January 12, 2010

Mr. Scott Head, Manager
Regulatory Affairs
STP Nuclear Operating Company
P. O. Box 289
Wadsworth, TX 77483

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 371 RELATED TO SRP SECTION 3.9.2 FOR THE SOUTH TEXAS PROJECT COMBINED LICENSE APPLICATION

Dear Mr. Head:

By letter dated September 20, 2007, STP Nuclear Operating Company (STP) submitted for approval a combined license application pursuant to 10 CFR Part 52. The U. S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within **30** days of the date of this letter. If changes are needed to the safety analysis report, the staff requests that the RAI response include the proposed wording changes.

If you have any questions or comments concerning this matter, I can be reached at 301-415-8484 or by e-mail at Tom.Tai@nrc.gov or you may contact George Wunder at 301-415-1494 or George.Wunder@nrc.gov.

Sincerely,

/RA/

Tom M. Tai, Senior Project Manager
ABWR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-012
52-013

eRAI Tracking No. 5343

Enclosure:
Request for Additional Information

cc: William Mookhoek
John Price
Loree Elton

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OFFICE	EMB2/TR	EMB2/BC	BWR/PM	BWR/L-PM
NAME	YWong	JDHerrity	TTai	GWunder
DATE	12/27/2010	1/3/2011	1/12/11	1/7/2011

***Approval captured electronically in the electronic RAI system.**

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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)

03.09.02-45

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 actual plant 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.

03.09.02-46

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 actual plant 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.

03.09.02-47

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.

03.09.02-48

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

Enclosure

(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 dryer.

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

03.09.02-49

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 Japanese 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 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 Japanese dryer
   - 7 strain gages on the Japanese dryer
   - 4 accelerometers on the Japanese 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.

03.09.02-50

The pressure spectra measured on the sub-scale dryer are compared with corresponding spectra obtained from the Japanese 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 Japanese dryer were filtered out in this comparison. In particular, two peaks near 20 and 40 Hz were removed from the Japanese 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.