



NON-PROPRIETARY

TENNESSEE VALLEY AUTHORITY BROWNS FERRY NUCLEAR PLANT

Dryer RAI Responses

December 10, 2007

Agenda



- Opening Remarks J. Emens
- Objectives R. Marks
- RAI Discussion K. Spates/ J Wolcott
 - RAIs for which TVA seeks clarification
 - RAIs for which TVA proposes an audit
 - RAIs which do not require clarification
 - RAIs common to Hope Creek
- Closing Remarks J. Emens



Objectives

- TVA's goal with RAIs is to "Get it Right the First Time"
 - Ensure questions are completely understood – do not want to make assumptions
 - Identify if additional information is expected or required
 - Ensure alignment on intended responses
 - Optimize use of staff resources
 - If we do our job well, follow up RAIs will be minimized

Clarification/Discussion Required: 130/97(a)



130/97 “...Provide the following information (a) analyses or test reports which explain the nature of the 218 Hz tones, along with the proposed changes to the standpipes and a demonstration that the changes will eliminate the tones”

- Strain Gage Data Units 1 and 2 – 218 Hz
- Accelerometer Data Units 1, 2 and 3 – 219-220 Hz
- Resonant Frequency and Vortex Shedding
- AVS Design
- 11/21/07 RAI Response

Clarification/Discussion Required: 133/100



133/100 “Identify the differences in the design and fabrication of Unit 1,2 and 3 steam dryers including modifications. Also identify the differences in the steam systems for these three units including the number of safety relief valves, blind flanges and elbows, their locations and acoustic resonance frequencies. Also identify the dead-ended branches that may be present in each unit and the associated acoustic resonance frequencies. Additionally specify whether verification of the as-built configuration was conducted or is the information based on original design drawings”

- One unique analysis to be performed for each unit
- No similarity arguments will be used
- U1 dryer analyzed to current configuration; i.e., with mods performed prior to restart as described in CDI 07-05P
- U2 & U3 dryers analyzed for current configuration + tie bar mods as described in CDI 07-06P
- Each dryer analyzed with unit-specific load
- Provided MSL geometrical comparison in response to RAI 125/92
- Dead leg resonant frequencies have been calculated.

Clarification/Discussion Required:134/101



134/101 “Describe the operating experience for each of the three units, especially the experience related to any fatigue cracking. The description should demonstrate that the frequency based approach used for the stress analysis of the steam dryer is consistent with the fatigue cracking experience. (Address whether the frequency-based approach shows peak stress locations in regions where cracking occurred)”

- Drain channel to skirt weld cracking occurred in all 3 units at OLTP
- Welds reinforced prior to restarts in 1990, 1995, & 2007.
- Will use CDI frequency analysis of U2/U3 with 218 Hz retained to define stresses in critical areas
- Will adjust stresses to account for weld configuration when cracking occurred
- Assess adjusted stresses vs. endurance limit

Clarification/Discussion Required: 146/113,
139/106, 140/107, 147/114, 148/115



Proprietary Information Deleted

Clarification/Discussion Required: 168/134, 169/135



168/134 “Compare the revised Unit 1 U limit curves to those for Hope Creek. Also, compare the Unit 1 limit curves to those of QC2 at EPU conditions prior to the installation of acoustic side branches (ASBs) on the SRVS”

169/135 “ Compare the Units 2 and 3 limit curves to those for Hope Creek. Also, compare the BFN Unit 1 and Unit 3 limit curves to those of QC2 at EPU conditions prior to the installation of acoustic side branches (ASBs) on the SRVS”

- Submittal of Data from Other Plants
 - Access
 - Proprietary Information
 - Suitability for Comparison

- Provide BFN Information to Assist NRC Staff with Meaningful Comparison



Clarification/Discussion Required: 129/96, 135/102

129/96 – Presence of 120 Hz tone indicated; a) expected on U2 and U3? Analyze MSL and valve specs, analyze potential resonances b) Discuss how TVA will address appearance of any tone which will challenge dryer stress limits c Explain how CDI differentiates electrical noise from actual tones.

135/102 Show that acoustic pressure associated with 120 Hz frequency will be doubled as power is increased from CLTP to EPU. Include this doubling of the acoustic pressure associated with 120 Hz and estimate the minimum alternating stress ratio at EPU.

- No 120 Hz range pressure tone seen at CLTP on U1 or U2, although predicted by previous scale model tests
- Vibration data shows 218 Hz response, but no 120 Hz
- Could double 120 Hz content at CLTP, but very little content there
- Differentiation of electrical noise straight-forward
- Evaluating potential ways to answer 129/196 (a) & (b):
 - Further analysis
 - 1/5th scale model testing - proceeding

RAIs for which TVA proposes an audit



- RAIs associated with CDI report 07-11P, *Dynamics of BWR Steam Dryer Components, Rev 0*. are all proprietary
- RAIs in question: 158/125, 159/126, 160/127, 161/127, 162/128, 163/129, 164/130, 165/131
- Propose that a separate audit be conducted at CDI to:
 - Provide a more open, less formal arena for exchange of information
 - Allow greater vendor and consultant participation
 - Facilitate transfer of information which is sensitive due to the highly proprietary nature of the material
 - Provide ready access to all supporting CDI information, methodology and personnel
- Proposed date for audit – week of January 14th



RAIs Requiring no Further Clarification

TVA RAI Number	Summary of Issue
130/97 (b), (c)	Provide revised stress analysis and limit curves for U3
131/98	Provide power ascension plans for Units 1,2,3
132/99	Provide MPR 3 rd party review with comment resolutions
136/103	Provide derivation of equation in report 07-05P
137/104	Explain computational strategies in report 07-05P, include why 1500 psi threshold used
138/105	Explain methodology in more detail in report 07-05P
141/108	Provide U1 stress calculations using U1 data
149/116	Validate U1 alternating stress ratios are higher than U2/U3 due to modifications on U1
157/124	Explain why smaller uncertainty values used for BFN than HC
166/132	Validate whether the variation in MSL wall thickness is taken into account
167/133	Submit U1 load limit curves based on U1 data



RAIs common with Hope Creek

TVA RAI Number	Hope Creek RAI Number	Summary of Issue
142/109	14.110	Validation of Frequency Based Approach
143/110	14.79	Adequacy of mesh spacing and dimensions
144/111	14.66	Uncertainty and bias
145/112	14.121	Explain 5 Hz intervals
150/117	14.111	Explain disparities in source strengths
151/118	14.113	Explain dipole orientation
152/119	14.114	Explain and validate pressure fluctuation equations
153/120	14.115	Compare parameters and values used in ACM Rev 4 vs ACM Rev 2
154/121	14.116	Explain noise removal methods
155/122	14.118	Validate ACM Rev 4 methodology against additional dryer data
156/123	14.119	Provide model parameter details and dipole source characteristics



RAIs common with Hope Creek

- TVA intends to submit the same responses as Hope Creek under TVA docket number
- All responses to be validated and independently reviewed; do not expect any changes
- RAI 144.111 associated with bias and uncertainty of the model is associated with Hope Creek Dryer “shake” test. TVA will review the results of Hope Creek test.

Closing Remarks



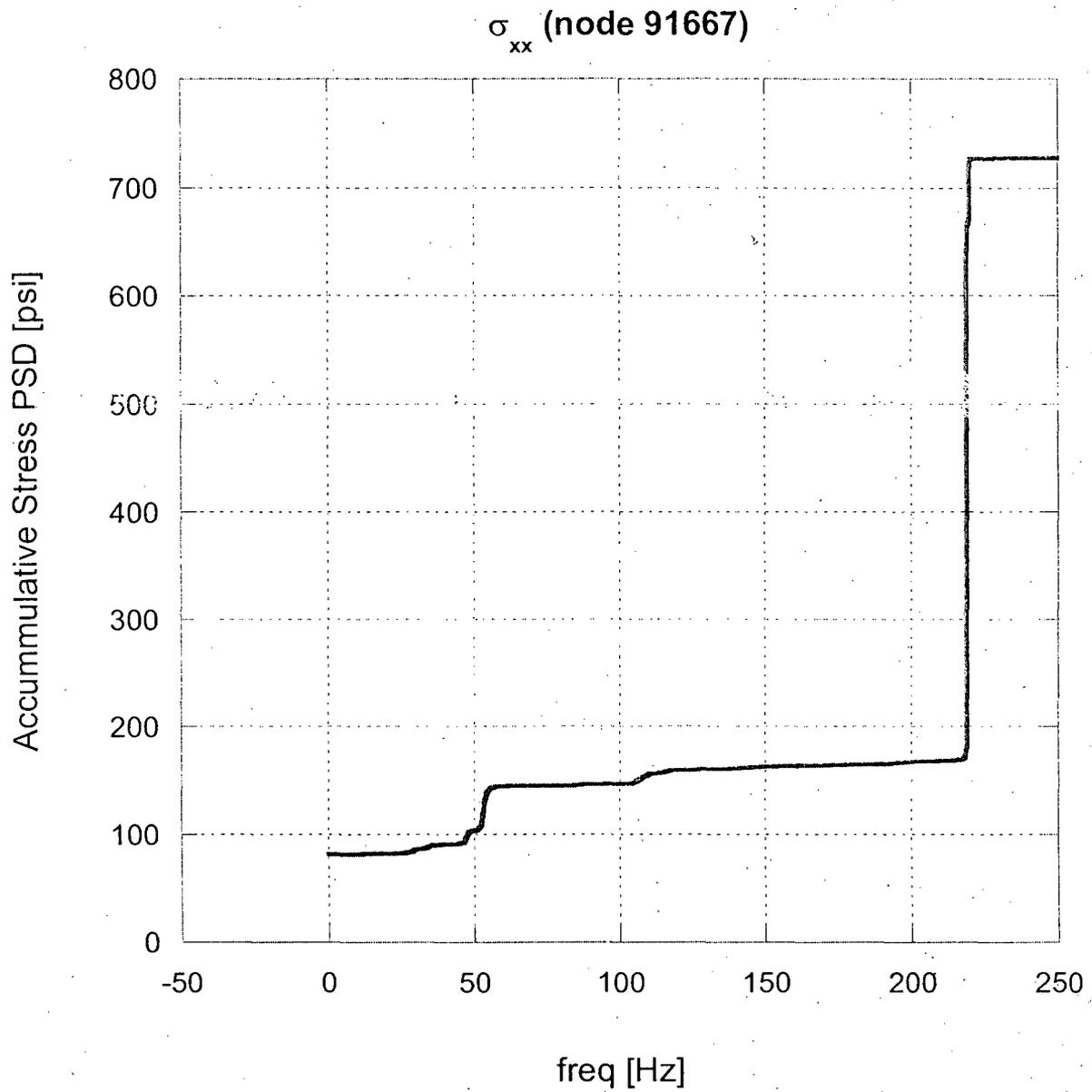


Figure 19. Accumulative PSD of the σ_{xx} stress response at node 91667 for nominal CLTP operation.

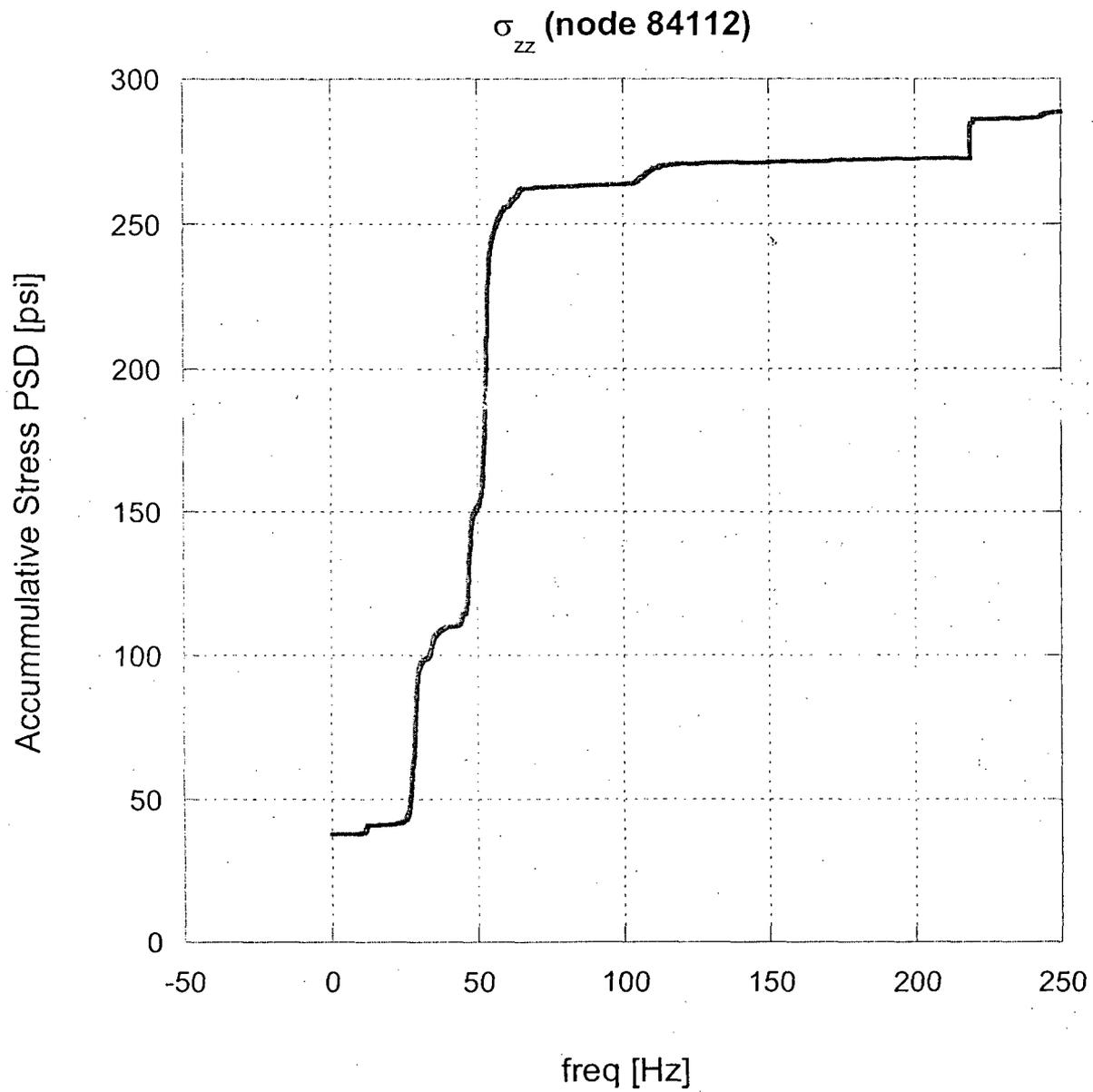


Figure 20. Accumulative PSD of the σ_{zz} stress response at node 84112 for nominal CLTP operation.