ENCLOSURE 5

WESTINGHOUSE LETTER REPORT, LTR-BWR-ENG-14-034-NP
NON-PROPRIETARY

INVESTIGATION INTO THE CAUSE OF EXCEEDING THE LEVEL 1 (L1) AND LEVEL 2 (L2) LIMIT CURVES GENERATED BASED ON 2011 MONTICELLO MAIN STEAM LINE STRAIN GAUGE DATA

51 pages follow

LTR-BWR-ENG-14-034-NP

Investigation into the Cause of Exceeding the Level 1 (L1) and Level 2 (L2) Limit Curves Generated Based on 2011 Monticello Main Steam Line Strain Gauge Data

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Background

In early 2014, during power ascension activities (at 1864 MWt) for the extended power uprate (EPU) license amendment, the United States Nuclear Regulatory Commission (U.S. NRC) questioned the accuracy of certain steam dryer data that had been provided as information by Monticello Nuclear Generating Plant (MNGP). After investigation, Northern States Power Minnesota (NSPM) discovered that data errors existed in the replacement steam dryer (RSD) analyses. The errors consisted of 1) a strain gauge (SG) adjustment factor in the data acquisition system (DAS) that was set to a value that reduced the amplitude of the data acquired by a constant factor and; 2) an inadvertent reversal of main steam line (MSL) strain gauge signals, on MSL C, [ ]^{a,c} In Reference 1, the NRC requested additional information (RAIs) related to this issue. NSPM/Westinghouse Electric Company reanalyzed the steam dryer performance using corrected information without changing the benchmark methodology and provided this analysis in response to the RAI request (Reference 2). The minimum alternating stress ratio (MASR) for operation at 2004 MWt that was used to derive the benchmark limit curves in References 2 and 3 [ ]^{a,c} These limit curves were generated based on the 2011 MSL pressure power spectral densities (PSDs) to be consistent for comparison with past work.

Following this submittal, the NRC informally requested that pressure PSDs calculated based on 2014 data, recorded at 1775 MWt, be plotted against the new limit curves provided as part of Reference 2. On August 6, 2014, Xcel Energy recorded a MSL strain gauge dataset at the 1775 MWt thermal power level. Westinghouse has evaluated this dataset and plotted the MSL pressure PSDs against the limit curves derived based on corrected 2011 SG data. [ ]^{a,c} Operability analyses existed and were enhanced to verify that the steam dryer was operable at 1775 MWt and at previous operation that included short periods at power levels up to 1864 MWt.

[ ]^{a,c} A new set of limit curves, developed based on August 6, 2011 data, is also provided. A separate document will be provided to the NRC that describes the alternate power ascension process that NSPM/Westinghouse Electric Company will use to perform the remainder of EPU power ascension testing.

References

1. Email from T Beltz (NRC) to J Fields (NSPM), "Monticello Nuclear Generating Plant – Draft Request for Additional Information (EMCB) in Support of EPU Power Ascension (TAC No. MF3330)," dated May 15, 2014. (Attached in EDMS)
2. Letter from K Fili (NSPM), "Monticello Extended Power Uprate: Replacement Steam Dryer – Response to NRC Requests for Additional Information, Revised Limit Curves and Supporting Information (TAC No. MF3330)," July 22, 2014. (Attached in EDMS)
3. Westinghouse Letter LTR-BWR-ENG-14-010, Revision 1, "Responses to the US NRC Request for Additional Information Relative to the Monticello Replacement Steam Dryer Acoustic/Structural Analyses Set #7," July 18, 2014.
4. Xcel Energy Design Information Transmittal (DIT) 1353, "EPU Data Acquisition System (DAS) Main Steam Line (MSL) Data," August 6, 2014.
5. Xcel Energy Design Information Transmittal (DIT) EC-13638, "Transmittal of SIA Letter AMK-11-001, Revision 1 confirming that the pressure conversion factors remain unchanged and strain gage data taken during power ascension following the spring 2011 refuel outage," June 2011.
6. Structural Integrity Associates Report 1301246.406.R2, "Investigation of Signal Discrepancies in Extended Power Uprate Strain Gage Data," April 10, 2014.
7. Structural Integrity Associates Report 1301246.407.R0, "Review of Strain Gage Signal Performance over Extended Time Periods," August 14, 2014.
8. Westinghouse Letter LTR-BSA-14-9, Revision 0, "Monticello Power Ascension Assessment of 105% of CLTP Power Level Data," May 17, 2014.
9. Westinghouse Letter LTR-BWR-ENG-14-031, Revision 0, "Monticello Steam Dryer Structural Integrity," August 14, 2014.
10. Structural Integrity Associates Report 1301246.408.R0, "Summary of Onsite DAS Functionality Verification," August 26, 2014.

Evaluation

Westinghouse has evaluated the 1775 MWt dataset, transmitted from Xcel Energy to Westinghouse on August 6, 2014 in Reference 4. [

]a,c

[

]a,c

The L1 and L2 curves in Figures 1A through 8C are based on the MASR consistent with the 2011 MSL SG data projected to 2004 MWt in Reference 3.

[

]a,c

Table 2
Recirculation Pump Speeds for 2011 and 2014

[a,b,c]

[

]a,c

[

]a,c

3. Several channels have changed slightly from 2011 to 2014. [

]a,c The changes include:

- [

]a,c

- [

]a,c

[

]a,c

From the SIA study, [

]a,c

[

]a,c

- [

]a,c

[

]a,c

[

]a,c

The changes to the MASR for MSL SG datasets taken at different times are summarized in Table 2.

Table 2

[ ]a,c

a,b,c

Conclusion

[

]^{a,c}

[a,b,c]

Figure 1-A MSL A Upstream
0-250 Hz

[ ] a,b,c

Figure 1-B MSL A Upstream
0-100 Hz

[ ]a,b,c

Figure 1-C MSL A Upstream
100-250 Hz

[ ] a,b,c

Figure 2-A MSL A Downstream
0-250 Hz

[a,b,c]

Figure 2-B MSL A Downstream
0-100 Hz

[ ]a,b,c

Figure 2-C MSL A Downstream
100-250 Hz

[ ] a,b,c

Figure 3-A MSL B Upstream
0-250 Hz

[a,b,c]

Figure 3-B MSL B Upstream
0-100 Hz

[ ] a,b,c

Figure 3-C MSL B Upstream
100-250 Hz

[a,b,c]

Figure 4-A MSL B Downstream
0-250 Hz

[a,b,c

Figure 4-B MSL B Downstream
0-100 Hz

[ ] a,b,c

Figure 4-C MSL B Downstream
100-250 Hz

[ ] a,b,c

Figure 5-A MSL C Upstream
0-250 Hz

[a,b,c]

Figure 5-B MSL C Upstream
0-100 Hz

[a,b,c]

Figure 5-C MSL C Upstream
100-250 Hz


a,b,c

Figure 6-A MSL C Downstream
0-250 Hz

Figure 6-B MSL C Downstream
0-100 Hz

[a,b,c]

Figure 6-C MSL C Downstream
100-250 Hz

[a,b,c]

Figure 7-A MSL D Upstream
0-250 Hz

[a,b,c

]

Figure 7-B MSL D Upstream
0-100 Hz

[ ] a,b,c

Figure 7-C MSL D Upstream
100-250 Hz

[a,b,c]

Figure 8-A MSL D Downstream
0-250 Hz

a,b,c

Figure 8-B MSL D Downstream
0-100 Hz

[a,b,c

]

Figure 8-C MSL D Downstream
100-250 Hz

[a,b,c]

Figure 9 [ ][a,c]

a,b,c

Figure 10 [

][a,c]

[a,b,c]

Figure 11 [ ][a,c]

[a,b,c

]

Figure 12 [

]a,c

[a,b,c]

Figure 13 [ ]^{a,c}

[a,b,c

]

Figure 14 [ ]a,c

[a,b,c

]

Figure 15 [

][a,c]

[a,b,c

]

Figure 16 [

][a,c]

[a,b,c]

Figure 17 Sample Plant 2, MSL A Upper

a,b,c

Figure 18 Sample Plant 2, MSL A Lower

[a,b,c]

Figure 19 Sample Plant 2, MSL D Upper

[a,b,c]

Figure 20 Sample Plant 2, D Lower

[ ] a,b,c

Figure 21 MSL A Upstream

[ ] a,b,c

Figure 22 MSL A Downstream

[ ]a,b,c

Figure 23 MSL B Upstream

[a,b,c]

Figure 24 MSL B Downstream

[ ]a,b,c

Figure 25 MSL C Upstream

[ ]a,b,c

Figure 26 MSL C Downstream

[a,b,c]

Figure 27 MSL D Upstream

[ ]a,b,c

Figure 28 MSL D Downstream