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GNRO-2012/00099

August 21, 2012

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Requested Information – Vibration Data

Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

REFERENCE: Entergy Operations, Inc. letter to the NRC (GNRO-2012/00079), *Summary Report of Replacement Steam Dryer Data – Responses to Requests for Additional Information*, August 7, 2012

Dear Sir or Madam:

In the referenced letter, Entergy Operations, Inc. (Entergy) committed to provide vibration data along with acceptance limits for the main steam line (MSL) and the MSL safety relief valves (SRVs) for Grand Gulf Nuclear Station based on data collected at various power plateaus during the Extended Power Uprate (EPU) power ascension testing program. The vibration data collected at ~4102 MWt [105% of 3898 MWt, the previous licensed thermal power (PLTP)] is provided in the attachment to this letter.

If you have any questions or require additional information, please contact Guy Davant at (601) 368-5756.

This letter contains no new regulatory commitments.

Sincerely,

CJR/ghd

Attachment: Vibration Data for the Main Steam Line Piping and Safety Relief Valves – 4102 MWt (105% PLTP)

cc: Mr. Elmo E. Collins, Jr.
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ATTACHMENT

GRAND GULF NUCLEAR STATION

GNRO-2012/00099

VIBRATION DATA FOR THE MAIN STEAM LINE PIPING AND SAFETY RELIEF VALVES 4102 MWt (105% PLTP)

VIBRATION DATA FOR THE MAIN STEAM LINE PIPING AND SAFETY RELIEF VALVES 4102 MWt (105% PLTP)

I. Main Steam Line (MSL) Piping Vibration Data and Acceptance Limits

Table 1, below, contains the results from the MSL piping vibration testing performed as part of the GGNS Extended Power Uprate (EPU) Power Ascension Test Plan (PATP) at 4102 MWt [105% of 3898 MWt, the previous licensed thermal power (PLTP)].

The measured accelerations were taken in the major axes for each of the nodes. A band pass filter (RMS) for the test data was applied based on:

- Lower Limit – Capturing frequencies below the lowest piping frequency which corresponds to the highest piping stresses. Generally, this number is higher than 1 Hz, which typically contains voltage drift and DC signals that need to be removed.

- Upper Limit – The upper limit frequency should be sufficiently high so that there is no significant modal participation on the maximum piping stresses. Also, the intent is to remove the high frequency noise, generally above 100 Hz.

The acceptance criteria are based on applying a constant 1g acceleration spectrum to the piping model and determining the maximum stress. The maximum stress was compared with the OM criteria alternating stress allowable per ASME OM-S/G-1997, *Standards and Guides for Operation and Maintenance of Nuclear Power Plants*. The resulting ratio was used to modify the output accelerations at the location for each of the test points.

Node 1008 of MSL-A has reported data that contained intermittent high-amplitude spikes. These types of spikes were neither seen in the corresponding data for the other valves at the same valve location (top) nor in the data of at any of the nodes. For these reasons, the data at this location was deemed unusable.

Table 1

PIPING DESCRIPTION/ SEGMENT	MONITOR LOC./DIR.	MEASURED ACCEL (g)	ACCEL. LIMIT LEVEL 2 / LEVEL 1 (g)	POINT NUM.	ACCEL. LEVEL 2/ LEVEL 1 MARGIN (%)	NOTES
Piping associated with B21-F041A (Top of Valve) MSL-A, Node 1008	X	N/A	0.720 / 1.440	1X	N/A	Non-Operable Sensor
Piping associated with B21-F041A (Top of Valve) MSL-A, Node 1008	Y	N/A	0.160 / 0.320	1Y	N/A	Non-Operable Sensor

PIPING DESCRIPTION/ SEGMENT	MONITOR LOC./DIR.	MEASURED ACCEL (g)	ACCEL. LIMIT LEVEL 2 / LEVEL 1 (g)	POINT NUM.	ACCEL. LEVEL 2/ LEVEL 1 MARGIN (%)	NOTES
Piping associated with B21-F041A (Top of Valve) MSL-A, Node 1008	Z	N/A	0.671 / 1.341	1Z	N/A	Non-Operable Sensor
Piping associated with B21-F041A (Actuator) MSL-A, Node 1010	X	0.301	0.447 / 0.893	2X	32.7 / 66.3	Acceptable
Piping associated with B21-F041A (Actuator) MSL-A, Node 1010	Y	0.204	0.231 / 0.461	2Y	11.7 / 55.7	Acceptable
Piping associated with B21-F041A (Actuator) MSL-A, Node 1010	Z	0.138	0.434 / 0.868	2Z	68.2 / 84.1	Acceptable
Piping associated with B21-F051A (Actuator) MSL-A, Node 2010	X	0.157	0.349 / 0.697	3X	55.0 / 77.5	Acceptable
Piping associated with B21-F051A (Actuator) MSL-A, Node 2010	Y	0.190	0.224 / 0.447	3Y	15.2 / 57.5	Acceptable
Piping associated with B21-F051A (Actuator) MSL-A, Node 2010	Z	0.202	0.389 / 0.778	3Z	48.1 / 74.0	Acceptable
Piping associated with B21-F047A (Actuator) MSL-A, Node 4010	X	0.378	0.420 / 0.840	4X	10.0 / 55.0	Acceptable
Piping associated with B21-F047A (Actuator) MSL-A, Node 4010	Y	0.065	0.310 / 0.619	4Y	79.0 / 89.5	Acceptable
Piping associated with B21-F047A (Actuator) MSL-A ,Node 4010	Z	0.214	0.474 / 0.948	4Z	54.9 / 77.4	Acceptable
Piping associated with B21-F051B (Top of Valve) MSL-B, Node 1008	X	0.011	0.701 / 1.402	5X	98.4 / 99.2	Acceptable

PIPING DESCRIPTION/ SEGMENT	MONITOR LOC./DIR.	MEASURED ACCEL (g)	ACCEL. LIMIT LEVEL 2 / LEVEL 1 (g)	POINT NUM.	ACCEL. LEVEL 2/ LEVEL 1 MARGIN (%)	NOTES
Piping associated with B21-F051B (Top of Valve) MSL-B, Node 1008	Y	0.152	0.185 / 0.370	5Y	17.8 / 58.9	Acceptable
Piping associated with B21-F051B (Top of Valve) MSL-B, Node 1008	Z	0.568	0.756 / 1.512	5Z	24.9 / 62.4	Acceptable
Piping associated with B21-F051F (Actuator) MSL-B, Node 3010	X	0.016	0.389 / 0.778	6X	95.9 / 97.9	Acceptable
Piping associated with B21-F051F (Actuator) MSL-B, Node 3010	Y	0.033	0.212 / 0.424	6Y	84.4 / 92.2	Acceptable
Piping associated with B21-F051F (Actuator) MSL-B, Node 3010	Z	0.188	0.436 / 0.872	6Z	56.9 / 78.4	Acceptable
Piping associated with B21-F041F (Top of Valve) MSL-B, Node 4008	X	0.293	0.645 / 1.290	7X	54.6 / 77.3	Acceptable
Piping associated with B21-F041F (Top of Valve) MSL-B, Node 4008	Y	0.082	0.181 / 0.362	7Y	54.7 / 77.3	Acceptable
Piping associated with B21-F041F (Top of Valve) MSL-B, Node 4008	Z	0.559	0.800 / 1.600	7Z	30.1 / 65.1	Acceptable
Piping associated with B21-F041K (Top of Valve) MSL-B, Node 6008	X	0.354	0.663 / 1.326	8X	46.6 / 73.3	Acceptable
Piping associated with B21-F041K (Top of Valve) MSL-B, Node 6008	Y	0.226	0.229 / 0.457	8Y	1.3 / 50.5	Acceptable
Piping associated with B21-F041K (Top of Valve) MSL-B, Node 6008	Z	0.300	0.677 / 1.353	8Z	55.7 / 77.8	Acceptable

PIPING DESCRIPTION/ SEGMENT	MONITOR LOC./DIR.	MEASURED ACCEL (g)	ACCEL. LIMIT LEVEL 2 / LEVEL 1 (g)	POINT NUM.	ACCEL. LEVEL 2/ LEVEL 1 MARGIN (%)	NOTES
Piping associated with B21-F041C (Top of Valve) MSL-C, Node 1008	X	0.299	0.701 / 1.402	9X	57.3 / 78.7	Acceptable
Piping associated with B21-F041C (Top of Valve) MSL-C, Node 1008	Y	0.030	0.185 / 0.370	9Y	83.8 / 91.9	Acceptable
Piping associated with B21-F041C (Top of Valve) MSL-C, Node 1008	Z	0.337	0.756 / 1.512	9Z	55.4 / 77.7	Acceptable
Piping associated with B21-F051C (Actuator) MSL-C, Node 3010	X	0.293	0.389 / 0.778	10AX	24.7 / 62.3	Acceptable
Piping associated with B21-F051C (Actuator) MSL-C, Node 3010	Y	0.029	0.212 / 0.424	10AY	86.3 / 93.2	Acceptable
Piping associated with B21-F051C (Actuator) MSL-C, Node 3010	Z	0.243	0.436 / 0.872	10AZ	44.3 / 72.1	Acceptable
Piping associated with B21-F047G (Top of Valve) MSL-C, Node 4008	X	0.359	0.645 / 1.290	10BX	44.3 / 72.2	Acceptable
Piping associated with B21-F047G (Top of Valve) MSL-C, Node 4008	Y	0.016	0.181 / 0.362	10BY	91.2 / 95.6	Acceptable
Piping associated with B21-F047G (Top of Valve) MSL-C, Node 4008	Z	0.250	0.800 / 1.600	10BZ	68.7 / 84.4	Acceptable
Piping associated with B21-F047L (Top of Valve) MSL-C, Node 6008	X	0.362	0.663 / 1.326	10CX	45.4 / 72.7	Acceptable
Piping associated with B21-F047L (Top of Valve) MSL-C, Node 6008	Y	0.152	0.229 / 0.457	10CY	33.6 / 66.7	Acceptable

PIPING DESCRIPTION/ SEGMENT	MONITOR LOC./DIR.	MEASURED ACCEL (g)	ACCEL. LIMIT LEVEL 2 / LEVEL 1 (g)	POINT NUM.	ACCEL. LEVEL 2/ LEVEL 1 MARGIN (%)	NOTES
Piping associated with B21-F047L (Top of Valve) MSL-C, Node 6008	Z	0.284	0.677 / 1.353	10CZ	58.0 / 79.0	Acceptable
Piping associated with B21-F047D (Top of Valve) MSL-D, Node 1008	X	0.235	0.720 / 1.440	10DX	67.4 / 83.7	Acceptable
Piping associated with B21-F047D (Top of Valve) MSL-D, Node 1008	Y	0.112	0.160 / 0.320	10DY	30.0 / 65.0	Acceptable
Piping associated with B21-F047D (Top of Valve) MSL-D, Node 1008	Z	0.244	0.671 / 1.341	10DZ	63.6 / 81.8	Acceptable
Piping associated with B21-F047D (Actuator) MSL-D, Node 1010	X	0.395	0.447 / 0.893	10EX	11.6 / 55.8	Acceptable
Piping associated with B21-F047D (Actuator) MSL-D, Node 1010	Y	0.214	0.231 / 0.461	10EY	7.4 / 53.6	Acceptable
Piping associated with B21-F047D (Actuator) MSL-D, Node 1010	Z	0.421	0.434 / 0.868	10EZ	3.0 / 51.5	Acceptable
Piping associated with B21-F014D (Actuator) MSL-D, Node 2010	X	0.167	0.349 / 0.697	10FX	52.1 / 76.0	Acceptable
Piping associated with B21-F014D (Actuator) MSL-D, Node 2010	Y	0.082	0.224 / 0.447	10FY	63.4 / 81.7	Acceptable
Piping associated with B21-F014D (Actuator) MSL-D, Node 2010	Z	0.110	0.389 / 0.778	10FZ	71.7 / 85.9	Acceptable
Piping associated with B21-F051D (Actuator) MSL-D, Node 4010	X	0.141	0.420 / 0.840	10GX	66.4 / 83.2	Acceptable

PIPING DESCRIPTION/ SEGMENT	MONITOR LOC./DIR.	MEASURED ACCEL (g)	ACCEL. LIMIT LEVEL 2 / LEVEL 1 (g)	POINT NUM.	ACCEL. LEVEL 2/ LEVEL 1 MARGIN (%)	NOTES
Piping associated with B21-F051D (Actuator) MSL-D, Node 4010	Y	0.288	0.310 / 0.619	10GY	7.1 / 53.5	Acceptable
Piping associated with B21-F051D (Actuator) MSL-D, Node 4010	Z	0.379	0.474 / 0.948	10GZ	20.0 / 60.0	Acceptable
Piping associated with Pipe Support N11G001H14 Turbine Bldg. MSL-D, Node 412	X	0.042	0.213 / 0.426	15X	80.3 / 90.1	Acceptable

II. Main Steam Safety Relief Valve (SRV) Vibration Data and Acceptance Limits

Table 2, below, contains the results from the SRV vibration testing performed as part of the GGNS EPU PATP at 4102 MWt (105% PLTP).

The resultant measured acceleration represents the combined peak accelerations reported by the tri-axial accelerometer at the particular node. This peak was gathered from the time-history data after band-pass filtering (2 - 250Hz) and DC-offset removal.

Node 1008 of MSL-A has reported data that contained intermittent high-amplitude spikes. These types of spikes were neither seen in the corresponding data for the other valves at the same valve location (top) nor in the data of at any of the nodes. For these reasons, the data at this location was deemed unusable and the other limits related to MSL-A were adjusted to account for this.

Table 2

COMP./PIPING DESCRIPTION / SEGMENT	MONITOR LOC./DIR.	RESULTANT ACCEL. MEASURED (g)	RESULTANT ACCEL. LIMIT (g)	POINT NUM.	RESULTANT ACCEL. MARGIN (%)	NOTES
B21-F041A	X	0.00	0.00	1	0	Non-Op Sensor
Top of Valve	Y					Non-Op Sensor
MSL-A, Node 1008	Z					Non-Op Sensor
B21-F041A	X	1.38	2.27	2	39.21	Acceptable
Actuator	Y					
MSL-A, Node 1010	Z					
B21-F051A	X	0.95	2.27	3	58.15	Acceptable
Actuator	Y					
MSL-A, Node 2010	Z					

COMP./PIPING DESCRIPTION / SEGMENT	MONITOR LOC./DIR.	RESULTANT ACCEL. MEASURED (g)	RESULTANT ACCEL. LIMIT (g)	POINT NUM.	RESULTANT ACCEL. MARGIN (%)	NOTES
B21-F047A	X	0.62	2.27	4	72.69	Acceptable
Actuator	Y					
MSL-A, Node 4010	Z					
B21-F051B	X	0.90	4.03	5	77.67	Acceptable
Top of Valve	Y					
MSL-B, Node 1008	Z					
B21-F051F	X	1.20	2.73	6	56.04	Acceptable
Actuator	Y					
MSL-B, Node 3010	Z					
B21-F041F	X	1.87	4.03	7	53.60	Acceptable
Top of Valve	Y					
MSL-B, Node 4008	Z					
B21-F041K	X	1.43	4.03	8	64.52	Acceptable
Top of Valve	Y					
MSL-B, Node 6008	Z					
B21-F041C	X	2.26	4.03	9	43.92	Acceptable
Top of Valve	Y					
MSL-C, Node 1008	Z					
B21-F051C	X	2.83	2.73	10a	-3.66	See Note 1.
Actuator	Y					
MSL-C, Node 3010	Z					
B21-F047G	X	1.68	4.03	10b	58.31	Acceptable
Top of Valve	Y					
MSL-C, Node 4008	Z					
B21-F047L	X	2.16	4.03	10c	46.04	Acceptable
Top of Valve	Y					
MSL-C, Node 6008	Z					
B21-F047D	X	1.28	4.03	10d	68.24	Acceptable
Top of Valve	Y					
MSL-D, Node 1008	Z					
B21-F047D	X	2.31	2.73	10e	15.38	Acceptable
Actuator	Y					
MSL-D, Node 1010	Z					
B21-F041D	X	1.25	2.73	10f	54.21	Acceptable
Actuator	Y					
MSL-D, Node 2010	Z					
B21-F051D	X	1.15	2.73	10g	57.88	Acceptable
Actuator	Y					
MSL-D, Node 4010	Z					

Note 1: Based on the vibration data from the SRV the acceleration level for valve Q1B21-F051C has reached the limit established based on qualification testing of the valves and actuators with conservative assumptions for endurance limits based on the peak limits of testing performed. The original acceleration limits based on testing data from Wyle Laboratories has conservatism due to the inherent limitations related to the shaker table testing. This testing configuration resulted in higher tested lateral and longitudinal accelerations than the vertical response. Revised limits have been developed at the actuator location with analytical results developed from the use of the original ASME NB-3500 calculation and structural analysis.

For the horizontal accelerations measured at the actuator of a valve, the resultant measured horizontal (lateral and longitudinal) acceleration represents the combined peak accelerations reported by the tri-axial accelerometer at the particular node in the X and Z-directions. For the vertical accelerations measured at the actuator of a valve, these accelerations represent the vertical peak accelerations reported by the tri-axial accelerometer at the particular node in the Y-direction. The peak accelerations were gathered from the time-history data after band-pass filtering (2-250Hz) and DC-offset removal and compared to limits developed through studies of the original ASME NB-3500 analysis and component specific structural analysis as noted above. These limits can be applied to any of the actuator locations if needed.

These limits compared to measured values using this method are as follows:

COMP./PIPING DESCRIPTION / SEGMENT	MONITOR LOC./DIR.	ACCEL. MEASURED (g) X-Z RESULTANT / VERTICAL	ACCEL. LIMIT (g) X-Z RESULTANT / VERTICAL	POINT NUM.	ACCEL. MARGIN (%)	NOTES
B21-F051C	X	1.49 (X-Z)	3.77		60.48	
Actuator	Y	2.40 (Y)	3.77	10a	36.34	Acceptable
MSL-C, Node 3010	Z					