Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

January 28, 2010
U7-C-STP-NRC-100028

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Requests for Additional Information

References: (1) Letter, Mark McBurnett to Document Control Desk, "Response to Request for Additional Information", dated July 13, 2009, U7-C-STP-NRC-090073 (ML091950615).

(2) Letter, Scott Head to Document Control Desk, "Response to Request for Additional Information", dated December 21, 2009, U7-C-STP-NRC-090226 (ML093580193).

(3) Letter, Mark McBurnett to Document Control Desk, "Response to Requests for Additional Information", dated January 13, 2010, U7-C-STP-NRC-100007.

Attached are the supplementary responses to NRC staff questions included in Request for Additional Information (RAI) letter numbers 123, 232, and 236 related to Combined License Application (COLA) Part 2, Tier 2, Section 6.1 and Appendix 6C. The original responses to these RAIs were provided in references 1, 2, and 3. This completes the responses to letters 123. Attachments 1 through 3 provide the supplementary responses to the RAI questions listed below:

RAI 06.01.01-1
RAI 06.02.02-11
RAI 06.02.02-14

There are no commitments made in this letter.

Where COLA changes are indicated, they will be incorporated in the next routine COLA update following NRC acceptance of the response.

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

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

Executed on 1/28/2010

MAM McBurnett

Mark McBurnett
Vice-President, Oversight and Regulatory Affairs
South Texas Project Units 3 & 4

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Attachments:

1. Question 06.01.01-1 Supp
2. Question 06.02.02-11 Supp
3. Question 06.02.02-14 Supp

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

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RAI 06.01.01-1 Supp:

QUESTION:

ABWR DCD Table 6.1-1 does not provide materials specifications and grades for reactor building cooling water system heat exchangers, or reactor service water system pumps, valves or piping. The ABWR DCD contains a note that states that the above information is site specific. COL FSAR Section 6.1.1.1.1 states that materials to be used in the reactor building cooling water system heat exchanger and the reactor service water system pump and valves will be provided in the FSAR in accordance with 10 CFR 50.71(e) prior to the initiation of the respective unit preoperational testing. (COM 6.1-1) In order for the staff to complete its review, the staff requests that the applicant modify COL FSAR Table 6.1-1 to include materials specifications and grades for reactor building cooling water system heat exchangers and reactor service water system pumps, valves and piping and provide a technical basis for its selection of materials.

RESPONSE (Supp):

By letter U7-C-STP-NRC-090073 (ML091950615), dated July 13, 2009, STPNOC provided a response to RAI 06.01.01-1. The response provided the basis for selection of these site-specific materials and stated that selection of the site-specific materials to be used in the reactor building cooling water system (RCW) heat exchanger and the reactor service water system (RSW) piping, pump, and valves would be provided in a supplemental response to this RAI, by January 28, 2010.

This supplemental response provides the information described above and completes COM 6.1-1. Note that no material information is provided for the RCW Heat Exchanger tubes because a plate-and-frame type heat exchanger is being used, as allowed by DCD Subsection 9.2.11.2. There is no material information provided for two of the three RSW valve castings, since only one casting material will be used. Note that in the case of RSW pump and valves, three different grades of one casting material may be used.

COLA Revision 3, FSAR Subsection 6.1.1.1.1 and Table 6.1-1 will be changed to include selection of materials as shown below. For clarification, only those changes associated with the selection of site-dependent materials are identified in gray shading.

6.1.1.1.1 Material Specification

The following site-specific supplement addresses site-dependent information identified in the reference ABWR DCD Tier 2, Table 6.1-1.

Materials to be used in the Reactor Building Cooling Water System heat exchanger and the Reactor Service Water System pump, piping and valves are identified in FSAR Table 6.1-1. ~~will be provided in the FSAR in accordance with 10 CFR 50.71(e) prior to the initiation of the respective unit preoperational testing. (COM 6.1-1)~~

Table 6.1-1 Engineered Safety Features Component Materials*

Component	Form	Material	Specification (ASTM/ASME)
Reactor Building Cooling Water System			
Heat Exchanger†	Plate Tubes	Titanium†	SB-265 Gr 1†
Pump	Casting Casting	Carbon Steel Stainless Steel	SA-216 Gr WCC SA-351 Gr CF8
Valves	Casting Forging	Carbon Steel Carbon Steel	SA-216 Gr WCB SA-105
Piping	Seamless Pipe Welded Pipe	Carbon Steel Carbon Steel	SA-106 Gr A SA-672 Gr B60
Reactor Service Water System†			
Pump	Casting	Stainless Steel†	SA-351 Gr CF3M† SA-351 Gr CF8† SA-351 Gr CF8M†
Valves	Casting Casting Casting Forging	 Stainless Steel† Stainless Steel†	 SA-351 Gr CF3M† SA-351 Gr CF8† SA-351 Gr CF8M† SA-182 Gr F316L†
Piping	Seamless Pipe Welded Pipe	Stainless Steel† Stainless Steel†	SA-312 Gr TP316L† SA-358 Gr 316L†

* *Carbon content for wrought austenitic stainless steels will be limited to 0.020% for service temperatures above 93.3°C.*

† *Materials are site-dependent.*

RAI 06.02.02-11 Supp:

QUESTION:

The September 28, 2009, response to RAI 06.02.02-9 states that aluminum is prohibited from containment, but small quantities could be introduced during the lifetime of STP 3&4. Since aluminum may be present, please provide the following information:

a. Address the possibility that aluminum could be a necessary constituent of equipment located in the containment and exposed to the post-LOCA fluid. The response to RAI 06.02.02-9 suggests insulation and latent debris are the only potential sources of aluminum.
b. Describe your approach to ensure that the aluminum in containment, which will dissolve at a rate that depends on temperature and pH, is acceptable with respect to the ECCS performance. For example, you could limit the amount of aluminum in containment based on the amount of chemical debris that causes unacceptable head loss.
c. If a limit will be placed on the amount of aluminum allowed in the containment, provide the basis for that amount and show how that limit will be made part of the licensing basis of each plant (e.g., revisions to the FSAR).

RESPONSE (Supp):

In the original response to RAI 06.02.02-11 provided in STPNOC Letter No. U7-C-STP-NRC-090226, dated December 21, 2009, it was stated that STPNOC is performing a calculation of the maximum surface area of "latent" aluminum that could be in the suppression pool, corrode, and then dissolve over the 30-day post-LOCA period, and still remain in solution in the suppression pool (i.e. not form precipitates).

It was further noted in that response that a COLA change would be provided by January 29, 2010. The COLA change would include the maximum amount of latent aluminum determined by analysis to not precipitate out of the suppression pool solution.

The calculation is currently being performed to evaluate the post-LOCA chemical effects due to latent aluminum using the methodology developed in WCAP-16530-NP-A. This calculation will provide the expected amount of aluminum precipitate as a function of latent aluminum present in the suppression pool. The calculation will be completed and a supplemental response to this RAI will be provided by February 22, 2010. A COLA markup reflecting those results will also be included in that supplemental response.

There is no COLA markup required for this supplemental response.

RAI 06.02.02-14 Supp:

QUESTION:

This RAI supplements RAI 06.02.02-6.

The staff has reviewed The Evaluation Report for Net Positive Suction Head of Pump in Emergency Core Cooling System (ECCS) (Report 1), The Supplementary Document for the Head Loss Evaluation Report of Japanese ABWR ECCS Suction Strainer (Report 2), and The Evaluation example of the Head Loss of the ECCS Suction Strainer and Pipe in the ECCS Pump Run-Out Flow Condition (Report 3) which were submitted to support STP in showing they have a bounding head loss analysis. In accordance with 10 CFR 50.46(a)(1)(i) and Regulatory Guide 1.82 Revision 3, the NRC staff requests that the applicant provide the following information to assist the staff in completing their safety evaluation. According to Report 1 it appears that the Small Scale Test, which is reported on pages 10 and 11, is being used to determine correction coefficient for bed thickness (empirical shape factor) of a cassette shaped strainer. Report 2 also appears to explain that the Small Scale Test was used to determine the correction coefficient for bed thickness (empirical shape factor) and also the specific surface area used for the cassette-shaped strainer:

a.) The staff finds this to be confusing. The applicant should provide clarification for the use of the small scale testing and whether or not this testing is being used to not only determine the various parameters to be used in the theoretical head loss correlation, but also to determine empirical head loss data to be used in comparison of the theoretical calculation of head loss. Also provide information which describes what makes this small scale test conservative or prototypical.

b.) If STP is suggesting that the small scale testing used to show NPSH predicted under debris loading is conservative, the applicant should also provide clarification of why the four pocket vertical small scale test was chosen to be conservative or prototypical.

c.) The applicant provided in page 24 of Report 2 'Test Case' at the top of the page. The applicant did not distinguish if the three test cases are used to determine the theoretical correction parameters for the NUREG/CR-6224 correlation or if they were used to determine empirical head loss data to be used in comparison of the theoretical calculation of head loss. The applicant should distinguish the uses of these test cases and provide a description of what makes them prototypical or conservative with respect to the Reference Japanese ABWR plant scenario Loss of Coolant Accident (LOCA). The applicant should also provide detailed procedures along with a description of what makes the procedures conservative or prototypical with respect the Reference Japanese ABWR plant scenario LOCA. In addition:

i.) The applicant should provide detailed information along with the procedures explaining why the debris selection, (i.e. size and density), debris loading, and debris preparation (I.e. crushing or shredding) was chosen as conservative or prototypical.

ii.). The applicant should also address the conservativeness or prototypicality with respect to settling and approach velocity for the testing used to determine empirical head loss data.

iii.) The applicant should clarify how it determined the thin bed effect cases and discuss what guidance was used in determining the appropriateness of this being acceptable for a thin bed effect.

d.) The staff finds the reports to be difficult to follow. The staff and the members of the public need be able to understand the logic used to determine the methods selected and how the evaluation was performed. The applicant should be sure that the logic is clear throughout the reports.

RESPONSE (Supp):

The STPNOC response to RAI 06.02.02-14 (letter U7-C-STP-NRC-100007) answered the questions above, and committed (in the response to Item d) to provide the following items in supplemental responses:

- Submit proprietary and non-proprietary versions of Reports 1 and 2 by February 15, 2010.
- Provide a discussion, which will be included in the Report 2 revision, of the shape factor (fg) and the two types of small-scale testing. Additionally, provide a discussion of differences between confirmatory small-scale testing results and analytically predicted head loss.

This Supplemental Response provides the discussion described in the second bullet.

The following discussion will be added to page 12 of Report 2:

There are two types of small-scale testing used to design and qualify the ECCS strainers:

1. The first small-scale test is to determine the empirical shape factor for bed thickness of a cassette-shaped strainer, fg. (The analytical correlation of head loss due to debris given in NUREG/CR-6224 is based on a one-dimensional strainer and would therefore under-predict the head loss for a cassette-type strainer that has the same surface area.)

This initial head loss testing results in shape factors for a range of debris bed thicknesses, as shown in Figures 4-4 and 4-5 of Reference 1. These figures are used to select an appropriate shape factor for each ECCS strainer. Note that the shape factor is a function of debris bed thickness (which is a function of the size of the strainers), so a best estimate must be made of the expected final debris bed thickness so that the strainer can be sized to result in an acceptable head loss.

2. The second small-scale tests are to confirm that the analytical head losses for the final, as-designed strainers (for both RHR and HPCF) are conservative, and that the strainers are adequately sized. This confirmatory head loss testing uses conditions, including scaled quantities of debris, consistent with all the design conditions. See Attachment C (pages 23 through 25) for more discussion of the confirmatory testing.

The following discussion will be added after the figures on page 25 of Report 2:

In the figures above, the analytically determined head loss exceeds the head loss resulting from the confirmatory tests even though the shape factor (fg) was selected to account for the nonconservatism in the one-dimensional NUREG-6224 correlation (see page 10 of Reference 1). This is due to the following:

- As shown in Figures 4-4 and 4-5 of Reference 1, the shape factor (fg) used with the NUREG-6224 correlation was selected to be 10% higher than the curve fitted to the initial strainer test results.

- The initial strainer tests were conducted using fiber only, but the confirmatory testing shown in the above figures included particulate debris in addition to fiber debris. When the small scale testing was performed to determine the shape factor, both the analytical determination of head loss used a Specific Surface Area of Particulate Debris (Svp) and the Ratio of Particulate Debris Mass to Fiber Debris Mass (η) were zero. When particulate debris is included in the analytical determination (see Equations 1 and 6 in Reference 1), the Svp and η are non-zero. In this case, the total Sv factor is higher than Svf (Specific Surface Area for fiber), and the analytical head loss is higher. For the RHR Case A where the debris bed thickness is approximately 32 mm, the analytically determined head loss including the non-zero Svp and η for particulate debris is approximately 1.6 m, as shown above. For a debris bed thickness of 32 mm, but no particulate debris (this case is not shown above), the analytical head loss is approximately 0.4 m.

Since the head losses from the confirmatory tests are bounded by the analytically-determined head losses, the strainers are adequately sized for the design conditions.