PMSTPCOL PEmails

From: Tai, Tom
Sent: Friday, January 07, 2011 8:37 AM
To: 'Price, John E'
Cc: STPCOL
Subject: STP - Draft RAI 5343 for Ch 3.9.2
Attachments: RAI 5343 03.09.02-xx.doc

John,

Attached for your information is a draft of RAI 5343 issued for Chapter 3.9.2. These are issues we identified in the audit.

Please let me know if we need a telephone conference to clarify. We can piggy-back the Wednesday OI call.

Regards

Tom Tai
DNRL/NRO
(301) 415-8484
Tom.Tai@NRC.GOV

Hearing Identifier: SouthTexas34Public_EX
Email Number: 2674

Mail Envelope Properties (0A64B42AAA8FD4418CE1EB5240A6FED1248DDA9C34)

Subject: STP - Draft RAI 5343 for Ch 3.9.2
Sent Date: 1/7/2011 8:36:40 AM
Received Date: 1/7/2011 8:36:42 AM
From: Tai, Tom

Created By: Tom.Tai@nrc.gov

Recipients:
"STPCOL" <STP.COL@nrc.gov>
Tracking Status: None
'"Price, John E"' <jeprice@STPEGS.COM>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	341	1/7/2011 8:36:42 AM
RAI 5343 03.09.02-xx.doc	37882	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Request for Additional Information No. 5343 Revision 4

South Texas Project Units 3 and 4
South Texas Project Nuclear Operating Co
Docket No. 52-012 and 52-013
SRP Section: 03.09.02 - Dynamic Testing and Analysis of Systems Structures and Components
Application Section: 3.9.2

QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)

03.09.02-***

Table 5.4 of FIV Stress Analysis Report of the Control Rod Guide Tube and Control Rod Drive Housing (7B11-D001-3809-08) shows that two predicted strains in load case 4' are less than the K-6 measurement results (ratio of predicted strain/measurement strain of 0.85 and 0.73). Though a safety factor of 1.38 (1/0.73) is applied in the analysis to compensate the difference, the report neither explains why the analysis underestimated the results nor provides any evidence that this factor is not larger for other locations within the reactor. Please explain the difference and provide evidence that the safety factor is not exceeded for other CR Guide Tube and CRD Housing.

03.09.02-***

Tables 5.11 and 5.13 of FIV Stress Analysis Report of the High Pressure Core Flood Sparger and Coupling (7B11-D001-3809-10) shows that several predicted strains under turbulent buffeting and pump pulsation loads are less than the K-6 measurement results (ratio of predicted strain/measurement strain of 0.28, 0.35, and 0.74). Please provide the explanation why the analysis underestimated the results. Also provide explanation why there is no safety factor applied in the analysis to compensate the difference.

03.09.02-***

An open item in Section 2.2 of the FIV Stress Analysis Report of the Shroud (7B11-D001-3809-11) states that the calculation is based on the load definitions in the CN-SEE-II-10-15, Rev. 0. During the audit, the applicant stated that the load definitions of the shroud have been updated. Please provide the impact or the results based on the new load on the fatigue usage of the shroud.

03.09.02-***

In Calculation Note CN-A&SA-10-48, the STP steam dryer modal analysis is compared with the K-6 hammer test results. In general, the calculated natural frequencies of the key dryer components agree well (within 10 percent) with the K6 hammer test, except the lowest mode of the outer hood which differs by 21percent compared to the K-6 results (64.7 Hz of modal analysis vs. 82 Hz of K-6 results). During the audit, the applicant re-examined the frequency spectra obtained from the hammer tests of the K-6

dryer and found a frequency close to the analytical result of 64.7 Hz. Therefore, STP is requested to:

(a) review the frequency spectra obtained from the hammer tests of all other components of the dryer to ensure that no other resonance frequencies are overlooked from the hammer tests of the K-6 dryer.

(b) update the STP modal analysis report CN-A&SA-10-38.

03.09.02-***

During the audit, STP presented sample pressure spectra measured on the sub-scale steam dryer. STP suggested that these pressure measurements can be scaled up to the full scale reactor size and operating conditions and then used to estimate the design dynamic loading on the dryer. After reviewing these sample pressure spectra, the NRC staff concluded that most of the pressure spectra measured on the sub-scale dryer do not exemplify the spectral characteristics of the pressure fluctuations measured on the K-6 dryer. Therefore, the staff advised STP that the use of pressure measurements from the sub-scale tests to estimate the STP dryer design load at full power level cannot be approved by the staff. STP was further advised to propose an alternative approach to demonstrate that the steam dryer can be operated safely at the planned maximum power level. In response, STP suggested the following alternative approach:

1. Comprehensive industrial experiences on ABWR dryers will be collected and submitted to NRC for review. The industrial experiences will be compiled for the K-6 and H-5 reactors in Japan because these reactors are “identical” to the STP dryer and have been in operation for several years at conditions similar to those of the STP dryer.

2. A “best estimate” design load for the STP dryer will be developed from compilation of the results obtained from:
   - 15 pressure transducers on the sub-scale dryer
   - 3 pressure transducers on the K-6 dryer
   - 7 strain gages on the K-6 dryer
   - 4 accelerometers on the K-6 dryer.
3. The “best estimate” design load will be used to design the dryer, but the dryer will be instrumented with pressure transducers, strain gages and accelerometers to monitor the alternating stresses during the start-up measuring program.

4. During the start-up measurement program, the reactor load will not be increased beyond an approved power level (around 60% CLTP) until pressure measurements on the actual dryer are obtained and used to update the dryer load, stress margins and limit curves. Further power increases would proceed only if the updated stress margins allow.

5. STP will provide a comprehensive report explaining the methodology which will be used to estimate the dynamic dryer load from pressure measurements on the dryer during the start-up test program. The report will include validation tests together with expected bias errors and uncertainties. The SMT will be used to validate the methodology of load definition.

6. STP will also submit a comprehensive report documenting the FE dynamic model of the dryer and the method which will be used to estimate the minimum

alternating stress ratio of the dryer at CLTP operating conditions. The report will include expected bias errors and uncertainties. In this report, the best estimate design load will be used to estimate the stress level of the dryer.

In order to confirm mutual understanding of the new approach being pursued by STP, the applicant is requested to:

(a) confirm that the above detailed approach will be followed, or update the NRC staff if any deviations from this approach are expected.

(b) submit comprehensive reports on: the industrial experiences of ABWRs; determination of the best estimate dryer load; validation of the procedure of load definition from pressure measurements on the dryer during start up tests; and FE stress analysis of the dryer based on the best estimate design load.

03.09.02-***

The pressure spectra measured on the sub-scale dryer are compared with corresponding spectra obtained from the K-6 ABWR in CDI Technical Note # 10-21P, “Loads predicted on the full scale STP dryer at 100 percent power, based on pressure transducer measurements on a subscale model” dated November 2010. The staff determined that some of the spectral peaks measured on the K-6 dryer were filtered out in this comparison. In particular, two peaks near 20 and 40 Hz were removed from the K-6 spectra at location P3. The amplitudes of these peaks exceed the SMT dryer pressure which will be used to calculate the best estimate design load of the dryer. CDI explained that these peaks are likely generated by dryer vibration, and not pressure oscillations, and therefore they were filtered out from the pressure spectra. The staff finds this explanation unconvincing and therefore, STP is requested to include these peaks in the best estimate design load of the dryer.