has been held in confidence by C.D.I., its owner. The Information has consistently been held in confidence by C.D.I. and no public disclosure has been made and it is not available to the public. All disclosures to third parties, which have been limited, have been made pursuant to the terms and conditions contained in C.D.I.'s Nondisclosure Secrecy Agreement which must be fully executed prior to disclosure.
  
5. The Information is a type customarily held in confidence by C.D.I. and there is a rational basis therefore. The Information is a type, which C.D.I. considers trade secret and is held in confidence by C.D.I. because it constitutes a source of competitive advantage in the competition and performance of such work in the industry. Public disclosure of the Information is likely to cause substantial harm to C.D.I.'s competitive position and foreclose or reduce the availability of profit-making opportunities.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to be the best of my knowledge, information and belief.

Executed on this 5<sup>th</sup> day of February 2009.

  
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Barbara A. Agans  
Continuum Dynamics, Inc.

Subscribed and sworn before me this day: January 5, 2009

  
Eileen P. Burmeister, Notary Public

**EILEEN P. BURMEISTER**  
**NOTARY PUBLIC OF NEW JERSEY**  
**MY COMM. EXPIRES MAY 6, 2012**