

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

Brian O'Grady
Vice President, Browns Ferry Nuclear Plant

July 27, 2007

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

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop OWFN, P1-35
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 -
TECHNICAL SPECIFICATIONS (TS) CHANGES TS-431 AND TS-418 -
EXTENDED POWER UPRATE (EPU) - STEAM DRYER EVALUATIONS**

By letters dated June 28, 2004 and June 25, 2004 (ADAMS Accession Nos. ML041840109 and ML041840301, respectively), TVA submitted license amendment applications to the 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 to 3952 megawatts.

This letter provides the completed BFN steam dryer stress analyses for Units 1, 2 and 3. These analyses were performed by Continuum Dynamics, Inc. (CDI) and are documented in the enclosed reports. These reports supersede the previous stress analysis reports performed for EPU conditions.

ADD1

BFN Steam Dryer Evaluation History

Initially, a steam dryer evaluation for EPU conditions was performed for BFN and the evaluation was provided as Enclosure 9 to the June 28, 2004, and June 25, 2004 EPU license amendment submittals. The evaluation consisted of a stress analysis which utilized the GE generic dryer load definition for both static equivalent and response spectrum. Following the time of the initial steam dryer evaluation, considerable developments had taken place with respect to analysis methodologies and the acquisition of additional plant operating data for dryer loads. These efforts included the development of scale model testing, acoustical analysis, main steam line monitoring, and the design and replacement of the two Quad Cities steam dryers.

Testing of a BFN scale model test (SMT) configuration utilizing the methodologies developed by GE to operate under the BFN EPU conditions was performed. BFN provided the SMT benchmarking report by submittal dated March 9, 2006 (ADAMS Accession No. ML060720303) and the BFN SMT report by submittal dated April 13, 2006 (ADAMS Accession No. ML061070627). By letter dated May 5, 2006 (ADAMS Accession No. ML061300436), BFN provided the steam dryer stress analysis. Based on this analysis, a few steam dryer components were predicted to exceed the fatigue endurance limit at EPU conditions.

A BFN stress report addendum submitted on June 23, 2006 (ADAMS Accession No. ML062400472) reflected planned modifications to the steam dryers. The stress analysis results for the modified steam dryer at EPU conditions demonstrated that the BFN steam dryer stresses were generally below the endurance level screening criteria; however, a few dryer components were predicted to exceed design limits.

On July 11, 2006 (ADAMS Accession No. ML061910705), TVA was notified of the NRC staff conclusions that the BFN submittals did not provide an adequate technical basis to enable the NRC staff to find the EPU applications acceptable. For example, the NRC staff noted that the June 23, 2006, addendum indicated that the maximum stress on some components was calculated to be above the fatigue endurance limit during EPU conditions.

A revised BFN steam dryer stress report was provided on July 21, 2006 (ADAMS Accession No. ML062120411). This

analysis reflected revised modifications and revised uncertainty determination for the acoustic circuit methodology. The engineering analyses for the modified dryer demonstrated that the stresses on the steam dryer components will be within the fatigue endurance limits under EPU conditions.

On July 26, 2006 (ADAMS Accession Nos. ML062200277 and ML062200279), TVA responded to Requests for Additional Information (RAI) associated with the steam dryer reports and provided a revised BFN steam dryer stress report which included revised uncertainties. The NRC staff's initial review of the July 26 submittal (as provided by NRC letter dated August 1, 2006 - ADAMS Accession No. ML062090555) identified concerns with the assumptions regarding specific aspects of the revised steam dryer stress analysis. TVA responded to additional RAIs in an August 18, 2006 letter.

On October 10, 2006, TVA presented its plans to address the NRC staff's concerns regarding the structural integrity of the steam dryers. In the October 10, 2006, meeting, and during subsequent informal conversations, TVA indicated that a revised stress analysis report incorporating an analysis of actual operating data from BFN Unit 2 would be submitted for NRC staff review.

By letter dated April 24, 2007 (ADAMS Accession No. ML071150371), TVA reported that the steam dryer structural analyses would be performed by CDI and would be based on a proprietary load definition methodology also developed by CDI.

Current BFN Steam Dryer Evaluation

Enclosure 1 is CDI Report No. 07-05P entitled "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer to 250 Hz." Enclosure 2 is CDI Report No. 07-06P entitled "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 2 and 3 Steam Dryers to 250 Hz." Separate reports are provided for Unit 1 and Units 2 and 3 because of modifications that were previously made to the BFN Unit 1 steam dryer. The Units 2/3 model reflects the addition of planned modifications to the steam dryer tie bars.

The analyses utilize an ANSYS 10.0 finite element structural model of the steam dryer. The analysis is carried out in the frequency domain. Previous BFN steam

dryer stress analyses have been based on transient simulations performed in the time domain. A comparison of these different methods is provided in Appendix B of the enclosed stress reports. The value of structural damping utilized in the ANSYS finite element model has been a point of discussion in previous RAIs regarding the BFN steam dryer analyses. CDI has used structural damping that is 1% of critical.

The stress analyses are based on an acoustic circuit model and load definition methodology developed by CDI. For BFN, measured strain gage time history data in the four main steam lines at BFN Unit 2 were processed by a dynamic model of the steam delivery system to predict loads on the full scale steam dryer. The acoustic circuit methodology was used to predict the fluctuating pressures applied to components of the steam dryer in the reactor vessel. The acoustic circuit methodology included a low frequency hydrodynamic contribution in addition to an acoustic contribution at all frequencies.

Enclosure 3 provides the latest acoustic circuit model methodology report, CDI Report No. 07-09P, entitled "Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements, with the Inclusion of a Low Frequency Hydrodynamic Contribution." The BFN analysis utilizing BFN Unit 2 strain gage data is provided in Enclosure 4, CDI Report No. 07-10P, entitled "Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 2 Steam Dryer to 250 Hz."

CDI has performed additional testing and evaluations to address dynamics of other components of the steam dryer. The test report is provided in Enclosure 5, CDI Report No. 07-11P, entitled "Dynamics of BWR Steam Dryer Components." The results of this test program and evaluation were included in the structural modeling of the steam dryer to more accurately represent the dynamics of the dryer.

Due to the availability of main steam line strain gage data and the schedule for performing the BFN steam dryer stress analyses, all three units were analyzed utilizing main steam line strain gage data from BFN Unit 2. Unit 2 strain gage data was obtained in October 2006 following a mid-cycle outage. Unit 1 strain gage data was taken during the unit restart from the extended outage during the last half of June 2007. To assess the applicability of the use of Unit 2 steam line data for the Unit 1 steam

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dryer stress analysis, a comparison of the Unit 1 and Unit 2 main steam line strain gage data was performed. This evaluation is provided in Enclosure 6, CDI Technical Memorandum No. 07-26P, entitled "Comparison of Browns Ferry Nuclear Unit 1 and Unit 2 Main Steam Line Strain Gage/Pressure Readings." This evaluation concluded that the use of the Unit 2 data for the Unit 1 analysis results in conservative prediction of dryer stresses on Unit 1.

The BFN steam dryer analyses have been reviewed by TVA and independent contractors.

Please note that the reports provided in Enclosures 1, 2, 3, 4, 5, and 6 contain information that CDI considers to be proprietary in nature and subsequently, pursuant to 10 CFR 9.17(a)(4), 2.390(a)(4) and 2.390(d)(1), requests that such information be withheld from public disclosure. Enclosures 7 through 12 contain the redacted versions of the reports with the CDI proprietary material removed which is suitable for public disclosure. Enclosure 13 is an affidavit from CDI supporting this request.

Results

Analysis of the BFN steam dryers reveals a strong 218 Hz component which is attributable to acoustics in the blind flanged safety valve standpipes. Elimination of this signal by filling the volume of these branches results in minimum alternating stress ratios of SR-a = 2.00 (Unit 1) & 1.77 (Units 2/3) which qualifies the steam dryer with substantial margin for EPU conditions.

Accordingly, prior to operation at EPU conditions, TVA will perform modifications to each BFN unit to fill the volume of the blind flanged safety valve standpipes that are in the main steam flow path. This is in addition to the planned tie bar modifications on Units 2 and 3.

Steam Dryer Monitoring Plan

As stated in TVA's response to Request for Additional Information (RAI) EEMB-D-7 (TVA letter of July 26, 2006), TVA will implement a Steam Dryer Monitoring Plan (SDMP). The SDMP is based on the Vermont Yankee SDMP that was reviewed and accepted by the NRC staff prior to that plant's EPU power ascension. The SDMP will procedurally control power ascension in accordance with pre-determined acceptance criteria (including stress limit curves) and provide for the close monitoring of plant parameters.

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Evaluations and action criteria will ensure that steam dryer integrity is maintained during the power ascension process. The SDMP will also require visual inspections of the steam dryer that follow GE Service Information Letter and BWRVIP recommendations. The comprehensive monitoring program includes provisions for flow induced vibration monitoring through system walkdowns and the use of accelerometers on selected plant components.

Stress Limit Curves for Power Ascension Testing

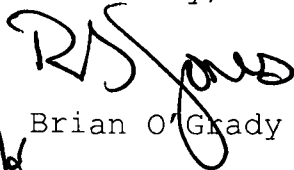
TVA will provide frequency-dependent stress limit curves that will become operating restrictions during EPU power ascension. The limit curves are scheduled to be submitted to NRC by August 21, 2007.

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 have been made in this submittal. If you have any questions regarding this letter, please contact D. Tony Langley at (256)729-3612.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 27th day of July, 2006.

Sincerely,



Brian O'Grady

Enclosures:

1. CDI Report No. 07-05P, "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer to 250 Hz" (proprietary version)
2. CDI Report No. 07-06P, "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 2 and 3 Steam Dryers to 250 Hz" (proprietary version)
3. CDI Report No. 07-09P, "Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements, with the Inclusion of a Low

- Frequency Hydrodynamic Contribution"
(proprietary version)
4. CDI Report No. 07-10P, "Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 2 Steam Dryer to 250 Hz" (proprietary version)
 5. CDI Report No. 07-11P, "Dynamics of BWR Steam Dryer Components" (proprietary version))
 6. CDI Technical Memorandum No. 07-26P, "Comparison of Browns Ferry Nuclear Unit 1 and Unit 2 Main Steam Line Strain Gage/Pressure Readings" (proprietary version
 7. CDI Report No. 07-05NP, "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer to 250 Hz" (non-proprietary version)
 8. CDI Report No. 07-06NP, "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 2 and 3 Steam Dryers to 250 Hz" (non-proprietary version)
 9. CDI Report No. 07-09NP, "Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements, with the Inclusion of a Low Frequency Hydrodynamic Contribution" (non-proprietary version)
 10. CDI Report No. 07-10NP, "Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 2 Steam Dryer to 250 Hz" (non-proprietary version)
 11. CDI Report No. 07-11NP, "Dynamics of BWR Steam Dryer Components" (non-proprietary version)
 12. CDI Technical Memorandum No. 07-26NP, "Comparison of Browns Ferry Nuclear Unit 1 and Unit 2 Main Steam Line Strain Gage/Pressure Readings" (non-proprietary version)
 13. CDI Affidavit

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cc: State Health Officer
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NRC Senior Resident Inspector
Browns Ferry Nuclear Plant
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ENCLOSURE 13

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) - STEAM DRYER EVALUATIONS

AFFIDAVIT

Attached is CDI's Affidavit for the proprietary information contained in CDI Report No. 07-05P, "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer to 250 Hz," CDI Report No. 07-06P, "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 2 and 3 Steam Dryers to 250 Hz," CDI Report No. 07-09P, "Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements, with the Inclusion of a Low Frequency Hydrodynamic Contribution," CDI Report No. 07-10P, "Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 2 Steam Dryer to 250 Hz," CDI Report No. 07-11P, "Dynamics of BWR Steam Dryer Components," and CDI Technical Memorandum No. 07-26P, "Comparison of Browns Ferry Nuclear Unit 1 and Unit 2 Main Steam Line Strain Gage/Pressure Readings."



Continuum Dynamics, Inc.

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

34 Lexington Avenue Ewing, NJ 08618-2302

24 July 2007

Ms. Marie Gillman
TVA Browns Ferry Nuclear Plant
Decatur, AL 35609

SUBJECT:

C.D.I. Report No. 07-05P "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer to 250 Hz," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007;

C.D.I. Report No. 07-06P "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 2 and 3 Steam Dryers to 250 Hz," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007;

C.D.I. Report No. 07-09P "Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements with the Inclusion of a Low Frequency Hydrodynamic Contribution," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007;

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C.D.I. Technical Memorandum No. 07-26P "Comparison of Browns Ferry Nuclear Unit 1 and Unit 2 Main Steam Line Strain Gage/Pressure Readings," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007

To Whom It May Concern:

Enclosed please find one copy of each of the above referenced documents which are being submitted to TVA Browns Ferry in accordance with the Non-Disclosure Secrecy Agreement between Continuum Dynamics, Inc. and TVA Browns Ferry dated June 14, 2004. Should the documents be submitted to the Nuclear Regulatory Commission, we have also enclosed an Affidavit requesting withholding of disclosure, in accordance with 10 CFR 2.390.

Very truly yours,

Alan J. Bilanin
President & Senior Associate

07129
Enclosures

AFFIDAVIT

Re:

C.D.I. Report No. 07-05P "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer to 250 Hz," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007;

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C.D.I. Technical Memorandum No. 07-26P "Comparison of Browns Ferry Nuclear Unit 1 and Unit 2 Main Steam Line Strain Gage/Pressure Readings," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007

I, Alan J. Bilanin, being duly sworn, depose and state as follows:

1. I hold the position of President and Senior Associate 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 attachments to C.D.I. Letter No. 07129 dated 24 July 2007, C.D.I. Report No. 07-05P "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer to 250 Hz," Revision 0 prepared by Continuum Dynamics,

Inc., dated July 2007; C.D.I. Report No. 07-06P "Finite Element Model for Stress Assessment of Browns Ferry Nuclear Unit 2 and 3 Dryers to 250 Hz," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007; C.D.I. Report No. 07-09P "Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements with the Inclusion of a Low Frequency Hydrodynamic Contribution," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007; C.D.I. Report No. 07-10P "Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 2 Steam Dryer to 250 Hz," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007; C.D.I. Report No.07-11P "Dynamics of BWR Steam Dryer Components," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007; and C.D.I. Technical Memorandum No. 07-26P "Comparison of Browns Ferry Nuclear Unit 1 and Unit 2 Main Steam Line Strain Gage/Pressure Readings," Revision 0 prepared by Continuum Dynamics, Inc., dated July 2007

3. The Information summarizes:

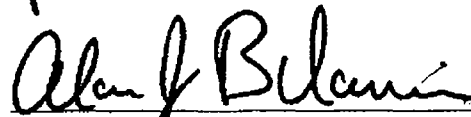
- (a) a process or method, including supporting data and analysis, where prevention of its use by C.D.I.'s competitors without license from C.D.I. constitutes a competitive advantage over other companies;
- (b) Information which, if used by a competitor, would reduce his expenditure of resources or improve 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.

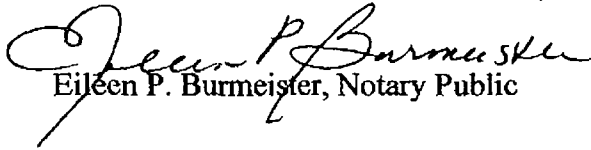
I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to be the best of my knowledge, information and belief.

Executed on this 24 day of July 2007.



Alan J. Bilamin
Continuum Dynamics, Inc.

Subscribed and sworn before me this day: July 27, 2007



Eileen P. Burmeister, Notary Public

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