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May 16, 2011
U7-C-NINA-NRC-110069

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Flow Induced Vibration - Closure of Actions

Following the October 2010 NRC Audit of the South Texas Project (STP) 3&4 Flow Induced Vibration (FIV) program, the NRC Staff requested documentation of the closure of the future actions referenced in the responses to several Request for Additional Information (RAI) to support the review of the Combined License Application (COLA) Section 3.9. The attachment to this letter documents Nuclear Innovation North America LLC (NINA) closure of future actions for the following RAIs:

RAI 03.09.02-17	RAI 03.09.02-25	RAI 03.09.02-34
RAI 03.09.02-18	RAI 03.09.02-26	RAI 03.09.02-35
RAI 03.09.02-19	RAI 03.09.02-29	RAI 03.09.02-37
RAI 03.09.02-20	RAI 03.09.02-30	RAI 03.09.02-38
RAI 03.09.02-21	RAI 03.09.02-32	RAI 03.09.02-43
RAI 03.09.02-24	RAI 03.09.02-33	

The action discussed in the response to RAI 03.09.02-49 remains open pending the completion of analyses and submittal of revised reports related to the steam dryer assessment. Completion of RAI 03.09.02-49 will be documented at that time. The attachment to this letter contains no proprietary information.

There are no commitments in this letter.

If you have any questions regarding these responses, please contact me at (361) 972-7136 or Bill Mookhoek at (361) 972-7274.

D091
NRO

STI 32858104

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 5/16/11

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

jep

Attachment: Closure of Actions

cc: w/o attachment except*
(paper copy)

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Closure of Actions to Support the Review of COLA Section 3.9.2

RAI 03.09.02-17

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100236, dated October 25, 2010. The response to RAI 03.09.02-17 states in part: "A revision of Calculation Note CN-SEE-II-10-15, "STP 3 Flow Induced Vibration Analysis" is currently scheduled to be available for NRC review by November 10, 2010." The future actions delineated in that response have been completed as follows.

Calculation Note CN-SEE-II-10-15, Revision 1, includes the corrected approach velocity values in Tables 4.6.5-1 and 4.6.5-2.

RAI 03.09.02-18

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100236, dated October 25, 2010. The response to RAI 03.09.02-18 states in part: "A revision of Calculation Note CN-SEE-II-10-15, "STP 3 Flow Induced Vibration Analysis" is currently scheduled to be available for NRC review by November 10, 2010." The future actions delineated in that response have been completed as follows.

Calculation Note CN-SEE-II-10-15, Revision 1, correctly references section 4.3.1 for the use of Mulcahy's method for estimating steam separator turbulent buffeting loads.

RAI 03.09.02-19

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100236, dated October 25, 2010. The response to RAI 03.09.02-19 states in part: "Flow induced vibration related to galloping will be addressed in the stress analysis report for the RIP guide rail and is currently scheduled to be available for NRC review by November 10, 2010." The future actions delineated in that response have been completed as follows.

Calculation Note CN-SEE-II-10-15, Revision 1, addresses flow induced vibration related to galloping for the RIP guide rail.

RAI 03.09.02-20

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The response to RAI 03.09.02-20 states in part: "This change, to use the CRD velocities in the recalculation of the forcing functions, will be reflected in a revision of Calculation Note CN-SEE-II-10-15, "STP 3 Flow Induced Vibration Analysis," which will be available for review by November 30, 2010." The future actions delineated in that response have been completed as follows.

Calculation Note CN-SEE-II-10-15, Revision 1, updates the flow velocities in the lower plenum with the CFD values (Appendix A.6).

RAI 03.09.02-21

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100236, dated October 25, 2010. The response to RAI 03.09.02-21 states in part: "A discussion of these ACSTIC code validations will be added to WCAP-17287-P, "South Texas Project 3, ABWR Pump-Induced Pulsation Analysis" which is currently scheduled to be available for NRC review by November 10, 2010." The future actions delineated in that response have been resolved as follows.

Following the review of the original response, the NRC required that the code be included in the STP 3&4 COLA. A revised response to this RAI was submitted via NINA letter U7-C-NINA-NRC-110064, dated April 13, 2011. The revised response states in part: "The STP 3&4 COLA will be revised to include the ACSTIC computer code in the list of computer codes used for evaluation of reactor internals." The revised response further states: "Therefore the revision to incorporate the ACSTIC computer into the COLA will be made to Appendix 3D and Subsection 4.1.4.1." The revised response also includes the validation discussion and the COLA markups.

RAI 03.09.02-24

A revised response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100246, dated November 4, 2010. The response to RAI 03.09.02-24 states in part: "Toshiba Document 7B11-D001-3809-01, "CFD Analysis Report for Lower Plenum," will be revised to address grid refinement analysis and is currently scheduled to be available for NRC review by November 10, 2010." The future actions delineated in that response have been completed as follows.

Toshiba Document 7B11-D001-3809-01, Revision 1, addresses the grid refinement analysis, sensitivity analysis results, and validation of the lower plenum portion of the CFD model. These changes are included in Section 5.4, Discussion of Bias Errors and Uncertainties, Section 5.5, Validation of the CFD Model, Appendix D, Grid-spacing and Inlet Turbulence

Quantities Sensitivity Study, and Appendix E, Comparison of Analyzed Velocity Distribution with Test Data.

RAI 03.09.02-25

A revised response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100246, dated November 4, 2010. The response to RAI 03.09.02-25 states in part: "Toshiba Document 7B11-D001-3809-01, "CFD Analysis Report for Lower Plenum," will be revised to address the sensitivity analyses results and is currently scheduled to be available for NRC review by November 10, 2010." The future actions delineated in that response have been completed as follows.

Toshiba Document 7B11-D001-3809-01, Revision 1, addresses the grid refinement analysis, sensitivity analysis results, and validation of the lower plenum portion of the CFD model. These changes are included in Section 5.4, Discussion of Bias Errors and Uncertainties, Section 5.5, Validation of the CFD Model Appendix D, Grid-spacing and Inlet Turbulence Quantities Sensitivity Study, and Appendix E, Comparison of Analyzed Velocity Distribution with Test Data.

RAI 03.09.02-26

A revised response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100246, dated November 4, 2010. The response to RAI 03.09.02-26 states in part: "Toshiba Document 7B11-D001-3809-01, "CFD Analysis Report for Lower Plenum" will be revised to address the validation of the lower plenum portion of the CFD model and is currently scheduled to be available for NRC review by November 10, 2010." The future actions delineated in that response have been completed as follows.

Toshiba Document 7B11-D001-3809-01, Revision 1, addresses the grid refinement analysis, sensitivity analysis results, and validation of the lower plenum portion of the CFD model. These changes have been included in Section 5.4, Discussion of Bias Errors and Uncertainties, Section 5.5, Validation of the CFD Model Appendix D, Grid-spacing and Inlet Turbulence Quantities Sensitivity Study, and Appendix E, Comparison of Analyzed Velocity Distribution with Test Data.

RAI 03.09.02-29

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The response to RAI 03.09.02-29 states: "STPNOC will analyze all components to determine the one with the highest dynamic stress. For example, all control rod guide tubes (CRGT) will be analyzed to determine the CRGT with the highest dynamic stress. This approach will also be taken for the control rod drive housings (CRDH), in-core monitor guide tubes (ICGT) and in-core monitor housings

(ICMH). This information will be described in the stress analysis report." The future actions delineated in that response have been completed as follows.

Toshiba Document Number 7B11-D001-3809-02, Revision 1, includes a description of the analyses of these components to determine which have the highest dynamic stress.

RAI 03.09.02-30

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The response to RAI 03.09.02-30 states in part: "The document XGEN-2010-03 will be revised to incorporate this correction and will be available for review by November 30, 2010." The future actions delineated in that response have been completed as follows.

The document XGEN-2010-03 contained a typographical error. The second criterion in Section 4.3 of XGEN-2010-03, Revision 1, corrects this criterion to be "($f_1/f_s > 3$)" as the criterion to limit FIV amplification. A frequency ratio (f_1/f_s) greater than 3 limits dynamic amplification to 20%.

RAI 03.09.02-32

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The future actions delineated in that response have been completed as follows.

The response to RAI 03.09.02-32 states:

> "The effects of individual biases and uncertainties will be evaluated for each of the calculations involved in the prediction of the structural responses and stresses. The following areas will be covered:
>
> 1. The principal operating parameters that define the three Analysis Cases,
> 2. The forcing function correlations and selection of local velocities for evaluating the forcing functions,
> 3. Grid size and boundary conditions for the computational fluid dynamics (CFD) modeling of the lower plenum flow distributions,
> 4. Structural analysis assumptions including boundary conditions, and
> 5. Damping, pump phasing and wavelength uncertainties in the pump pulsation analysis.
>
> The above effects will be addressed in the individual calculations, either quantitatively where possible, or qualitatively if necessary. In addition, a plan will be

developed and included in the comprehensive vibration assessment program (CVAP) report that covers:

1. Measurement biases and uncertainties associated with the CVAP instrumentation and data acquisition system,
2. Scaling from calculation points to measurement points on the structures,
3. The end-to-end combination of individual biases and uncertainties on responses and the method for combining the biases and uncertainties.

An additional section dealing with uncertainties will be incorporated in the stress analysis reports."

The future actions delineated in that response have been completed as follows.

The evaluation of the effects of the biases and uncertainties in the analyses of the internals components are addressed in the CVAP reports as noted below, and the supporting calculations that are referenced in those reports.

The treatment of biases and uncertainties associated with the principal operating parameters that define the three Analysis Cases is discussed in WCAP-17371-P, Rev. 0. The biases and uncertainties associated with the forcing function correlations and selection of local velocities for evaluating the forcing functions are included in WCAP-17256-P, Rev. 1, and WCAP-17371-P, Rev. 0. A discussion of the biases and uncertainties associated with the CFD modeling of the lower plenum flow distributions is presented in WCAP-17371-P, Rev. 0. Biases and uncertainties associated with structural analysis assumptions, including boundary conditions, are discussed in WCAP-17256-P, Rev. 1, WCAP-17371-P, Rev. 0, and WCAP-17385-P, Rev. 1. Biases and uncertainties associated with damping, pump phasing, and wavelength uncertainties in the pump pulsation analysis are presented in WCAP-17371-P, Rev. 0.

In addition, the CVAP addresses the following: measurement biases and uncertainties associated with the CVAP instrumentation and data acquisition system (WCAP-17370-P, Rev. 0), and scaling from calculation points to measurement points on the structures (WCAP-17385-P, Rev. 1). Biases and uncertainties are addressed in each step of the analysis (e.g., modeling, modal damping, forcing functions); therefore, the cumulative effect of all biases and uncertainties are included in the final analysis results.

RAI 03.09.02-33

A revised response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100246, dated November 4, 2010. The response to RAI 03.09.02-33 states: "The calculation SES 10-161, Rev. 0, "RG 1.20 Assessment for Natural Frequencies & Mode Shapes for CP DP lines & RIP DP lines," will be revised to document the installation procedure as provided in this response, and the revised calculation is currently scheduled to

be available for NRC review by November 30, 2010." The future actions delineated in that response have been completed as follows.

Calculation SES 10-237, Revision 1, documents the installation procedure for the CP DP lines and the RIP DP lines.

RAI 03.09.02-34

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The response to RAI 03.09.02-34 states in part: "The calculation note will be revised and will justify the boundary conditions." The future actions delineated in that response have been completed as follows.

Sections 3.1, 3.2, and 5.2 of Calculation SES 10-162, Revision 1, include justification of the boundary conditions for the pin and the stop.

RAI 03.09.02-35

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The response to RAI 03.09.02-35 states in part: "The calculation will be revised to include a modal analysis without any support at the lower bracket in the modal analysis report. The report will be available for review by November 30, 2010." The future actions delineated in that response have been completed as follows.

Calculation SES 10-164, Revision 1, includes a modal analysis of the guide rods without any support at the lower bracket.

RAI 03.09.02-37

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The response to RAI 03.09.02-37 states in part: "The detailed stress analysis will account for density variation." The future actions delineated in that response have been completed as follows.

Calculation SES 10-165, Revision 1, addresses fluid density variation.

RAI 03.09.02-38

A revised response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100246, dated November 4, 2010. The response to RAI 03.09.02-38 states in part: "The need for a measurement plan for the shroud head structure has not yet been determined. This will be determined based on the results of the final stress analysis, which is currently scheduled to be completed by November 10, 2010. NRC will be informed as to whether a measurement plan is needed in a supplementary response to this RAI by November 30, 2010." The future actions delineated in that response have been completed as follows.

The measurement plan for the shroud head structure, as well as the rest of the reactor internals structures, is documented in WCAP-17370-P, Revision 0, "South Texas Project Unit 3 Comprehensive Vibration Assessment Program Measurement, Test, and Inspection Plan," which has been submitted to the NRC via NINA letter U7-C-NINA-NRC-110016, dated February 23, 2011.

RAI 03.09.02-43

The original response to this RAI was submitted with STPNOC Letter U7-C-STP-NRC-100229, dated October 18, 2010. The response to RAI 03.09.02-43 states in part: "Additional clarification will be included in the final calculation which will be available for review by November 30, 2010." The future actions delineated in that response have been completed as follows.

Document 7B11-D001-3809-03, Revision 1, includes additional clarification of the treatment of the 7th and 8th mode shapes.