ATTACHMENT 2

Vermont Yankee Nuclear Power Station

Technical Specification Proposed Change No. 263 – Supplement No. 27

Extended Power Uprate - Dryer Acoustic Load Methodology Benchmark

VY-RPT-05-00006
VYNPS Acoustic Model Benchmark- Dryer Acoustic Load Methodology

NON-PROPRIETARY VERSION

Total number of pages in Attachment 2 (excluding this cover sheet) is 224.

Engineering Report No. VY-RPT-05-00006 Rev. 0

Entergy

ENTERGY NUCLEAR NORTHEAST

Engineering Report Cover Sheet

Engineering Report Title:

Acoustic Model Benchmark

Dryer Acoustic Load Methodology

Engineering Report Type:

New ☒ Revision ☐ Cancelled ☐ Superceded ☐

Applicable Site(s)

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Quality-Related: ☐ Yes ☒ No

Prepared by: Enrico J. Betti — Responsible Engineer (Print Name/Sign) Date: ____

Verified/ Reviewed by: Pedro B. Pérez — Design Verifier/Reviewer (Print Name/Sign) Date: ____

*Reviewed by: N/A — Authorized Nuclear In-service Inspector (ANII) Date: ____

Approved by: Brian Hobbs — Supervisor (Print Name/Sign) Date: ____

Multiple Site Review			
Site	Design Verifier/Reviewer (Print Name/Sign)	Supervisor (Print Name/Sign)	Date

*: For ASME Section XI Code Program plans per ENN-DC-120, if required.

NON PROPRIETARY NOTICE

IMPORTANT NOTICE

GE has determined that the PSD and other statistical data developed by ENTERGY from data obtained from the GE SMT facility in San Jose be considered as GE proprietary information. Therefore Figures 3 through 8 and Appendices A through H are considered GE proprietary.

This is a non-proprietary version of the Report No. VY-RPT-05-00006, which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

RECORD OF REVISIONS

Engineering Report No: VY-RPT-05-00006, Acoustic Model Benchmark Dryer Acoustic Loads

Revision No.	Description of Change	Reason For Change
0	Original report	NA

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Summary

In order to evaluate the ability of CDI's acoustic circuit methodology to predict dryer loads, a "blind" benchmark test was performed using the GE Scale Model Test Facility (SMT) in San Jose CA. This test involved acquiring pressure measurements from an instrumented main steam system and steam dryer on the BWR-3 SMT facility. CDI was provided data from the eight points in the SMT steam piping, and one point on the exit plenum to the blower, as well as SMT flow and temperature information. All SMT dryer data from this test was held back in order to perform this benchmark assessment.

CDI used the data provided as input to the acoustic circuit analysis to predict scale model steam dryer fluctuating pressures. These CDI-predicted dryer pressures were then compared to the actual scale model dryer measurements in this report. Therefore, the predictions of steam dryer loads were blind, since measured steam dryer loads were not provided prior to CDI's analysis.

The CDI methodology was benchmarked in the same manner as it was applied in the full-scale VYNPS dryer acoustic analysis; using eight measurements from the main steam system to predict dryer loads. The measurements are representative of the four strain gages and four pressure sensors installed in the VY plant. The test cases were designed to assess how well the CDI acoustic model would predict acoustic pressures on the dryer when provided with the external piping measurements.

The benchmark results provide the justification and guidance for applying the CDI acoustic circuit methodology in predicting the full scale VYNPS dryer loads.

Purpose

The CDI acoustic circuit analysis methodology was used to predict flow induced pressure loading on the VYNPS steam dryer. The methodology uses measurements from strain gages mounted on the main steam piping and measurements from temporary high frequency pressure sensors attached to the main steam venturi sensing lines. A blind benchmark test of the CDI methodology was conducted in order to determine the viability of the methodology.

Background

Scale Test Model Test Facility

A 1:17.3 sub-scale model was used to generate data for the benchmark test (Reference 1). The sub-scale test platform represented the Quad Cities 1 nuclear plant configuration with its original steam dryer design installed. The scale model test facility (SMT) consisted of a reactor vessel head, steam dryer and main steam piping. The model extended from the steam/water interface, located at an inlet plenum, to the turbine inlet. Main steam valves including SRV/ERVs, MSIVs, turbine control valves and turbine stop valves were included in the model at locations reflecting full scale plant configuration. The HPCI and RCIC steam supply lines were included on the associated main steam line. The SMT relied on a blower to generate a flow of ambient air through the facility in the direction of reactor steam flow. Upstream of the plenum is a muffler that served to isolate the model from blower and delivery piping noise. A venturi flow meter located between the blower and muffler was used to measure total system airflow. Two thermocouples were used to monitor air temperature in the system. All tests were performed at ambient pressure.

Microphones were installed in the SMT main steam piping, steam dryer and inlet plenum to measure the unsteady pressure oscillations in the system. The microphone circuits included pre-amplifiers. The microphones were mounted such that their diaphragms were flush with the outer surface of the steam dryer assembly or the inside surface of the pipe wall. The microphones used to collect data on the main steam lines were in the approximate locations of the strain gages and venturis on the full scale plant.

A sound generator (exciter) source was installed on the "A" main steam line near the equalizing header. The purpose of this exciter was to generate a known sound signal that could be detected by the microphones in the SMT. Burst random and deterministic chirp exciter signatures were used during certain benchmark SMT test cases in order to provide a sufficiently broad range of sound frequencies.

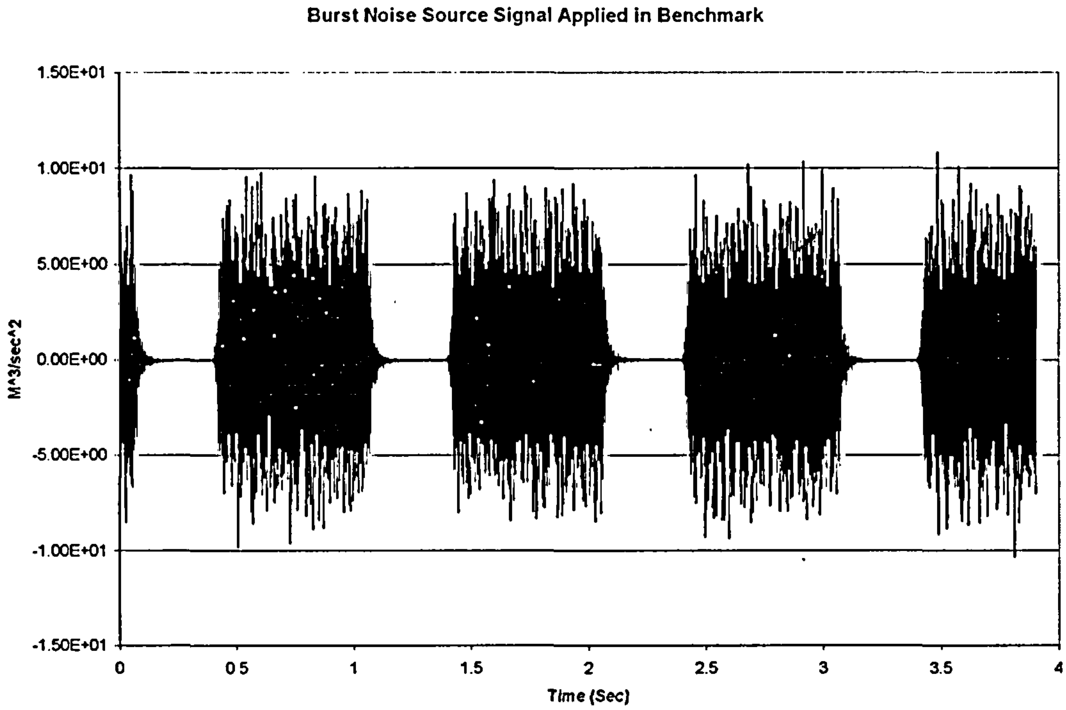
The analog signals from the microphones were routed to a 32 channel LMS SCADAS III dynamic signal analyzer, which recorded and analyzed the data. The analyzer converted the analog signal to digital data, performed signal analysis and stored the output data in digital format on a PC.

CDI developed an analytical model of the SMT for use in predicting loads on the model dryer. The SMT components and as-built dimensions were provided to CDI. CDI was provided with SMT main steam line microphone data, inlet plenum microphone data, the SMT process flow rate, SMT Temperature, and the PSD functions for the exciter sound source. CDI used this data to predict the responses at 20 selected SMT dryer microphone locations. Entergy subsequently compared the loads predicted by CDI to the subscale model dryer measured microphone data.

The SMT benchmark test in San Jose (Reference 3) included the following conditions:

Test 1	Test Name	Flow Rate (cfm)	External Exciter Source
1	VY1	0	1000Hz Constant Signal
2	VY2	0	Chirp Input
3	VY3	0	Burst Input
4	VY4	81	Off
5	VY5	81	Chirp Input
6	VY6	81	Burst Input
7	VY7	115	Off
8	VY8	115	Chirp Input
9	VY9	115	Burst Input
10	VY10	0	1000Hz Constant Signal
11	VY11	144	Off
12	VY12	81	Chirp Input.(Hi Volume)
13	VY13	0	Chirp Input (Hi Volume)

The 81 CFM flow rate represents ~50% Power for Q2 Pre-EPU. The VY3 Burst signal and VY13 Chirp signals are depicted in Figure 1.



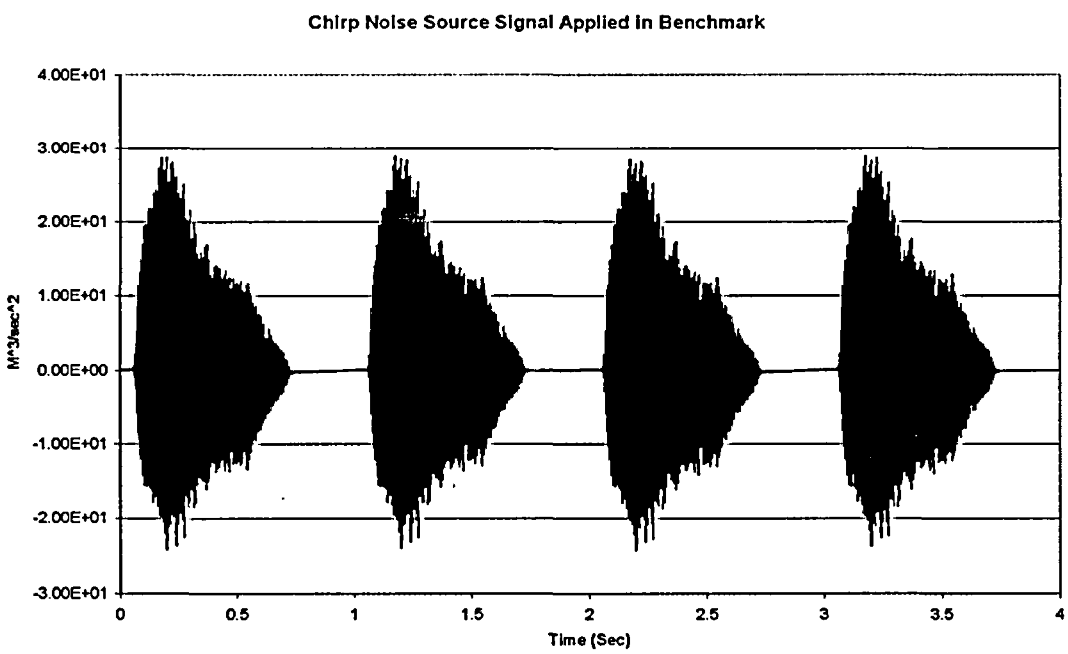


Figure 1: Source Noise Signals Applied in SMT Test (Mic P3A)

Evaluation

Selection of Cases for the CDI Benchmark

The initial Entergy review of the SMT benchmark test data was performed in San Jose on 01/13/2005. This review included the 11 original benchmark cases. In this review it was noted that the deterministic chirp and burst random signals had insufficient volume and provided negligible signal at the dryer when combined with either of the two flow cases. Therefore, two additional cases (cases 12 and 13) were performed. The chirp volume was set loud enough to provide a good signature of the chirp signal at the dryer face when combined with flow noise. The volume had to be limited however to not saturate the microphone channels. Therefore the lower of the two flow rates was used in the Case 12 test. Case 13 used the same volume chirp signal without flow.

For each test case a minimum of 25 segments of data were collected for each run. There were 3 runs performed for each test case. During each test run more than 30 seconds of data were captured. One sound trigger per second was used for runs with the exciter allowing adequate time between sound inputs for the signal to dissipate. A review of the PSD data for each of the 1 second sound segments was performed between test runs using the digital analyzer. This review demonstrated that there was acceptable repeatability in the segments with no discernable change in the input or transmission of the sound throughout the SMT. This allowed use of data from any one of the three runs for the benchmark analysis input. The three data collection runs for each case were performed with only a brief pause between each run. The blower was kept continuously running for the flow cases.

Based on VY review of data from the 13 test conditions, four test cases were selected by Entergy for CDI use in predicting SMT dryer microphone measurements. The test cases selected for the CDI acoustic model analysis included:

SMT Tests Selected for CDI Benchmark Analyses			
Test	Blower Flow Rate (cfm)	Installed Exciter	Exciter Location
VY3Run2	0	Burst Random	Port 3A upstream of D-Ring
VY6Run2	81	Burst Random	
VY12R1	81	Chirp	
VY13R1	0	Chirp	

Cases 3 and 13 provide both exciter source signals without flow. This provides two different signals for which we can compare the acoustic model without flow. The two flow cases, 6 and 12, provide one case where flow noise predominates and one case where the exciter sound source has a significant impact on the observed flow noise at the dryer.

In the full scale plant, the reactor vessel steam/water interface below the dryer serves as a reflective boundary for acoustic waves. In the SMT, this interface did not exist. In order to establish the conditions at the SMT interface, CDI was provided with microphone signal M30 at the outlet to the muffler. Review of the SMT data by Entergy demonstrated that the M30 microphone data had minimal coherence with microphone data on the face of the dryer or outside skirt regions. There was coherence between M30 and microphone data at the top of the dryer. It is the dryer face regions where pressure forces are highest. The dryer face forces are responsible for the major dryer loads that have likely contributed to dryer failures. Therefore, Entergy agreed to supply the M30 data to CDI for the benchmark and focus benchmark comparison on microphones on the face of the dyer.

SMT Data Uncertainty

Case 1 included a 1000 Hz input signal. This was repeated in Case 10. This case was done to assess if there was any overall drift or signal change over the course of the testing. This evaluation demonstrated that there was a larger than expected variation on amplitude as a function of temperature. Some microphones data increased as much as 20% under the higher temperature conditions during later testing. During Case 10 the temperature was allowed to cool. As the temperature approached Case 1 temperature, pressure values also returned to Case 1 values. Through multiple repeated runs at 144 CFM GE has found that that the removal and reinstallation of the microphone can have an impact on pressure amplitude.

The microphones were also subject to a pre- and post-test loop test with a calibrated sound source. (Reference 4) Results indicated that there was little change in the calibration of the microphones. Most microphones a post test sensitivity within 3% of the pre-test value. All microphones exhibited a post-test sensitivity within 6% of the pre-test values. The GE test summary containing the calibration results is attached included in Reference 4 and 5.

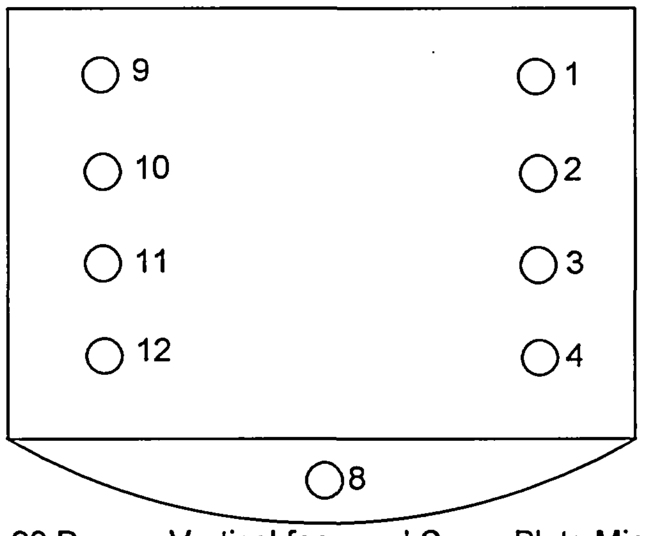
Selection of Dryer Microphone Data for Benchmark Comparison

Microphones installed on the dryer and skirt during the test included M1, 3, 4, 8, 9, 10, 12, 13, 14, 15,16, 20, 21, 23, 24, 25, 32, 33, 39, 50, and 52.

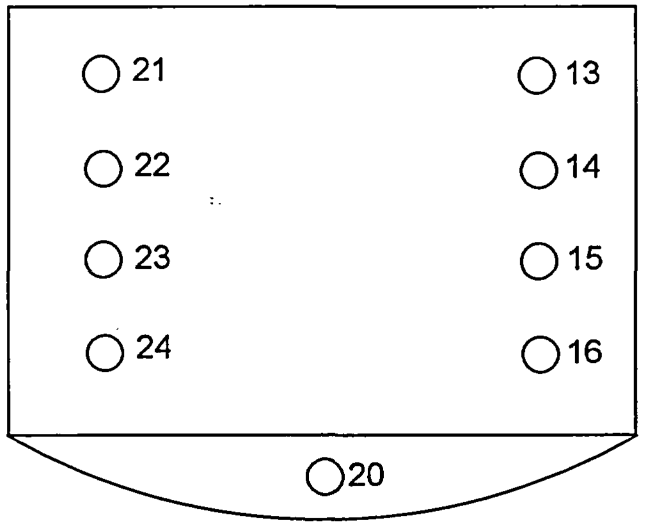
The microphone data used in the comparison was parsed to a subset that includes those microphones on the components of greatest interest; the dryer face and cover-plates. Microphones M1, 3, 4, 8, 9, 10, 12, 13, 14, 15, 16, 20, 21, 23, and 24 were located on these components. The location of these microphones is depicted in Figure 2.

M50 and M52, located at the top of the dryer, were not included in the comparison. The acoustic model shows very good agreement with these locations, but these microphones have very similar frequency content and amplitude as microphone M30, the microphone at the outlet of the SMT muffler. The M30 data was provided to CDI to allow characterization of the boundary condition in the inlet plenum. Having the data for M30 does not make prediction of the signal at M50 and M52 a meaningful test.

The balance of microphones excluded were M25, 32, 33, and 39. These microphones were in the dryer skirt region. These regions are well below the top of the dryer and in areas were the dryer is cylindrical in shape. Flow loads in this region have negligible impact on fatigue life.



Dryer 90 Degree Vertical face and Cover Plate Microphone Locations
This is Nozzle (Pipe) C&D Side of the Dryer
(cover plate rotated for clarity)



Dryer 270 Degree Vertical Face and Cover Plate Microphone Locations
This is Nozzle (Pipe) A&B Side of the Dryer
(cover plate rotated for clarity)

Figure 2. Dryer Microphone Locations Used in the Benchmark Assessment (Reference 2)

Comparison of Microphone Data; Time Domain

Entergy supplied CDI with approximately 30 seconds of data for each of the four selected test cases. In the acoustic model analysis, CDI elected to use the first 8 seconds of data provided. Therefore all comparisons in this assessment were performed using the same 0 to 8 second subset of the SMT data. The CDI report documenting their blind benchmark calculation is included in Reference 6.

The first comparison performed included a review of the time domain data. The LMS system is configured for AC acquisition. This means any bias or drift has been filtered out of the data. Entergy's check of the output data demonstrated that the mean pressure data at all the microphones was approximately zero.

Figures 3a, b, c and d compare the peak amplitude from the time history data. This includes the maximum absolute pressure data over the 8 seconds of loading, or 65536 time points. In general the CDI acoustic analysis model did a good job at predicting the peak loads on the dryer. These figures also include a comparison of the Prms over the 8 seconds of loading. Prms is representative of energy in the signal. This data also compares reasonably well.

Figures 3a and 3b show that with no flow and the sound source applied, the acoustic model predicts higher loads on the dryer than the SMT measure loads.

Figures 3c shows maximum pressure for flow and low volume burst source. Here the comparison shows a better match; with microphone measurements slightly higher than the loads predicted by CDI. Figure 3d shows maximum pressure for flow and high volume chirp source. The CDI predicted acoustic loads matched reasonably well predicting slightly higher values than the microphone measurements.

While the figures compare individual microphone results, in a structural analysis of the modified full scale VYNPS steam dryer, these loads would be effectively 'integrated' by the 1" face plate and heavy 5/8" cover plate and ½" gussets. The following table therefore presents an average dryer face loads from the acoustic model and the SMT benchmark.

CDI vs. SMT Comparison of Averaged Point 1 to 24

Averaged Data pts 1 to 24		VY3RUN2	VY13R1	VY6RUN2	VY12R1
Average CDI	Max Pascal	21.5	87.2	26.9	63.6
Average	Max Pacal	16.6	53.9	29.4	58.4
Ratio	CDI/SMT %	130%	162%	91%	109%

The results indicate that the averaged maximum CDI acoustic analysis predicted loads range from 160% to 91% of the SMT microphone measured loads. Therefore, the CDI acoustic analysis model would appear to be a reasonable tool for predicting steam dryer peak loads.

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Figure 3A. Burst Random No Flow. All Mics. Maximum Pressure and Prms (Std Dev).
(For a Full size plot see Appendix A pgs A1 and A2)

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Figure 3B. Chirp No Flow. All Mics. Maximum Pressure and Prms (Std Dev).
(For a Full size plot see Appendix C pgs C1 and C2)

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Figure 3C. Burst Random and 81 CFM Flow. All Mics. Maximum Pressure and Prms (Std Dev).(For a Full size plot see Appendix E pgs E1 and E2)

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Figure 3D. Chirp and 81 CFM Flow. All Mics. Maximum Pressure and Prms (Std Dev).
(For a Full size plot see Appendix G, pgs G1 and G2)

Comparison of Microphone Data; Frequency Domain

A comparison of measured versus predicted dryer frequency response was performed by converting the time history data to the frequency domain data using a Fourier transform. The structural analysis of the dryer is performed as a dynamic analysis. Therefore the frequency characteristics of the signal can be a key factor in determining fatigue stress. This is especially important near the natural frequency of the loaded component. Appendices A through H include PSD Comparison plots for all dryer face microphones.

In summary

Appendix,	Description[1]
A	VY3RUN2, Burst with No Flow, Log and Linear Plots
B	VY3RUN2, Burst with No Flow, +/-10% Load Step Uncertainty
C	VY13R1, Chirp with No Flow, Log and Linear Plots
D	VY13R1, Chirp with No Flow, +/-10% Load Step Uncertainty
E	VY6RUN2, Burst with 81 CFM Flow, Log and Linear Plots
F	VY6RUN2, Burst with 81 CFM Flow, +/-10% Load Step Uncertainty
G	VY12R1, Chirp with 81 CFM Flow, Log and Linear Plots
H	VY12R1, Chirp with 81 CFM Flow, +/-10% Load Step Uncertainty

Appendix I provides a road map for the data and file processing done in this Benchmark.

The PSD data in these Appendices was developed for a sample rate of 8192 Hz and a fast Fourier transform (FFT) size of 1024 for a bin size of 8 Hz. This provides a resolution of 400 bins in the 0 to 3200 Hz plots below. The 400 bin resolution resulted in data plots that provide a detailed yet discernable resolution in the plotted data. A Hanning window was used in the FFT calculation. The averaging was done with a 50% FFT overlap. To maintain a 8 Hz bin size, for the +10% time step PSDs the sample rate was assumed to be (8192 Hz / 1.1 =) 7447 Hz and the FFT size was reduced to 931. For the -10% time step PSDs the sample rate was assumed to be (8192 Hz / 0.9 =) 9102 Hz and the FFT size was increased to 1138.

Figures 4 and 5 provide a good depiction of where the acoustic model did well and not so well at predicting the frequency content of the dryer loads when there was an applied noise signal and no flow.

In Figure 4 it can be noted that the acoustic model enveloped most of the peaks of the SMT Microphone 4 data. From the log chart it is noted that the amplitude follows the SMT quite

[1] Note the +/- Load step uncertainty assessments were done in the post processing of data by Entergy on the data provided by CDI.

well. In Figure 5 it can be noted that for Microphone 16 the acoustic model over-predicts the response at 800 and 1200 Hz and misses a peak at 900 Hz.

Microphone 16 with Burst signal and 81 CFM flow (Figure 6) depicts the typical comparison of acoustic predictions and SMT data for the tests conducted with flow. With minor exception, the acoustic model envelopes the amplitude from 240 Hz through 3200 Hz. In general the acoustic model becomes more conservative above 2000 Hz. The model typically under predicts the flow noise below 240 Hz[2]. In this case you will also note that the acoustic model does not predict an SMT peak at 800 Hz.

While in general the acoustic model did well under flow conditions from 240 Hz to 3200 Hz there are still some mismatches at narrow frequency bands. The frequency content of the load at or near the fundamental structural frequencies of the dryer face components is very important to the structural response. One method to address uncertainty in the frequency content of a dynamic load is to perform the structural analysis with a plus and minus variation in the load step. In this benchmark, we generated additional PSD data sets varying the sample rate (Hz) by 1/0.9 and 1/1.10. This is equivalent to varying the time step +/- 10%. Then we established an enveloping PSD curve by using the maximum value of the three PSD curves. We provide a full set of these enveloped curves in Appendices B, D, F and H. We have included an excerpt below in Figure 7 for Microphone 16, Burst signal and 81 CFM flow. As can be seen from Figure 6, the +/- 10% provides a conservative envelope of nearly all frequencies above 240 Hz.

From this benchmark it can be said that with the application of the +/-10% timestep variation that acoustic loads are conservative from 240 Hz to 3200 Hz and nonconservative at lower frequencies. Figure 8 compares the pipe signal with the dryer face signal and the acoustic model prediction at this same point for the Burst signal with 81 cfm flow. It should be noted that the pipe signal had significant noise amplitude below 240 Hz. Therefore the dryer load amplitude is reflected in the piping data.

Conversion of frequency values from the SMT to the full scale plant is as follows:

240 Hz in the SMT corresponds to ~20 Hz in the full scale plant.
2000 Hz in the SMT corresponds to ~160 Hz in the full scale plant.

In the full scale plant, the repaired dryer face first natural frequency is 77 Hz (Reference 7 and also Entergy response to NRC RAI EMEB-B-1-5 contained in BVY 04-058). Therefore it is likely that under predicting the frequency content below 20 Hz (full scale, 240 Hz SMT scale) and shifting the peak response to higher frequencies below 77 Hz would have a

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[2] It should be noted that the microphones response characteristics are published from 20 to 15000 Hz. Therefore ENVY cannot establish the reliability of SMT data below 20 Hz.

conservative impact on stress in the structural assessment. Alternatively other methods could be employed to better define low frequency forces.

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Figure 4. Mic 4, Burst No Flow

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Figure 5. Mic 16, Burst No Flow

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Figure 6. Mic 16. Burst with 81 CFM Flow

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Figure 7. Mic 16. Burst with 81 CFM Flow, Time Step CDI Data +/-10%

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Figure 8. Comparison of Pipe Signals (P2A), Dryer Signal smtM16, and CDI Prediction at M16.

Conclusion

The acoustic model does a reasonable job of predicting pressure amplitude and energy at the dryer face. The acoustic model does an adequate job of predicting SMT frequency content in the 240 Hz to 2000 Hz [3] range. If a 10% load step uncertainty is applied to the data the acoustic model predictions are conservative. The acoustic model under predicts the frequency content below 20 Hz and over-predicts the high frequency content above 2000 Hz.

Fatigue assessment is generally performed with mean centered load prediction. The design margin is provided through use of the conservative fatigue stress endurance limits that provide a factor of 2 against failure. For the purpose of fatigue assessment the acoustic methodology will provide a conservative representation of full scale plant loads from 20 to 200Hz.

References

1. GENE-0000-0032-7903-04, Interim Test Report # 2, Quad Cities Unit 1 Scale Model, Source Screening Tests – Original Dryer Configuration, November 2004 (GE Proprietary).
2. GE Proprietary Drawing 124D1043, Sensor Locations, Quad Cities Steam Dryer, Scaled.
3. Entergy SMT-CDI Test Plan, Phase I, Data Acquisition, 3/9/05.
4. Letter Daniel Somerville, GENE to Enrico Betti, Fulfillment of remaining Items for Benchmark Testing in Support of VY EPU. 3-10-2005,
5. CD from GE Copy of SMT Microphone Certifications and Instrument Calibration Reports.
6. C.D.I. Technical Memorandum No. 05-09, Calculations Supporting Blind Benchmarking of CDI's Acoustic, Circuit Analysis for Steam Dryer Loads, March 2005.
7. GE Report, GE-NE-0000-0024-7944-1, "Vermont Yankee Nuclear Power Station Steam Dryer Modification", Revision 1, March 2004.

[3] 240 Hz to 2000 hz is equivalent to 20 Hz to 160 Hz full scale frequency

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone Mall Prms

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M1 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M3 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M3

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M4 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M4

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M8 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M8

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M9 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M9

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M10 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M10

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M12 log

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Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M12

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M13 log

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Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M13

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Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M14 log

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Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M14

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M15 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M15

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M16 log

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Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M16

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M20 log

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Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M20

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M21 log

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Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M21

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M23 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M23

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Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M24 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix A, VY3RUN2 Burst Random with No Flow
Microphone M24

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M1 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M3 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

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Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M4 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

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Appendix B, VY3RUN2, Burst Random No Flow
Microphone M8 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

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Appendix B, VY3RUN2, Burst Random No Flow
Microphone M9 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

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Appendix B, VY3RUN2, Burst Random No Flow
Microphone M10 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M12 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M13 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M14 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M15 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M16 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M20 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M21 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix B, VY3RUN2, Burst Random No Flow
Microphone M23 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Acoustic Model Benchmark

Appendix B, VY3RUN2, Burst Random No Flow

Microphone M24 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone Mall Max

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone Mall Prms

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M1 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M1

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M3 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M3

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M4 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M8 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M8

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M9 log

Acoustic Model Benchmark

Appendix C, VY13R1 Chirp with No Flow

Microphone M9

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M10 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M10

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M12 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M12

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M13 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M14 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M14

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M15 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M15

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M16 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M16

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M20 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M21 log

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M23

Non-Proprietary Version
Acoustic Model Benchmark
Appendix C, VY13R1 Chirp with No Flow
Microphone M24

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M1 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M3 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M4 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M8 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M9 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M10 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M12 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M13 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M14 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M15 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M16 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M20 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M21 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Acoustic Model Benchmark

Appendix D, VY13R1, Chirp with No Flow

Microphone M23 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix D, VY13R1, Chirp with No Flow
Microphone M24 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone Mall Max

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone Mall Prms

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M1 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M1

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M3 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M3

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M4 log

Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M4

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M8 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M8

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M9 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M9

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M10 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M10

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M12 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M12

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M13 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M13

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M14 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M14

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M15 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M15

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M16 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M16

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M20 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M20

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M21 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M21

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M23 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M24 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix E, VY6RUN2 Burst Random with 81 CFM Flow
Microphone M24

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M1 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M3 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M4 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M8 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M9 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M10 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M12 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M13 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M14 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M15 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M16 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M20 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M21 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M23 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix F, VY6RUN2, Burst Random with 81 CFM Flow
Microphone M24 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone Mall Max

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone Mall Prms

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M1 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M1

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M3 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M3

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M4 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M4

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M8 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M8

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M9 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M9

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M10 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M10

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M12 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M12

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M13 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M14 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M14

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M15 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M15

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M16 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M16

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M20 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M20

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M21 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M21

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M23 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M23

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M24 log

Non-proprietary Version
Acoustic Model Benchmark
Appendix G, VY12R1 Chirp with 81 CFM Flow
Microphone M24

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M1 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M3 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M4 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M8 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M9 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M10 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M12 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M13 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M14 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M15 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M16 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M20 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M21 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M23 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Non-proprietary Version
Acoustic Model Benchmark
Appendix H, VY12R1, Chirp with 81 CFM Flow
Microphone M24 with +/-10% Uncertainty Applied to CDI Loads (Max SR/.9, SR/1, SR/1.1)

Appendix I;

Roadmap for Processing Data

Roadmap for Processing SMT and CDI Data

GE provided the following Time history files. These files included all the recorded data from the SMT test. Each data file included approximately 30 seconds of data.

Summary of time history files provided by GE:

01/13/2005	05:33 PM	283,478,487 VY9Run9All.txt
01/13/2005	04:17 PM	275,602,618 VY10Run7All.txt
01/13/2005	05:43 PM	271,238,830 VY10Run9All.txt
01/13/2005	04:26 PM	267,722,256 VY11Run5All.txt
01/13/2005	01:59 PM	283,489,431 VY1Run1All.txt
01/13/2005	02:56 PM	283,487,337 VY1Run2All.txt
01/13/2005	02:59 PM	283,488,018 VY1Run3All.txt
01/13/2005	02:04 PM	287,771,675 VY2Run11All.txt
01/13/2005	03:03 PM	287,763,890 VY2Run12All.txt
01/13/2005	03:06 PM	283,369,687 VY2Run13All.txt
01/13/2005	02:07 PM	283,345,842 VY3Run2All.txt
01/13/2005	03:12 PM	283,376,049 VY3Run3All.txt
01/13/2005	03:15 PM	283,335,261 VY3Run6All.txt
01/13/2005	02:11 PM	283,471,938 VY4Run1All.txt
01/13/2005	03:21 PM	267,726,153 VY4Run2All.txt
01/13/2005	03:26 PM	267,722,849 VY4Run3All.txt
01/13/2005	02:14 PM	283,451,074 VY5Run3All.txt
01/13/2005	03:35 PM	283,457,552 VY5Run4All.txt
01/13/2005	03:38 PM	283,463,399 VY5Run5All.txt
01/13/2005	02:18 PM	283,478,752 VY6Run2All.txt
01/13/2005	03:42 PM	283,461,218 VY6Run3All.txt
01/13/2005	03:47 PM	283,484,900 VY6Run4All.txt
01/13/2005	02:21 PM	267,720,093 VY7Run5All.txt
01/13/2005	03:51 PM	267,719,082 VY7Run6All.txt
01/13/2005	03:54 PM	267,703,991 VY7Run7All.txt
01/13/2005	02:24 PM	287,950,372 VY8Run1All.txt
01/13/2005	03:57 PM	287,949,363 VY8Run3All.txt
01/13/2005	04:00 PM	287,956,400 VY8Run4All.txt
01/13/2005	02:27 PM	283,462,108 VY9Run3All.txt
01/13/2005	05:36 PM	283,478,017 VY9Run5All.txt
01/13/2005	05:40 PM	267,784,949 VY10Run1All.txt
01/13/2005	09:13 PM	287,174,379 VY13R3All.txt
01/13/2005	09:26 PM	287,954,233 VY12R2All.txt
01/13/2005	09:29 PM	283,473,846 VY12R3All.txt
01/13/2005	09:07 PM	282,698,036 VY13R1All.txt
01/13/2005	09:09 PM	287,169,906 VY13R2All.txt
01/13/2005	09:22 PM	283,446,151 VY12R1All.txt

GE also included PSD files for one of the three Runs for each SMT condition. These PSDs were based on the 8192 hz sampling rate and a 8192 transfer size and therefore provide a 1Hz bin resolution. They are averaged over the entire ~30 sec transient.

01/13/2005	08:44 PM	1,298,459	V10R1.csv
01/13/2005	06:42 PM	1,339,454	V1R1.csv
01/13/2005	08:04 PM	1,339,454	V2R11.csv
01/13/2005	08:08 PM	1,339,454	V3R2.csv
01/13/2005	08:10 PM	1,339,454	V4R1.csv
01/13/2005	08:27 PM	1,339,454	V5R3.csv
01/13/2005	08:31 PM	1,339,454	V6R2.csv
01/13/2005	08:40 PM	1,298,459	V7R5.csv
01/13/2005	08:36 PM	1,339,454	V8R1.csv
01/13/2005	08:46 PM	1,339,454	V9R3.csv
01/14/2005	12:21 AM	1,339,454	V10R9.csv
01/13/2005	09:50 PM	1,133	V13R1.mtx
01/13/2005	09:49 PM	528	V12R1.idx
01/13/2005	09:49 PM	101,032	v12r1.ix0
01/13/2005	09:49 PM	21,024	v12r1.ix1
01/13/2005	09:49 PM	1,133	V12R1.mtx
01/13/2005	09:50 PM	2,157,601	v13r1.dat
01/13/2005	09:50 PM	528	V13R1.idx
01/13/2005	09:50 PM	101,032	v13r1.ix0
01/13/2005	09:50 PM	21,024	v13r1.ix1
01/13/2005	09:49 PM	2,157,601	v12r1.dat
01/14/2005	12:51 AM	1,339,451	V13R1.csv
01/14/2005	12:50 AM	1,339,451	V12R1.csv

From these time history and PSD files ENVY then extracted the following data subset for CDI:

PSD at the Source microphone, Mic P3A,
8 piping microphone data sets, P1 a,b,c,&d, P2 a,b,c,&d,
1 muffler exhaust microphone M30,
flow dP transmitter signal, PT-1,
RPV dome pressure, PT-2, and the
RPV dome temperature, TC-1.

This data was provided to CDI in the following data files. This information was transmitted to along with SMT configuration information in accordance with ENN-DC-141. The data was downloaded by CDI from the ENVY upload data transfer website.

1- Applied Source PSD
01/17/2005 07:46 PM 1,061,376 Source PSDs.xls
2a- Time History Data at P1, P2, M30 TC Data
01/18/2005 07:01 PM 26,112 Conversion of
01/17/2005 09:26 PM 40,122,459 VY12R1CDI.txt
01/17/2005 09:32 PM 40,136,425 VY13R1CDI.txt

01/17/2005 09:08 PM 40,124,293 VY3Run2CDI.txt
01/17/2005 09:20 PM 40,121,532 VY6Run2CDI.txt
2b- Time History Data for Pressure Transmitters
01/18/2005 06:43 PM 10,999,750 VY12R1CDIpt.txt
01/18/2005 06:39 PM 10,999,750 VY6R2CDIpt.txt

CDI then used this data in their Accoustic model. They analyzed the first 8 seconds of the 30 seconds of data supplied. This included 65536 time points at 8192 Hz . When the benchmark analysis was complete CDI transferred the results of their model at the 21 specified dryer points to the Continuum Dynamics upload site.

The following list summarizes the files downloaded from the CDI site for the Benchmark Comparison:

CDI Data

03/10/2005	03:23 PM	91,590	vy3psd.txt
03/11/2005	06:43 PM	88,897	vy6psd.txt
03/11/2005	06:43 PM	85,792	vy12psd.txt
03/10/2005	03:22 PM	86,178	vy13psd.txt
03/10/2005	03:25 PM	11,903,347	vy3time.txt
03/11/2005	06:46 PM	11,127,839	vy6time.txt
03/11/2005	06:45 PM	11,083,085	vy12time.txt
03/10/2005	03:25 PM	11,951,116	vy13time.txt

CDI later after delivering the benchmark (prior knowing how their data compared with SMT data) decided to experiment with a refined acoustic model mesh. The full scale VY and QC mesh has a 3" element size. The 1/16" SMT scale model has a 3/16" sized mesh. The reduced size mesh being investigated by CDI required much longer to process. If the refined mesh resulted in substantial improvements in the Benchmark comparison, it would be advisable to refine the full scale model 3" mesh and regenerate dryer loads for the full scale VY model. The following list summarizes the files downloaded from CDI for the refined mesh benchmark comparison:

CDI Data Refined Mesh Loads

03/14/2005	03:13 PM	90,887	vy3psd.txt
03/14/2005	03:15 PM	88,834	vy6psd.txt
03/14/2005	03:12 PM	85,502	vy12psd.txt
03/14/2005	03:13 PM	84,585	vy13psd.txt
03/14/2005	03:16 PM	11,874,837	vy3time.txt
03/14/2005	03:15 PM	11,137,388	vy6time.txt
03/14/2005	03:14 PM	11,097,900	vy12time.txt

03/14/2005 03:14 PM 11,865,093 vy13time.txt

The GE time history data for the 21 dryer points and the input signal Mic P3A were parsed from the original GE output files. The data was also subdivided into three files to permit printing and checking of data. These files included the following. The title and data were also separated for use in Matlab.

VY3RUN2

01/26/2005	12:05 PM	1,122	VY3RUN2Mic0and180andTopViewTitleList.txt
01/26/2005	12:06 PM	25,738,548	VY3RUN2Mic0and180andTopViewDataNumbers.txt
01/26/2005	11:45 AM	1,382	VY3RUN2Mic90TopViewTitleList.txt
01/26/2005	11:48 AM	32,939,091	VY3RUN2Mic90TopViewDataNumbers.txt
01/26/2005	12:00 PM	1,398	VY3RUN2Mic270and180ViewTitleList.txt
01/26/2005	11:58 AM	32,927,667	VY3RUN2Mic270and180ViewDataNumbers.txt

VY6RUN2

01/26/2005	12:43 PM	1,122	VY6RUN2Mic0and180andTopViewTitleList.txt
01/26/2005	12:45 PM	25,759,522	VY6RUN2Mic0and180andTopViewDataNumbers.txt
01/26/2005	12:31 PM	1,382	VY6RUN2Mic90andTopViewTitleList.txt
01/26/2005	12:37 PM	32,992,951	VY6RUN2Mic90andTopViewDataNumbers.txt
01/26/2005	12:41 PM	1,398	VY6RUN2Mic270and180ViewTitleList.txt
01/26/2005	12:34 PM	32,995,121	VY6RUN2Mic270and180ViewDataNumbers.txt

VY12R1

01/26/2005	01:02 PM	1,122	VY12R1Mic0and180andTopViewTitleList.txt
01/26/2005	01:05 PM	25,759,245	VY12R1Mic0and180andTopViewDataNumbers.txt
01/26/2005	12:54 PM	1,382	VY12R1Mic90andTopViewTitleList.txt
01/26/2005	12:55 PM	32,978,268	VY12R1Mic90andTopViewDataNumbers.txt
01/26/2005	12:58 PM	1,402	VY12R1Mic270and180ViewTitleList.txt
01/26/2005	01:00 PM	32,978,865	VY12R1Mic270and180ViewDataNumbers.txt

VY13R1

01/26/2005	01:17 PM	1,122	VY13R1Mic0and180andTopViewTitleList.txt
01/26/2005	01:19 PM	25,652,663	VY13R1Mic0and180andTopViewDataNumbers.txt
01/26/2005	01:10 PM	1,382	VY13R1Mic90andTopViewTitleList.txt
01/26/2005	01:11 PM	32,675,383	VY13R1Mic90andTopViewDataNumbers.txt
01/26/2005	01:13 PM	1,402	VY13R1Mic270and180ViewTitleList.txt
01/26/2005	01:15 PM	32,664,780	VY13R1Mic270and180ViewDataNumbers.txt

It was imperative that the benchmark comparison be done with the same set time data used in the CDI analysis. Therefore the original data files above were parsed to extract the dryer microphone data from 0 to 8 seconds. (all lines after 8 seconds were deleted). The titles were cut into an excel spread sheet this provided a numeric file for Matlab reading. The data files were run through MatLab to calculate important statistical data from the time history data including:

maxTH

minTH
averageTH (Mean Function in Matlab)
stdevTH
PSD

The PSDs calculated in Matlab were done for a sample rate of 8192Hz and a FFT size of 1024 for a bin size of 8 Hz. This provides a resolution of 400 bins in the 0 to 3200 Hz plots provided. This resolution is on par with the 1 Hz resolution used in the evaluation of full scale data from 0 to 200 Hz. The 400 bin resolution resulted in data plots that provide a detailed yet discernable resolution in the plotted data. A Hanning window was used. The averaging was done with a 50% fft overlap. These same parameters were in the PSD processing on the CDI data.

This information was then copied into an excel spread sheet. The spread sheet was formulated to reorders the data in the same format provided by CDI. These statistical data evaluations are done in the following files:

VY3RUN2
03/08/2005 06:39 PM 6,745,841 VY3RUN2Mic0and180andTopViewDataNumbers.txt
03/09/2005 07:10 AM 8,631,326 VY3RUN2Mic90TopViewDataNumbers.txt
03/09/2005 07:26 AM 8,627,051 VY3RUN2Mic270and180ViewDataNumbers.txt
03/13/2005 10:43 AM 6,060 PT_smt_psd_stats.m
03/13/2005 12:12 PM 1,571,328 reorderedPSDdataVY3RUN2.xls

VY6RUN2
03/13/2005 12:21 PM 6,752,882 VY6RUN2Mic0and180andTopViewDataNumbers.txt
03/13/2005 12:23 PM 8,651,592 VY6RUN2Mic90andTopViewDataNumbers.txt
03/13/2005 12:25 PM 8,650,645 VY6RUN2Mic270and180ViewDataNumbers.txt
03/13/2005 12:42 PM 6,060 PT_smt_psd_stats.m
03/13/2005 01:05 PM 665,088 reorderedPSDdataVY6RUN2.xls

VY12R1
03/13/2005 01:21 PM 6,752,985 VY12R1Mic0and180andTopViewDataNumbers.txt
03/13/2005 01:23 PM 8,645,481 VY12R1Mic90andTopViewDataNumbers.txt
03/13/2005 01:25 PM 8,643,308 VY12R1Mic270and180ViewDataNumbers.txt
03/13/2005 01:38 PM 6,059 PT_smt_psd_stats.m
03/13/2005 01:44 PM 665,088 reorderedPSDdataVY12R1.xls

VY13R1
03/13/2005 01:47 PM 6,724,177 VY13R1Mic0and180andTopViewDataNumbers.txt
03/13/2005 01:49 PM 8,565,086 VY13R1Mic90andTopViewDataNumbers.txt
03/13/2005 01:51 PM 8,562,186 VY13R1Mic270and180ViewDataNumbers.txt
03/13/2005 02:01 PM 6,059 PT_smt_psd_stats.m
03/13/2005 02:03 PM 665,088 reorderedPSDdataVY13R1.xls

The final step was to perform the same Matlab assessment that was use in for the SMT data assessment. One Matlab run was performed for all 21 sets of CDI predicted Mic locations. The time history txt files included in this directory are the same files provided by CDI with one change, the first header line was removed for Matlab processing. The resulting Matlab data was then pasted in an Excel file, the SMT data from the corresponding excel file above was also added and comparison charts were made. Each of these assessments was completed in the following files:

Comparison VY3RUN2

03/27/2005	05:14 AM	2,089,472	CompareVY3RUN2plusminus.xls
03/27/2005	05:43 AM	1,622,016	CompareVY3RUN2R1.xls
03/26/2005	01:56 PM	6,040	PT_smt_psd_stats.m
03/10/2005	06:52 PM	11,903,262	vy3time.txt

Comparison VY6RUN2

03/27/2005	06:05 AM	6,040	PT_smt_psd_stats.m
03/13/2005	12:51 PM	11,127,754	vy6time.txt
03/24/2005	10:05 AM	1,285,120	CompareVY6RUN2.xls
03/27/2005	05:49 AM	1,614,336	CompareVY6RUN2R1.xls
03/27/2005	06:15 AM	2,082,304	CompareVY6RUN2plusminus.xls
03/29/2005	08:52 AM	802,304	Compare Pipe data and Mic 16.xls

Comparison VY12R1

03/27/2005	06:24 AM	6,039	Comparison VY12R1
03/13/2005	01:09 PM	11,083,000	vy12time.txt
03/24/2005	09:47 AM	1,282,048	CompareVY12R1.xls
03/27/2005	05:42 AM	1,614,336	CompareVY12R1R1.xls
03/27/2005	07:07 AM	6,041	PT_smt_psd_stats.m
03/27/2005	01:55 PM	2,362,880	CompareVY12R1plusminus.xls

Comparison VY13R1

03/27/2005	08:06 AM	6,034	PT_smt_psd_stats.m
03/13/2005	02:07 PM	11,951,031	vy13time.txt
03/24/2005	10:05 AM	1,322,496	CompareVY13R1.xls
03/27/2005	08:18 AM	1,616,384	CompareVY13R1R1.xls
03/27/2005	08:18 AM	2,396,160	CompareVY13R1plusminus.xls

Comparison VY6RUN2 refined mesh

03/13/2005	12:53 PM	6,033	PT_smt_psd_stats.m
03/14/2005	03:20 PM	11,137,303	vy6time.txt
03/14/2005	03:35 PM	1,238,016	CompareVY6RUN2refinedmesh.xls

Comparison VY13R1 refined mesh

03/13/2005	02:09 PM	6,034	PT_smt_psd_stats.m
03/14/2005	03:40 PM	11,865,008	vy13time.txt
03/14/2005	03:38 PM	1,275,392	CompareVY13R1refinedmesh.xls

Appendix J – Technical Review Comments And Resolution Form

Entergy	ENN Site Applicability: ☐ IP1 ☐ IP2 ☐ IP3 ☐ JAF ☐ PNPS ☒ VY Engineering Report Technical Review Comments and Resolutions Form			
Engineering Report Number: VY-RPT-05-00006	Rev. 0	Title **Acoustic Model Benchmark Dryer Acoustic Loads**		
Quality Related: ☐ Yes ☒ No	**Special Notes or Instructions: None.**			
Comment Number	Section/ Page No.	Review Comment	Response/Resolution	Responsible Engineer's Accept Initials
1	**3**	**See attachment Comment 1**	**1. Incorporated**	**EJB**
2	**8**	**270 CFM should be 81 CFM**	**2. Corrected**	**EJB**
3	**16**	**See attachment Comment 3**	**3. Added Footnote**	**EJB**
4	**Various**	**Minor editorial comments**	**4. Incorporated**	**EJB**
Reviewed/ Verified By:	Pedro B. Pérez	Date: 3-29-2205		
Site/Department:	VYNPS/Design Engineering, Fluid Systems	Phone: 802-451-3118		

Entergy	ENN Site Applicability: ☐ IP1 ☐ IP2 ☐ IP3 ☐ JAF ☐ PNPS ☒ VY Engineering Report Technical Review Comments and Resolutions Form		
Engineering Report Number:	VY-RPT-05-0006	Rev. 0	Title **Acoustic Model Benchmark Dryer Acoustic Loads**
Quality Related: ☐ Yes ☒ No		**Special Notes or Instructions: None**	

Comment 1:

Change the last paragraph in the summary to read as follows:

The benchmark results provide the justification and guidance for applying the CDI acoustic circuit methodology in predicting the VYNPS dryer loads.

Comment 3:

The ± 10% is really not part of the benchmark. It was performed post benchmark to provide an enveloping spectrum. Please provide an introductory comment on Page 16 to avoid confusion over the scope of the actual benchmark.

Reviewer Closing Comment:

The reviewer utilized the Appendix I road map and fully followed the comprehensive process for VY3RUN2. All Matlab script files (M files) where checked as well as the data for the other cases. In addition a consultant, Dr. Charles W. Mayo, provided technical comments throughout the benchmark effort that have been incorporated in this report.

ATTACHMENT 3

Vermont Yankee Nuclear Power Station

Technical Specification Proposed Change No. 263 – Supplement No. 27

Extended Power Uprate - Dryer Acoustic Load Methodology Benchmark

VY-RPT-05-00006
VYNPS Acoustic Model Benchmark- Dryer Acoustic Load Methodology

Affidavit

Total number of pages in Attachment 3 (excluding this cover sheet) is 3.

General Electric Company

AFFIDAVIT

I, George B. Stramback, state as follows:

(1) I am Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Entergy Northeast Nuclear Engineering Report and Attachments, VY-RPT-05-00006, *Acoustic Model Benchmark Dryer Acoustic Load Methodology*, (This Report Contains GE Proprietary Information), dated March 29, 2005. The proprietary information is delineated by a double underline inside double square brackets. In Appendixes A through H, the entirety of each page is proprietary. Therefore, the header of each page in those Appendixes carries the notation "GE Proprietary Information{3}." In each case, the superscript notation{3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.790(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic 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 reveals aspects of past, present, or future General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

d. 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 (4)a., and (4)b, above.

(5) To address 10 CFR 2.790 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains GE's benchmarking details for analysis of the design of the BWR Steam Dryer. Development of this information and its application for the design, procurement and analyses methodologies and processes for the Steam Dryer Program was achieved at a significant cost to GE, on the order of approximately two million dollars.

This information also supports NEDC-33090P, *Safety Analysis Report for Vermont Yankee Nuclear Power Station Constant Pressure Power Uprate,* Class III (GE Proprietary Information), Revision 0, dated September 2003, which was submitted to the NRC. This power uprate report contains detailed results and conclusions from evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability for the power uprate of a GE BWR, utilizing analytical models, methods and processes, including computer codes, which GE has developed, obtained NRC approval of and applied to perform evaluations of the transient and accident events in the GE Boiling Water Reactor ("BWR"). The development and approval of these system, component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

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

Executed on this 3rd day of April 2005.

George B. Stramback
General Electric Company

ATTACHMENT 4

Vermont Yankee Nuclear Power Station

Technical Specification Proposed Change No. 263 – Supplement No. 27

Extended Power Uprate - Dryer Acoustic Load Methodology Benchmark

BVY 05-034, Attachment 5

Replacement General Electric Company Affidavit

Total number of pages in Attachment 4 (excluding this cover sheet) is 3.

General Electric Company

AFFIDAVIT

I, George B. Stramback, state as follows:

(1) I am Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in the GE proprietary report, GE-NE-0000-0038-0936, *Vermont Yankee Nuclear Power Station Modified Steam Dryer Stress Analysis,* Class III (GE Proprietary Information), dated March 2005. The proprietary information is delineated by a double underline inside double square brackets. Figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation{3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.790(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic 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 reveals aspects of past, present, or future General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

d. 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 (4)a., and (4)b, above.

(5) To address 10 CFR 2.790 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

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(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed information about the steam dryer stress analysis in support of NEDC-33090P, *Safety Analysis Report for Vermont Yankee Nuclear Power Station Constant Pressure Power Uprate,* Class III (GE Proprietary Information), Revision 0, dated September 2003, which was submitted to the NRC. This power uprate report contains detailed results and conclusions from evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability for the power uprate of a GE BWR, utilizing analytical models, methods and processes, including computer codes, which GE has developed, obtained NRC approval of and applied to perform evaluations of the transient and accident events in the GE Boiling Water Reactor ("BWR"). The development and approval of these system, component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of

the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

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

Executed on this 30th day of March 2005.

George B. Stramback
George B. Stramback
General Electric Company