WITHHOLD ENCLOSURE 1 FROM PUBLIC DISCLOSURE UNDER 10 CFR 2.390

May 30, 2008

L-MT-08-040
10 CFR 50.90

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

Monticello Nuclear Generating Plant
Docket 50-263
Renewed Facility Operating License
License No. DPR-22

Monticello Extended Power Uprate (USNRC TAC MD8398):
Acceptance Review Supplemental Information Package 3

References:

1) NMC Letter to USNRC, "License Amendment Request: Extended Power Uprate," dated March 31, 2008

2) NMC Letter to USNRC, "Monticello Extended Power Uprate (USNRC TAC MD8398): Acceptance Review Supplement Regarding Radiological Analysis," dated May 20, 2008

3) NMC Letter to USNRC, "Monticello Extended Power Uprate (USNRC TAC MD8398): Acceptance Review Supplemental Information," dated May 28, 2008.

Pursuant to 10 CFR 50.90, Nuclear Management Company, LLC (NMC), requested in Reference 1 approval of amendments to the Monticello Nuclear Generating Plant (MNGP) Renewed Operating License (OL) and Technical Specifications (TS) to increase the maximum power level authorized from 1775 megawatts thermal (MWt) to 1870 MWt, an approximate five percent increase in the current licensed thermal power (CLTP). The proposed request for Extended Power Uprate (EPU) represents an increase of approximately 12 percent above the Original Licensed Thermal Power (OLTP). The Monticello EPU application was supplemented on May 20, 2008 and May 28, 2008 by References 2 and 3.

In a teleconference held May 12, 2008, the NRC staff indicated that additional information would be necessary for the NRC to complete the acceptance review of the Monticello EPU license amendment request (LAR) in the area of mechanical engineering. The questions were formalized and emailed to NMC on May 15, 2008.

Enclosures 1 and 4 contain the questions and responses to the Mechanical and Civil Engineering Branch (EMCB). A portion of the supplemental information provided in Enclosure 1 is considered proprietary by Continuum Dynamics Incorporated (CDI). CDI requests that the proprietary information be withheld from public disclosure in accordance with 10 CFR 2.390(a)4. An Affidavit supporting this request is provided in Enclosure 2. Enclosure 3 contains a non-proprietary version of Enclosure 1.

NMC has reviewed the No Significant Hazards Consideration and the Environmental Consideration submitted with Reference 1 relative to the enclosed supplemental information. NMC has determined that there are no changes required to either of these sections of Reference 1.

Commitment Summary

This letter makes no new commitments and does not change any existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 30, 2008.

Timothy J. O'Connor
Site Vice President, Monticello Nuclear Generating Plant
Nuclear Management Company, LLC

cc: Administrator, Region III, USNRC
Project Manager, Monticello, USNRC
Resident Inspector, Monticello, USNRC
Minnesota Department of Commerce

Enclosures (4)

1. Enclosure 1, Mechanical and Civil Engineering Branch Questions and Responses (Proprietary)
2. Enclosure 2, CDI Affidavit for Enclosure 1
3. Enclosure 3, Non-proprietary version of Enclosure 2, Mechanical and Civil Engineering Branch Questions and Responses
4. Enclosure 4, Mechanical and Civil Engineering Branch Question 3 and Response 3

Enclosure 2 to L-MT-08-040

CDI Affidavit for Enclosure 1

Continuum Dynamics, Inc.

(609) 538-0444 (609) 538-0464 fax 34 Lexington Avenue Ewing, NJ 08618-2302

AFFIDAVIT

Re: Monticello Extended Power Uprate Request – Acceptance Process Group 6)
EMCB – Mechanical and Civil Engineering Branch – Basavaraju Chakrapani

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 Nuclear Management LLC as attachments to C.D.I. Letter No. 08102 dated 23 May 2008, Monticello Extended Power Uprate Request – Acceptance Process Group 6) EMCB – Mechanical and Civil Engineering Branch – Basavaraju Chakrapani.

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 23rd day of May 2008.

Alan J. Bilanin
Continuum Dynamics, Inc.

Subscribed and sworn before me this day: May 23 2008

Eileen P. Burmeister, Notary Public

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

Enclosure 3 to L-MT-08-040

Non-Proprietary Version of Enclosure 1, Mechanical and Civil Engineering Branch Questions and Responses

Group 6

6.1: The analysis does not account for Finite Element mesh bias and uncertainty errors consistent with those accepted by the staff in previous applications. The FE bias and uncertainty errors were established from the bench-marking of Hope Creek FE analysis to the shaker test results. Why should Monticello's FE analysis be any different?

Monticello Response:

At the time of completion of the Monticello analysis in late February 2008, the mesh bias and uncertainties were those offered by PSEG (Hope Creek) in their EPU submittal. Subsequent RAIs and discussions with the staff by PSEG resulted in a change to the finite element bias and uncertainties first put forth in the Hope Creek submittal. Monticello is willing to discuss an update to the stress calculation during the EPU review phase to reflect what was finally accepted by the staff for the Hope Creek application.

6.2: *The dryer was considered structurally adequate despite the fact that the minimum alternating stress ratio is less than 2, which the staff and ACRS consider as the threshold for acceptance due to the limited validation of the ACM Code. Why didn't the applicant consider dryer structural modifications and improvements to increase the minimum stress ratio to a magnitude higher than 2?*

Monticello Response:

The minimum stress ratio on the Monticello dryer at EPU conditions was calculated to be 1.79, which is less than 2.0 minimum alternating stress ratio stated above. Please note that the stress ratio limit of 2.0 was initially set during the Hope Creek ACRS evaluation in Mid-March, well after the Monticello analysis was completed.

The Monticello minimum stress ratio is the result of applying a bias and uncertainty at the Monticello standpipe resonant frequency of 160 Hz. In the SER issued for Hope Creek power uprate (after the submission of the Monticello EPU application), the staff concludes that the CDI SMT is appropriate for estimating the onset of flow induced vibration in main steam lines. CDI Report 07-23P entitled: "Flow Induced Vibration in the Main Steam Lines at Monticello and Resulting Steam Dryer Loads," Revision 0, indicates that the onset of standpipe resonance at Monticello will occur at flow rates greater than expected with EPU and therefore the bias and uncertainty at resonance of [[$^{(3)}$]] respectively, is not appropriately applied at 160 Hz. With no response anticipated, the appropriate bias and uncertainty of the ACM Rev. 4.0 is bias [[$^{(3)}$]] and uncertainty [[$^{(3)}$]] respectively. The stress analysis report for Monticello, CDI Report No. 07-26P entitled: "Stress Assessment of Monticello Steam Dryer," Revision 0, shows that more than [[$^{(3)}$]] of the peak alternating stress occurs at 160 Hz. Using [[$^{(3)}$]] as a conservative value and applying the bias and uncertainty for the 150-200 Hz interval yields minimum stress ratios in excess of 2.3. While these results are approximate, applying the bias and

uncertainties that are applied in the Hope Creek final analysis would result in margins that are greater than 2.0, which would meet the new guideline which was first mentioned at the Hope Creek ACRS meeting.

6.3: The application does not include information on operating history, location of flaws and cracks that currently exist in the steam dryer, and the root causes for such cracks. Furthermore, the application does not address the effect of EPU on the integrity of the dryer in the presence of existing cracks.

Monticello Response:

Response is included in Enclosure 5 to this letter.

6.4: *Insufficient details were provided regarding the establishment of the Main Steam Lines time histories that are used to define the dryer loads. How were they established? What is their length? How did the applicant determine that they are conservative?*

Monticello Response:

The stress analysis calculations for Hope Creek were initially done in the time domain. In the time domain, 128 seconds of data was screened for a two second record that would give a bounding load definition. In this domain, computational costs limited the transient calculations to these durations and selection of an appropriate short interval of data to be analyzed to guarantee a bounding load was an important activity.

[[

(3)]]

6.5: *The application does not address the strong spectral (PSD) peak around 100 Hz (for outer hood nodes 7 and 99). The application should clarify the source and nature of the strong peak at these nodes.*

Monticello Response:

White noise was used as inputs to the Acoustic Circuit Model for the Monticello steam dome and the normalized load on the steam dryer outer bank hood shows a peak at 100 Hz. A similar peak was observed at 80 Hz for the Hope Creek steam dome model and was found to be [[

(3)]] (see Figure 6.5). Note, however, that while the Monticello

PSD shows a peak at 100 Hz (node 7), the energy under this peak between 90 and 110 Hz corresponds to only [[(3)]] psid of the rms pressure. Since acoustic frequency scales by a/L, where a is the acoustic speed and L is a physical dimension such as the reactor diameter, forming the ratio of the frequency in Hope Creek to that in Monticello is

$$f_M = \frac{L_{HC} f_{HC}}{L_M}$$

[[

(3)]] Therefore, the "strong spectral peak around 100 Hz" is the [[

(3)]]

6.6: *The application does not include the procedure employed for noise signal removal. No information was provided on whether only fictitious tones due to ACM error are removed from dryer loads? It is unclear why the alternating stress ratios dropped so significantly by 50% when noise is removed.*

Monticello Response:

[[

(3)]]

6.7: *The application does not include information on the mode shapes of the dryer at and near peak frequencies including 25-26 Hz, 154 Hz, and 162 Hz.*

Monticello Response:

Please refer to Figures 6.7a through 6.7h of this response for this information.

6.8: *A bump up factor of 1.39 was used to scale stresses and loads from CLTP to EPU. This factor appears non conservative considering that a bump up factor at about 2.1 would more appropriately capture the potential valve resonance frequency near 162 Hz.*

Monticello Response:

[[

(3)]]

[[

(3)]]

Figure 6.5: PSD of pressure loading on the outer bank hood. [[(3)]]

Eigenmodes of Monticello steam dryer at 25 Hz, 154 Hz and 162 Hz.

The modal analysis was conducted using the Monticello steam dryer model in the requested frequency ranges. Due to dryer symmetry and multiple parts having close resonant frequencies the multiple similar modes are expected. Below is a summary of the displacement shapes of dominant modes. Displacements are normalized to the mass matrix.

a) 25-26 Hz range

There are five eigenmodes in the range 25-26 Hz. These eigenmodes involve primarily hoods of the steam dryer as indicated on Figure 6.7a and Figure 6.7b. Additionally, there are modes with coupled motion of the hoods and the skirt, as shown on Figure 6.7c.

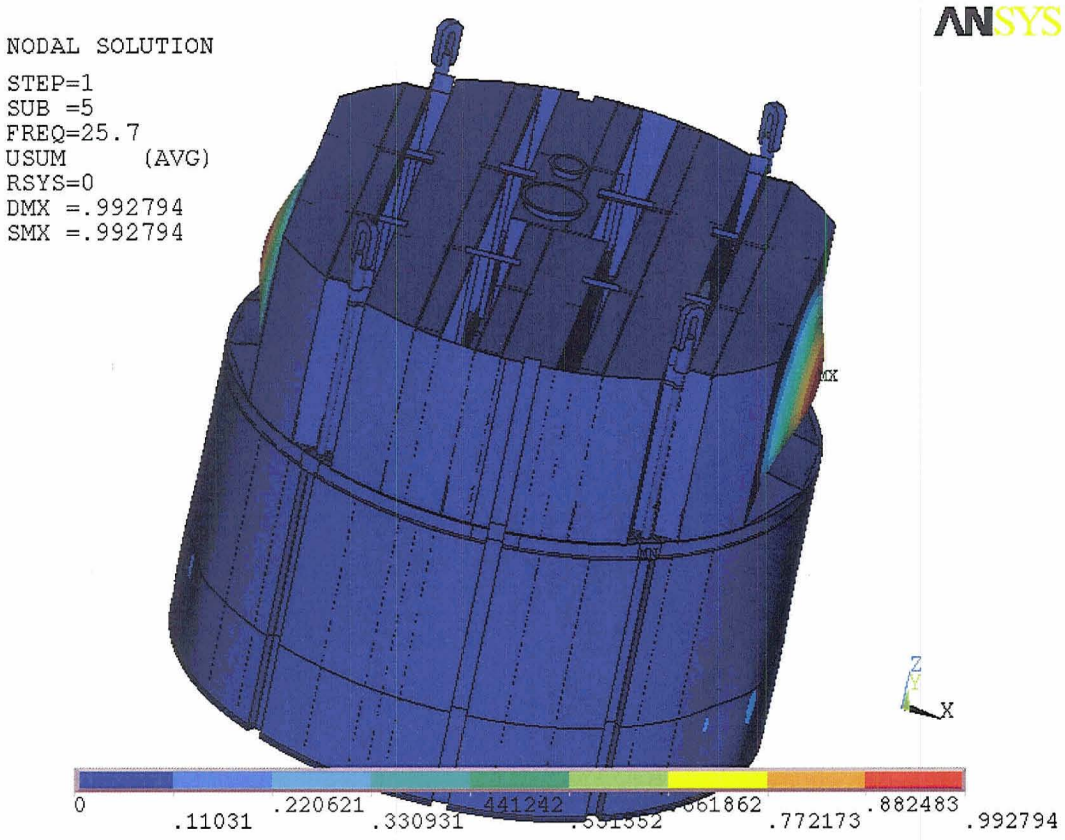


Figure 6.7a: Eigenmode at 25.7 Hz. Outer hood mode.

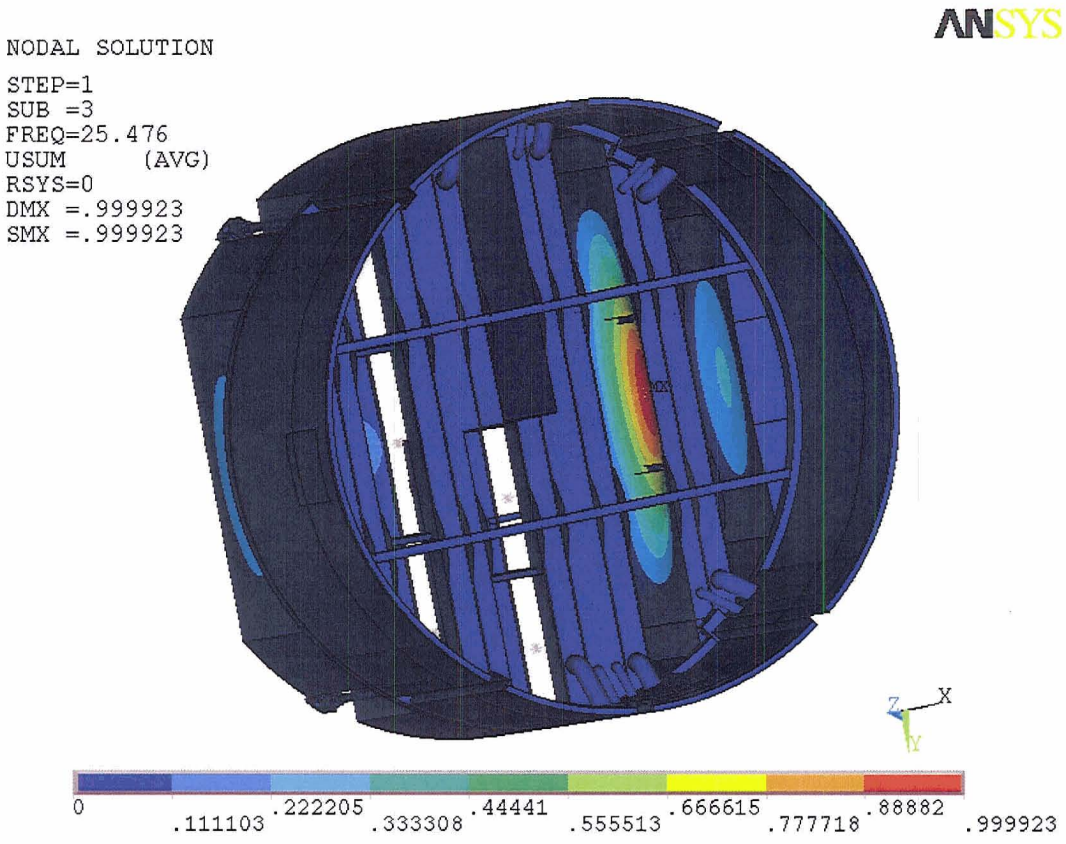


Figure 6.7b: Eigenmode at 25.476 Hz. Middle hood mode. View from the bottom of the dryer.

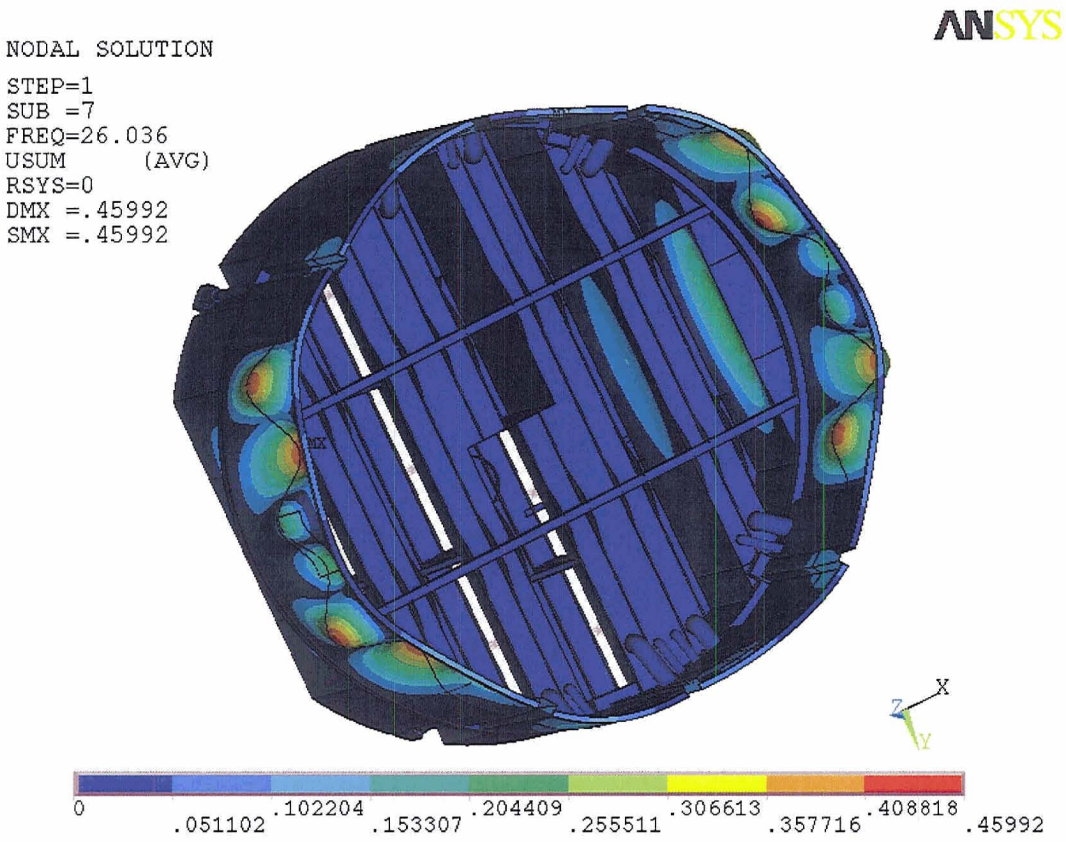


Figure 6.7c: Eigenmode at 26.036 Hz. Coupled hood-skirt mode.

b) 153-155 Hz range

There are ten eigenmodes in the 153-155 Hz range. Most of these involve motion of the diagonal braces under the hoods, see Figure 6.7d. There is also a skirt mode, see Figure 6.7e. Other modes are various combinations of these two.

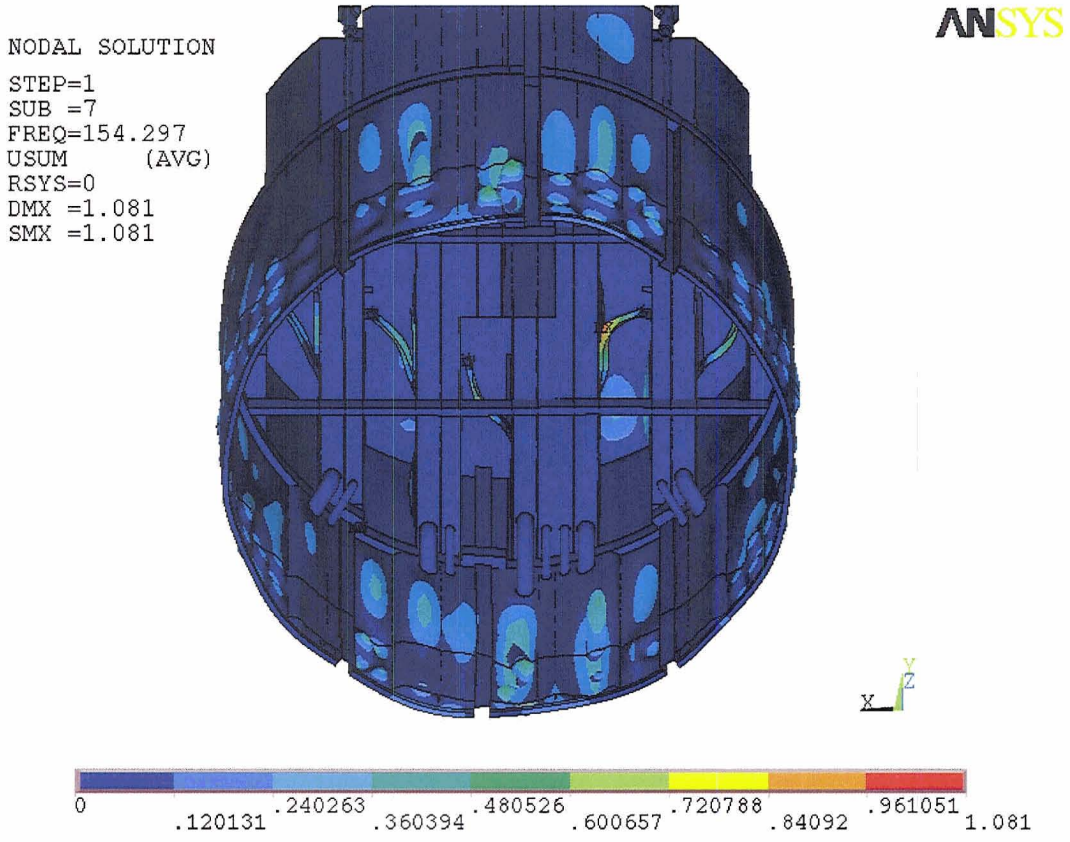


Figure 6.7d: Eigenmode at 154.297 Hz. Diagonal braces under the hood are involved.

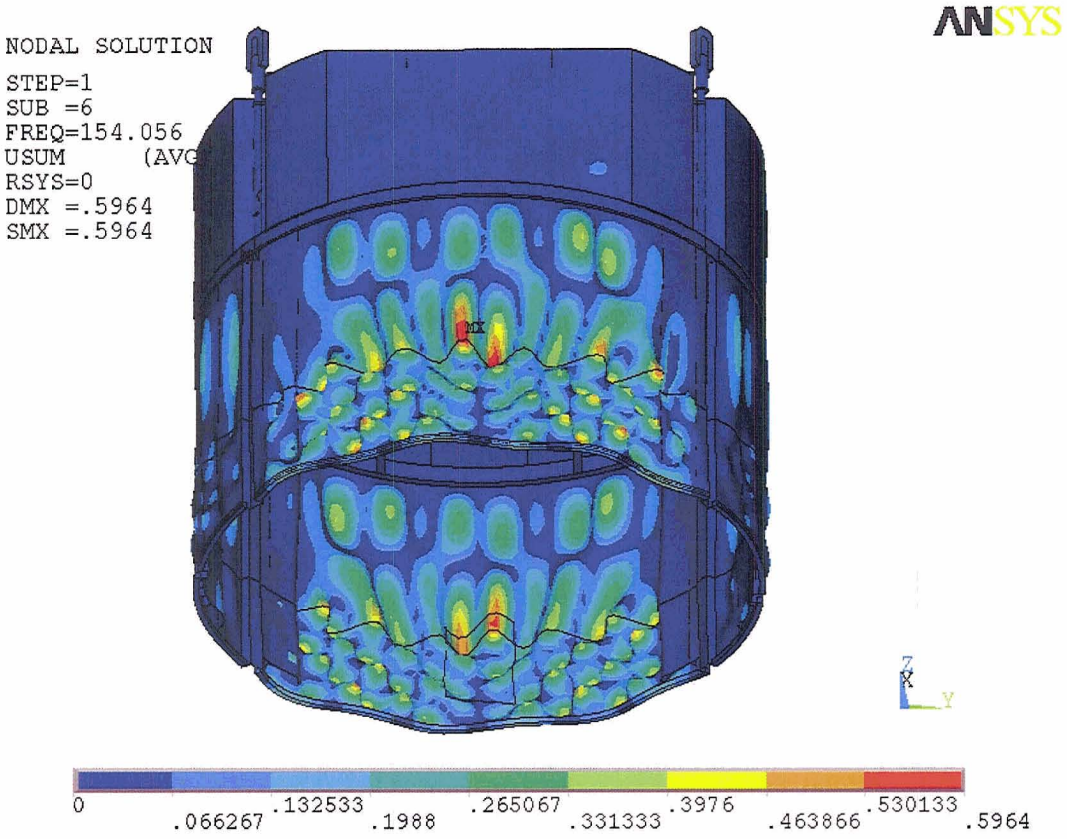


Figure 6.7e: Eigenmode at 154.056 Hz. Skirt mode.

c) 161-163 Hz range

There are seven eigenmodes in the 161-163 Hz range. Most of these involve motion of the diagonal braces under the hoods, see Figure 6.7f. Also there is a mode coupled to the skirt, see Figure 6.7g. Finally, there are several modes involving the middle hoods, see Figure 6.7h. All other modes in this frequency range are essentially combinations of these three.

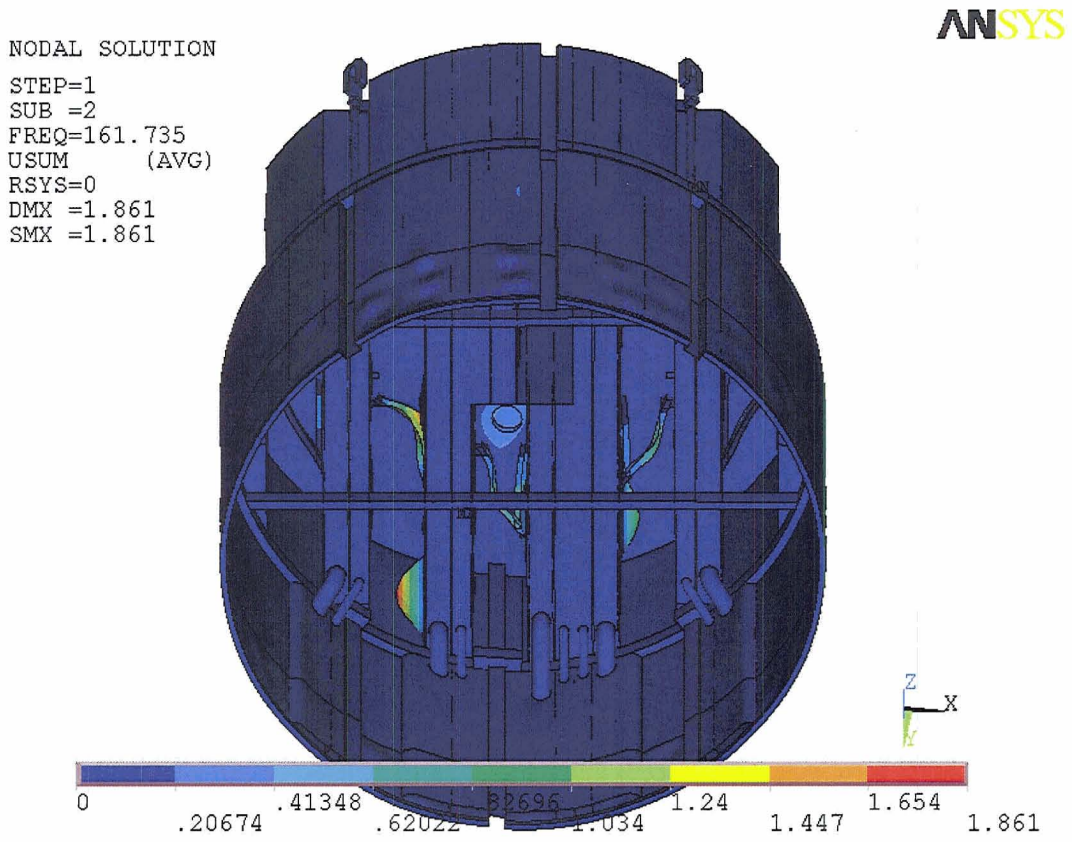


Figure 6.7f: Eigenmode at 161.735 Hz. Diagonal braces under the hoods are involved.

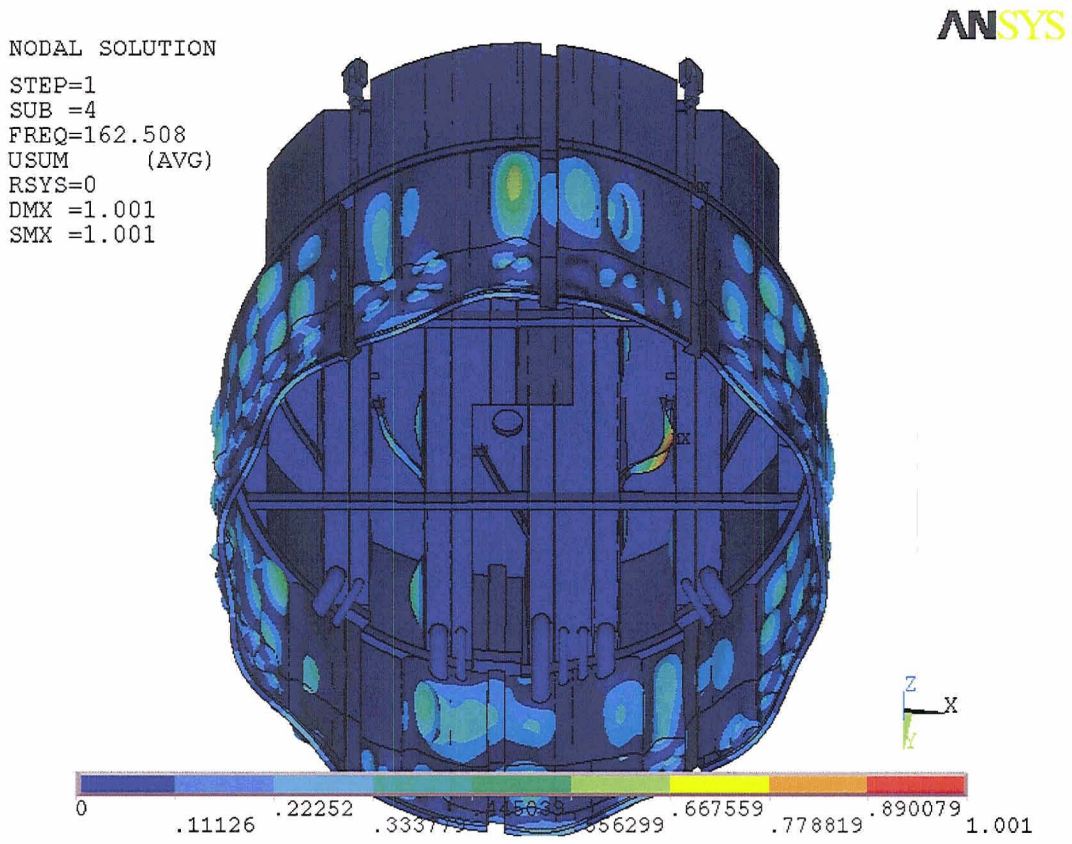


Figure 6.7g: Eigenmode at 162.508 Hz. Skirt mode is coupled with diagonal braces' motion.

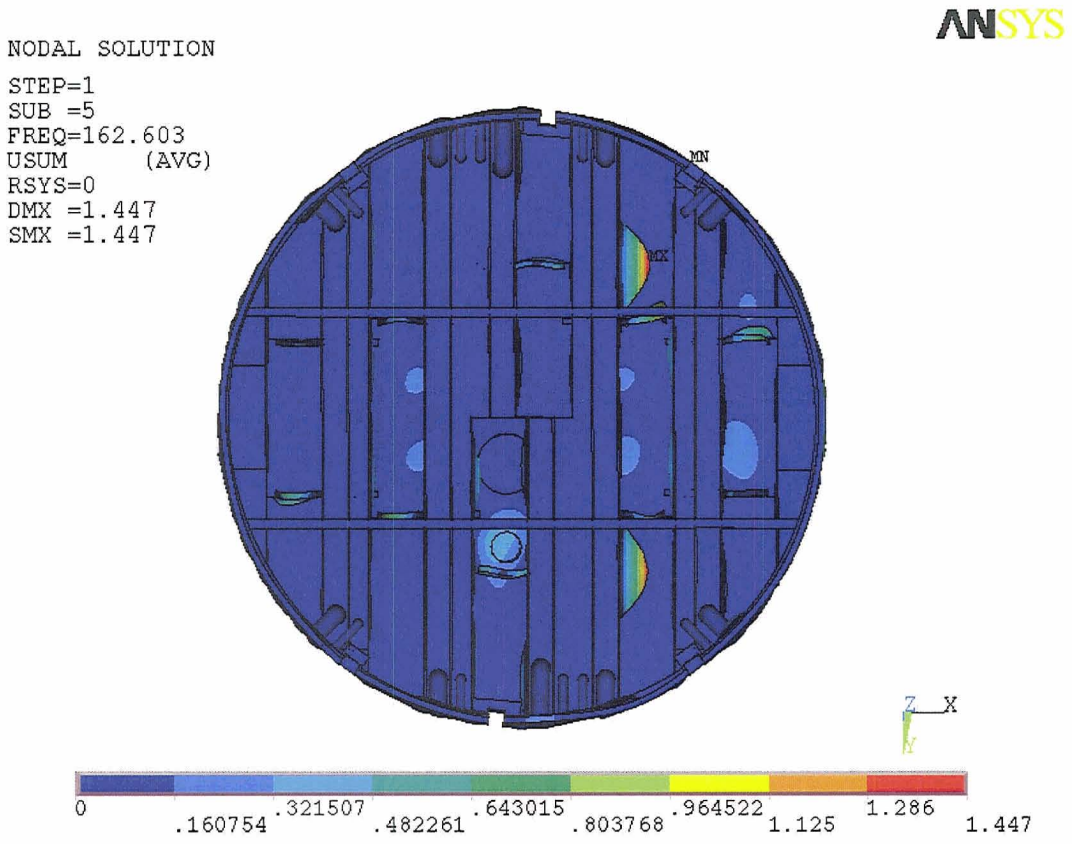


Figure 6.7h: Eigenmode at 162.603 Hz. Most of the response is on the middle hoods. View from the bottom of the dryer.

Enclosure 4 to L-MT-08-040

Mechanical and Civil Engineering Branch Question 3 and Response 3

Enclosure 4

NRC Question:

6.3: The application does not include information on operating history, location of flaws and cracks that currently exist in the steam dryer, and the root causes for such cracks. Furthermore, the application does not address the effect of EPU on the integrity of the dryer in the presence of existing cracks.

Monticello Response:

The Monticello steam dryer is the original component supplied with the plant. Commercial operation started in 1971. No repairs have been performed to the steam dryer.

The Monticello Steam Dryer was inspected using the guidelines established in BWRVIP-139, "BWR Vessel and Internals Project: Steam Dryer Inspection and Evaluation Guidelines," dated November 2004, during the 2005 and 2007 refueling outages. The inspections identified five indications on the outer diameter (OD) of the steam dryer. The areas with the indications were not included in steam dryer inspections at Monticello prior to the 2005 refueling outage. The dryer internals were inspected for the first time in the 2007 refueling outage. The five steam dryer indications identified were at the following locations (note the steam dryer indications at welds V3 90°, V10 90°, and V10 270° correspond to the vertical welds located directly behind the lifting rods):

1. V3 at 90 degrees (V3 90°)
   a. Indication is located at the top of Weld V3 90°. This indication extends for approximately 1.375 inches on the outside of the end panel weld across the top and down the inside of the weld to Dryer Bank "B" for approximately 1 inch.

2. V10 at 90 degrees with two indications (V10 90°)
   a. One indication is located at the top of Weld V10 90°. This indication extends for approximately 1.375 inches in length.
   b. A second indication is located on the opposite side the plate from the first identified indication and is approximately 0.25 inch long.

3. V10 at 270 degrees (V10 270°)
   a. Indication is located at the top of the weld at the junction of the end panel and the dryer bank. This indication is less than 1 inch in length.

4. Dryer support bracket guide channel
   a. Indication is located approximately 4 feet from the bottom of 215° Dryer Support Bracket Guide Channel. The indication is oriented horizontally across from a possible arc strike around the corner of the channel and into the left toe of vertical weld on the face of the dryer. This is on the right side of the Guide Channel and the length is approximately ¾ inch.

5. Access hole cover plate in drain channel "F" on the dryer internals

a. The 2007 dryer internal examination results indicate cracking sporadically around the circumference of the access hole cover plate.

Indications at Steam Dryer Welds V3 90°, V10 90° and V10 270°:

The indications on the Monticello steam dryer are at the top of the vertical weld behind the lifting rods. Figures 5-1 and 5-3 through 5-8 of BWRVIP-139 provide weld identification numbers that were used to identify the steam dryer welds.

The stresses due to flow induced vibration (FIV) loads were qualitatively reviewed using information provided in BWRVIP-139. Typical finite element analysis (FEA) results of a square hood steam dryer design are presented in BWRVIP 139. From the FEA results, the stresses at the location of the indications due to FIV loads appear to be relatively low. Figures 4-8 and 4-9 of BWRVIP-139 show stress plots for the vertical dryer plates of a square hood steam dryer design. A review of these plots shows that the stresses due to FIV are relatively low at the location of the indications on welds V3 90°, V10 90°, and V10 270°. This is further supported by FEA results for the Monticello steam dryer as shown in Extended Power Uprate (EPU) License Amendment Request (LAR), Enclosure 11, Figures 13a, 13c, 14a, 14b, 14c and 14d. Monticello current licensed thermal power (CLTP) alternating stresses at the indication locations are below 500 psi and peak stresses are on the order of 1000 psi. These values are well within allowable stress values. Thus, high residual stresses due to fabrication were most likely the cause of the indications along with some stress concentration, rather than the magnitude of the FIV loads. This conclusion is also reinforced by the extent of cracking. The lengths of the indications are relatively short and would expect to be significantly longer at this time if significant FIV loads were present. Sufficient time has passed such that enough cycles would have occurred to cause initiation and significant crack growth if the FIV loading was significant.

Based on available information, the Monticello steam dryer indications at Welds V3 90°, V10 90°, and V10 270° were fabricated using the same welding sequence resulting in elevated residual stresses. After the crack initiated, the residual stress would be reduced as the crack extended and the crack growth would slow, limiting the length of the indication. Since loads in this area based on the Monticello FEA are low, crack growth is not expected under EPU conditions.

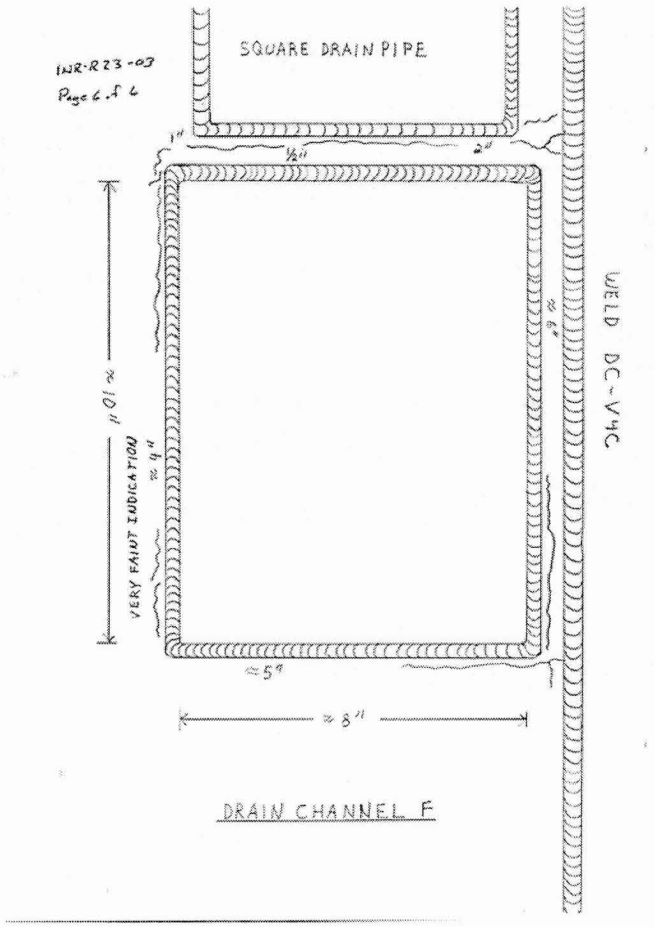
Indications at Steam Dryer Support Bracket Guide Channel:

The crack is oriented horizontally across from a possible arc strike around the corner of the channel and into the left toe of vertical weld on the face of the dryer. This is on the right side of the Guide Channel and the length is approximately ¾ inch. An indication in this location is not subjected to large loads during plant operation, thus, it is not expected to increase significantly in length.

Enclosure 4

Indications at Access Hole Cover Plate in Drain Channel "F":

Drain channel "F" has an access hole cover plate permanently welded to the inner surface of the drain channel. The cover plate is filet welded (from visual evidence) to the drain channel. The cover plate is not identified in BWRVIP-139. The 2007 dryer internal examination results indicate cracking sporadically around the circumference of the access hole cover plate. Almost the entire top edge of the cover plate has visual indications of cracking. The left edge of the access plate has approximately 4 inches of indication free area near the center of the edge. The unflawed length on the bottom is approximately 5 inches. The right edge has almost 6 inches of unflawed length. A sketch is provided below. The trained technicians performing the inspection have characterized the indication as Intergranular Stress Corrosion Cracking (IGSCC).



IGSCC is a phenomenon that is very predictable relative to crack growth rates. BWRVIP-139 indicates that crack growth rates for IGSCC are 5x10-5 in/hour. A two year (17,532 Hour) operating cycle results in 0.8766 inches per cycle growth in each crack tip. This rate must be applied to each crack tip. Considering crack growth, the top

side of the weld is assumed to be flawed. The right side has one crack tip and, therefore, will have approximately 5 inches of unflawed material after one cycle of growth. The bottom has one crack tip and will have 4 inches remaining of unflawed material after one cycle of growth. The left side has two crack tips and will have 2 inches of unflawed material after one cycle of growth. Note that the remaining weld ligaments are generally equally distributed around the perimeter of the access plate. This area is planned to be inspected during the 2009 refueling outage.

Conclusion

No growth of previously identified indications has been observed based on inspections completed in 2005 and 2007 refueling outages. This lack of indication growth, and the minimal size, demonstrates that the driving force for the indication is not due to dynamic loads and that high weld residual stresses that caused the indications have been relieved. FEA results presented in the Monticello EPU LAR, Enclosure 11, do not predict significant loads in the area of the indications on welds V3 90°, V10 90°, and V10 270° and, therefore, indication growth is not expected. The indication at the 215° Dryer Support Bracket Guide Channel is not subjected to large loads during plant operation; and thus, it is not expected to increase significantly in length. The drain channel “F” indication is IGSCC related and is not expected to be significantly impacted by EPU loads.