ENCLOSURE 3

WESTINGHOUSE LETTER ATTACHMENT, LTR-BWR-ENG-14-010-NP

RESPONSES TO THE US NRC REQUEST FOR ADDITIONAL INFORMATION RELATIVE TO THE MONTICELLO REPLACEMENT STEAM DRYER ACOUSTIC/STRUCTURAL ANALYSES SET #7

27 pages follow

LTR-BWR-ENG-14-010-NP

Responses to the US NRC Request for Additional Information Relative to the Monticello Replacement Steam Dryer Acoustic/Structural Analyses Set #7

July 18, 2014

Westinghouse Electric Company LLC
1000 Westinghouse Drive
Cranberry Township, PA 16066 USA

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REQUEST FOR ADDITIONAL INFORMATION

MECHANICAL AND CIVIL ENGINEERING BRANCH (EMCB) OF THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING MONTICELLO NUCLEAR GENERATING PLANT

EXTENDED POWER UPRATE POWER ASCENSION DATA TREND EVALUATION

NORTHERN STATES POWER COMPANY – MINNESOTA

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NO. 50-263

(TAC NO. MF3330)

MNGP EPU-EMCB-RSD-RAI-120

During a review of power ascension data in March and April 2014, Xcel Energy discovered mislabeling of the main steam line (MSL)-C leads at the Monticello Nuclear Generating Plant (MNGP). In a conference call on April 9, 2014, the NRC staff were informed that the leads from the upper and lower strain gauges on MSL-C were confirmed to be erroneously reversed in 2011. Xcel Energy indicated during the conference call that the impact would be small. However, this issue could potentially impact the bias errors and uncertainties provided in the end-to-end benchmarking report for Acoustic Circuit Model Enhanced (ACE) 2.0 (Reference 1).

The NRC staff requests the following additional information:

1. Please provide a detailed technical explanation for why the changes in bias errors and uncertainties were small, when the upper and lower strain gauge signals for MNGP MSL-C were interchanged due to mislabeling, compared to the correct case. The explanation should address the entire frequency range, since the dominant dryer excitation is frequency dependent.

2. Also, provide plots of the MSL-C monopole and dipole sources for the two cases, and a plot of overlaid or super-imposed Power Spectral Densities (PSDs) of MSL-C strain gauge signals to compare the similarities and the differences.

Reference

1. Letter L-MT-13-091 from Mark Schimmel, Xcel Energy, to U.S. Regulatory Commission Document Control Desk, dated August 29, 2013 (ADAMS Accession No. ML13248A343): Enclosure 6 (proprietary) and Enclosure 14 (non-proprietary), Westinghouse WCAP-17716-P(NP), Revision 1, "Benchmarking of the Acoustic Circuit Enhanced Revision 2.0 for the Monticello Steam Dryer Replacement Project," dated August 2013 (ADAMS Accession Nos. ML13248A353 (proprietary) and ML13248A349 (non-proprietary), respectively).

RESPONSE

Background

In April 2014, Xcel Energy identified that the main steam line (MSL)C strain gauge cable switching performed during the 2011 refuel outage, as a corrective action in response to a cable labeling issue, appeared to have resulted in erroneous reversal of the upstream and downstream strain gauge cables. Numerous methods were employed to validate that the MSLC cables were incorrectly switched. A revised replacement steam dryer (RSD) acoustic-structural analysis has consequently been performed and is documented in this response. The revised analysis addresses the impact to the MSLC strain gauge signals due to the switched cables. Additionally, this response provides brief descriptions of the revisions that will be made to the previously submitted RSD reports as a result of the revised acoustic-structural analysis.

The MSL strain gauge signals are [

]^{a,c} Figure RAI-120-1 summarizes the steps in the process which are affected by the correcting of the signals. In both cases (MSLC-2011 and MSLC-Corrected), the methods used in each step are identical; however, changing the input MSL signals [ ]^{a,c}

a,c

[

]

Figure RAI-120-1 Summary of the Acoustic-Structural Analysis Process

Response to Request 1

ACE Revision 2.0 was benchmarked against [

]a,c

Table RAI-120-1 Bias and Uncertainty

[ ]a,b,c

Table RAI-120-2 MNGP Total Uncertainty

[ ]a,b,c

In the frequency ranges for which the MSLC upstream and downstream signals differ (see Figure RAI-120-1), [

]a,b,c

Response to Request 2

Plots of the MSLC monopole and dipole sources for the two cases are presented in Figure RAI-120-8 and Figure RAI-120-9. A plot of the MSLC upstream and downstream signal Power Spectral Densities (PSDs) is provided in Figure RAI-120-2.

Detailed Results

This RAI response documents the portions of the acoustic-structural analysis that are affected by switching the MSLC signals. Revisions to the previously submitted reports will be updated to include the changes documented herein due to the MSLC signal correction. The proprietary and non-proprietary versions of the following reports will be updated and submitted along with the final EPU report after power ascension to EPU is complete:

WCAP-17716, Rev 1, "Benchmarking of the Acoustic Circuit Enhanced Revision 2.0 for the Monticello Steam Dryer Replacement Project."

WCAP-17252, Rev 4, "Acoustic Loads Definition for the Monticello Steam Dryer Replacement Project."

WCAP-17549, Rev 2, "Monticello Replacement Steam Dryer Structural Evaluation for High-Cycle Acoustic Loads Using ACE."

SES 09-127, Rev 2, "Monticello Steam Dryer Replacement - Structural Verification of Steam Dryer."

The ASME qualification for the RSD will be updated to include the FIV stresses resulting from the correction of the MSLC signals. All ASME Section III, Subsection NG requirements are met with the updated FIV stress values.

Signal Processing

Digital signal processing is performed to [

]^{a,c} The signal processing techniques used for the CLTP and EPU signal generation were identical to those documented and accepted in WCAP-17716-P Rev. 1. Any plots of MSL signals for MSLA, MSLB, and MSLD are unchanged. For MSLC, any plot previously labeled as "upstream" will now be "downstream" and vice-versa.

[

]^{a,c}

[ ] a,b,c

Figure RAI-120-2 CLTP Signal (after signal processing) – MSLC

[a,b,c]

Figure RAI-120-3 Predicted EPU Signal - MSLC

ACE Revision 2.0.1 Benchmarking

The ACE Revision 2.0 model was benchmarked [

]^{a,c}

Table RAI-120-3 [**]^{a,c}**

[a,b,c]

[

]^{a,c}

[a,b,c]

Figure RAI-120-4 [ ]^{a,c}

[a,b,c]

Figure RAI-120-5 [ ]^{a,c}

Table RAI-120-4 Predicted RMS Strains

[a,b,c]

[

]a,c

[a,c]

[

]a,c

[a,c]

Based on the above measurements, predictions, and calculations, the biases/uncertainties and total uncertainties for ACE Revision 2.0.1 are presented in Table RAI-120-1 and Table RAI-120-2.

[

]a,c

[a,b,c

Figure RAI-120-6 [ ]a,c

[a,b,c

Figure RAI-120-7 [**]^{a,c}**

Application of ACE Revision 2.0.1 – Acoustic Load Definition of Monticello Steam Dryer at EPU Using Corrected MSLC Signals

[

]^{a,c}

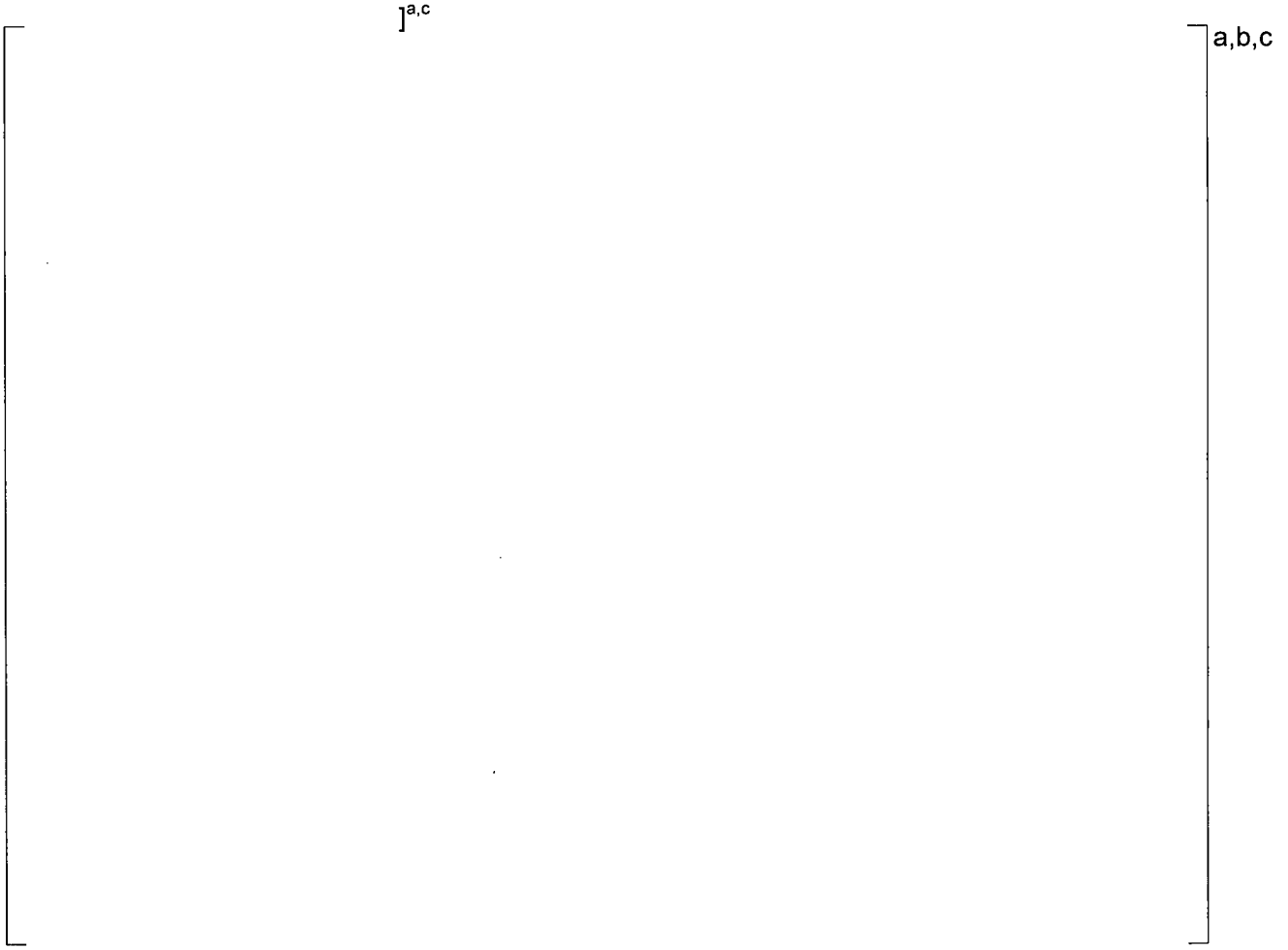

Figure RAI-120-8 ACE Dipole Signal - EPU - MSL C

a,b,c

Figure RAI-120-9 ACE Monopole Signal - EPU - MSL C

Application of [ ]^{a} – Acoustic Load Definition of Monticello Steam Dryer at EPU Using Corrected MSLC Signals

[

]a,c

[a,b,c

Figure RAI-120-10 [ ]a Dipole Signal - EPU – MSLC

[a,b,c

]

Figure RAI-120-11 [ ]a Monopole Signal - EPU - MSLC

Structural Evaluation for High-cycle Acoustic Loads

A high-cycle fatigue evaluation of the MNGP RSD was completed with acoustic loads generated using ACE Revision 2.0.1 [ ]^{a}. The methods and techniques used in the evaluation are identical to those submitted in WCAP-17549-P Revision 2. The finite element model was identical to what was previously used. [

]^{a,c}

Summary of Results

[

]^{a,c}

Table RAI-120-5 Summary of Results at EPU: [ ]^{a,c} a,b,c

Table RAI-120-6 Summary of Results at EPU: [ ]^{a,c} a,b,c

a,b,c

Figure RAI-120-12 Limiting High-Stress Locations [ ]^{a,c}

[a,c

]

Figure RAI-120-13 Limiting High-Stress Locations [ ]^{a,c}

a,b,c

Figure RAI-120-14 MASR [ ]^{a,c}- MSLC 2011 - Stress PSD

a,b,c

Figure RAI-120-15 MASR [ ]^{a,c}- MSLC Corrected - Stress PSD

[a,b,c]

Figure RAI-120-16 MASR [ ]^{a,c}- MSLC 2011 - Stress PSD

[a,b,c]

Figure RAI-120-17 MASR [ ]^{a,c} - MSLC Corrected - Stress PSD

[

]a,c

a,b,c

Figure RAI-120-18 [ ]a,c Submodel Maximum Detailed View (Acoustic Stress)

[

]^{a,c}

[a,c

Figure RAI-120-19 [ ]^{a,c} Weld Evaluation Location

MSL Limit Curves

The method and technique used to develop the limit curves for the MNGP EPU power ascension are identical to those previously submitted in LTR-A&SA-09-32, Revision 8. For MSL A, B, and D, the shape of the upstream and downstream limit curves will be identical to those submitted in LTR-A&SA-09-32, Revision 8. [
]^{a,b,c}. For MSLC, the same is true except the figures previously labeled upstream will now be labeled as downstream and vice versa. Figure RAI-120-20 through Figure RAI-120-23 present the updated MSL limit curves for the MNGP RSD. Level 1 limit curves ensure that the ASME allowable alternating stress value on the RSD is not exceeded. Level 2 limit curves ensure that 80% of the allowable alternating stress value on the RSD is not exceeded. During power ascension, the plant will be monitored and the PSDs will be compared to the limit curves at each power level test condition in the EPU Power Ascension Test. The situations presented in Table RAI-120-7 may occur depending on the magnitude of the pressure load. This process will be repeated until the EPU power level is achieved.

Table RAI-120-7 EPU Power Ascension

Condition	*Action*
Pressure Load < Level 2	Increase power to the next level
Level 2 < Pressure Load < Level 1	Perform a stress analysis at the current power level
Pressure Load > Level 1	Reduce power to the previous step, engineering evaluation, and consideration of mitigation actions

a,b,c

Figure RAI-120-20 Limit Curves – MSLA

a,b,c

Figure RAI-120-21 Limit Curves – MSLB

a,b,c

Figure RAI-120-22 Limit Curves – MSLC

a,b,c

Figure RAI-120-23 Limit Curves - MSLD

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