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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
Response to Request for Additional Information

Reference: Letter from Tom Tai to Scott Head, "Request for Additional Information Letter No. 373 Related to SRP Section 3.9.6 for the South Texas Project Combined License Application" (ML110410665)

Attached are the responses to the following NRC staff questions included in the reference:

RAI-03.09.06-27 RAI 03.09.06-28

When a change to the COLA is required, it will be incorporated into the next routine revision of the COLA following NRC acceptance of the RAI response.

There are no commitments in this letter.

If you have any questions, please 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 3/10/2011

MR McBurnett

Mark McBurnett
Senior Vice President, Oversight & Regulatory Affairs
Nuclear Innovation North America LLC

rhs
Attachments:

1. Question 03.09.06-27
2. Question 03.09.06-28

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NRO

STI 32832631

cc: w/o attachment except*
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**RAI 03.09.06-27**

**QUESTION:**

On December 15, 2010, STP submitted a supplemental response to RAI 03.09.06-5 to justify relief from the inservice testing (IST) requirement for flow rate testing in the ASME *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) for the Residual Heat Removal (RHR) system fill pumps. In its RAI response, STP proposes to modify the STP FSAR to include Subsection 3.9.6.9.3, "Relief Requested Pursuant to 10 CFR 50.55a(f)(5)(iii) for Testing RHR Fill Pumps." The proposed subsection states that the primary function of the three RHR system fill pumps is to maintain a watersolid condition in the RHR pump discharge piping. The proposed subsection indicates that the RHR system fill pumps will not meet the requirement for measurement of flow rate in ASME OM-2004, Table ISTB-3000-1, "Inservice Test Parameters," during the Group A tests and Comprehensive Tests for these pumps. The proposed subsection asserts that measurement of flow rates is impractical for the RHR system fill pumps because the pump flow rate is expected to vary considerably around a small value due to variations in leakage through the RHR system. The proposed subsection states that the ISTB-3000 requirement for measuring pump differential pressure and peak vibration velocity will assure detection of any significant degradation in the pumps' hydraulic or mechanical performance. The proposed subsection indicates that the plant technical specifications will require confirmation of a watersolid RHR pipeline on a 31-day frequency. The proposed subsection also specifies that the RHR system pressure will be continuously monitored and alarmed in the plant control room. The proposed subsection asserts that the operation of the pumps on the flat portion of their pressure-flow curve and the planned monitoring of pump performance will provide an acceptable level of quality and safety. The COL applicant is requested to discuss compliance with the ASME OM Code requirement to perform Comprehensive Testing every 24 months for the RHR system fill pumps. The applicant is also requested to clarify why the proposal is submitted as relief from the OM Code based on 10 CFR 50.55a(f)(5)(iii) as an impractical test, rather than as an alternative to the OM Code based on 10 CFR 50.55a(a)(3)(i) that provides an acceptable level of quality and safety.

**RESPONSE:**

The proposal has been revised to propose alternative testing which provides an acceptable level of quality and safety, in accordance with 10 CFR 50.55a(a)(3)(i). The proposed alternative is in lieu of flow rate measurement during the Group A test. The following revised markups to COLA Section 3.9.6.9.3 and Table 3.9S-1 are being provided as a response to RAI 03.09.06-27. The markup below provides (1) the required changes for Section 3.9.6.9.3 provided in the supplemental response to RAI 03.09.06-5, and (2) the changes to Note (i1) in Table 3.9S-1 provided originally as part of RAI 03.09.06-7.

**3.9.6.9.3 Alternative Testing Pursuant to 10CFR CFR 50.55a(a)(3)(i) for Testing RHR System Fill Pumps.**

ASME OM Code-2004, Table ISTB-3000-1, requires measurement of flow rate (Q) for all pumps during Group A, Group B and Comprehensive Tests. Specifically,

- ISTB-3300, "Reference Values," paragraph (e)(2) states, "Reference values shall be established within +20% of pump design flow for a Group A test, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate."

- ISTB-3400, "Frequency of Inservice Tests," states, "An inservice test shall be run on each pump as specified in Table ISTB-3400-1." Table ISTB-3400-1, "Inservice Test Frequency," specifies that a Group A pump test shall be performed on a quarterly frequency.

- ISTB-5121 requires that Group A tests shall be conducted with the pump operating at a specified reference point. ISTB 5221(b) requires that the resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

The three RHR System Fill Pumps (E11-C002) are classified as Group A pumps. NINA proposes alternative measures in accordance with 10CFR CFR 50.55a(a)(3)(i) in lieu of the OM-2004 ISTB-3000 requirement to measure flow rate during Group A Tests for the RHR system fill pumps, as indicated in Note (i1) in Table 3.9-8. The alternative measures discussed below provide an acceptable level of quality and safety.

As described in Section 6.3.2, the primary function of the RHR System Fill Pumps is to maintain a water solid condition in the RHR pump discharge piping, and the piping will be maintained full by a small fraction of the pump's flow capacity. The RHR System Fill Pumps are expected to run continuously providing a small makeup flow to compensate for any back leakage through the RHR system. These pumps will provide a low flow rate that is dependent on the piping system leakage characteristics at any given time. Without a constant, explicit, and definable piping system leak rate and path, the system resistance and make up requirements cannot be set. Therefore, the pump flow rate may vary considerably around a small value and these variations likely would exceed the Table ISTB-5221-1 Acceptance Criteria, but actually be due to variations in RHR system back leakage rather than the pump's hydraulic performance. Accordingly, it is impractical to perform the measurement of flow rates for the three RHR System Fill Pumps during plant operation, as designed, to obtain meaningful results.

The RHR System Fill Pumps will be monitored for degradation on a quarterly basis by observing pump discharge pressure and bearing vibration during normal operating conditions. This testing will be performed without varying the resistance of the system as discussed in ISTB-5221(b). These parameters will then be evaluated and trended to assess the pump's performance. The measurement and trending of these parameters under these conditions will provide satisfactory indication of the operational readiness of the pumps and detect degraded performance. These system fill pumps will be full flow tested every 24 months in conjunction with the comprehensive pump test performed in accordance with the requirements specified in ISTB-5223, "Comprehensive Test Procedure."

The RHR System Fill Pump will be designed so that they will normally operate in the flat region of the pump pressure-flow performance curve. The pumps will be designed and analyzed to

continuously operate in this low-flow regime without any significant pump degradation. Since the pump will normally be operating on the flat region of the pump performance curve, the pump differential pressure is the hydraulic parameter of interest in monitoring pump nonperformance. The ISTB-3000 requirement for measuring pump differential pressure as well as peak vibration velocity, as reflected in Table 3.9-8, will assure detection of any significant degradation in the pumps' hydraulic or mechanical performance during normal plant operation. In addition, SR 3.5.1.1 in Chapter 16 requires the physical confirmation of a water solid RHR pipeline by opening a high point vent to confirm solid water flow on a 31-day frequency and RHR system pressure is continuously monitored and alarmed in the control room.

In summary, using the provisions of this relief request as an alternative to the requirements of ISTB-3300(e)(2), ISTB-3400, and ISTB-5221(b), in accordance with 10CFR CFR 50.55a(a)(3)(i), provides a reasonable alternative to the ASME OM Code requirements, and an acceptable level of quality and safety. In lieu of measuring flow rate during the Group A tests, the use of pumps that are designed and analyzed to ensure that (1) the expected flow rate stays well within the flat portion of the pressure-flow curve and that (2) no significant degradation occurs with the expected continuous low flow operation, combined with the system monitoring and alarms, will provide an acceptable level of quality and safety.

**Table 3.9S-1, Inservice Testing Program Plan (OM-2004)**

Note (i) Summary justification for alternative testing request (ISTB-5120)

(i1) The piping is maintained full by a small fraction of the pump's flow capacity. These pumps are a constant speed centrifugal type with a cooling by-pass loop. Normal operation will be near minimum flow in the flat or constant region of the pressure/flow performance curve. Therefore, a flow measurement during the Type A test would not be useful and will only be performed during the comprehensive test. The pumps will be designed and analyzed to withstand low flow operation without significant degradation.

**RAI 03.09.06-28**

**QUESTION:**

On December 15, 2010, STP submitted a supplemental response to RAI 03.09.06-7 to revise the STP FSAR to include Section 3.9S, "Inservice Testing Program (OM-2004)," that provides an updated IST table that incorporates the requirements in the 2004 Edition of the ASME *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code). In the RAI response, STP states that the new Table 3.9S-1, "Inservice Testing Program Plan," supersedes the existing Table 3.9-8, "Inservice Testing Safety-Related Pumps and Valves," which will be deleted in a future departure. The RAI response also indicates that Note (f) in Table 3.9S-1 provides additional justification in response to RAI 03.09.06-8 for Cold Shutdown and Refuel test frequencies. The RAI response also indicates that Note (h) in Table 3.9S-1 provides additional justification in response to RAI 03.09.06-9 for deferring tests of valves where such testing might cause valve damage or impact power operations.

The NRC staff requests that the COL applicant address the following items regarding Table 3.9S-1:

(a) The IST table does not specify the type of pump (such as centrifugal pump, vertical line shaft centrifugal pump, or positive displacement pump) for each application to identify the applicable OM Code requirements. The table does not indicate the bases for the specified test parameters for the Group A, Group B, and Comprehensive Tests for each pump.

(b) The IST table indicates that specific valves will receive an exercise test. The table does not appear to indicate that active power-operated valves (POVs) will receive a stroke-time test as part of the exercise test requirement in accordance with the ASME OM Code requirements.

(c) The OM Code requires that valves within the scope of the IST program receive a position indication test if the valve is equipped with a remote position indicator. The table does not indicate this requirement for some POVs, manual valves, check valves, relief valves and vacuum breaker valves. See, for example, B21-F002, F004, F006, F021, and F022; B31-F008; C41-F003 and F004; E11-F002, F016, F024, F028, F036, F037, F039, F051, F101, and F102; E22-F002, F020, and F021; E31-F702 and F704; E51-F002, F017, F054, and F055; G31-F018; G41-F016, F018, and F020; G41-F016; P11-F141; P21-F006, F010, F025, and F175; P25-F005, F012, F016, and F022; P41-F010; P51-F131; P54-F011; P81-F251 and F252; and Y52-F002.

(d) The OM Code requires that valves categorized as A or A/C receive a leakage test. The IST table does not specify leakage testing for many valves identified as OM Code Category A or A/C. Most of these valves reference Note k4 (Appendix J Type C Leak Test not required as noted in Table 6.2-7) in the IST table. The basis for not meeting the OM Code leakage test requirement for these individual valves is not clear. Also, some Category A valves in the IST table do not indicate leakage testing and do not reference Note k4. See, for example, P41-F003 and F005; and P54-F012.

(e) The OM Code requires that relief valves be tested in accordance with its Appendix I, "Inservice Testing of Pressure Relief Devices in Light-Water Reactor Nuclear Power Plants." The IST table indicates that the test frequency of some relief valves might be as

long as 10 years. The table does not indicate that the OM Code requires sampling of relief valves on a 24-month interval for Code Class 1 relief valves, and a 48-month interval for Code Class 2 and 3 relief valves. See, for example, B21-F010; C41-F003; E11-F028, F039, and F051; E22-F020; E51-F017; P21-F175; P41-F010; P54-F011; and Y52-F002.

(f) The IST table identifies some check valves as passive valves although check valves within the IST program should be identified as active valves with an exercise test. See, for example, E11F048; P11-F142; and P41-F007 and F008.

(g) The IST table identifies Manual Valve C51-J011 as an OM Category A and C valve. The basis for this dual categorization is not clear.

(h) The IST table specifies that MOV E22-F001 will receive a stroke exercise test and position indication test. However, the test frequencies are indicated to be 2 year, 2 year, and 3 month intervals. The basis for three frequency indications is not clear.

(i) The IST table identifies Relief Valve P41-F010 as a passive valve. The basis for the relief valve being categorized as passive is not clear.

(j) The IST table specifies E1 (operational convenience) as part of the test frequency for MOV P41-F015. The basis for this test frequency together with E2 (regular use) is not clear.

**Response:**

Table 3.9S-1, "Inservice Testing Program Plan (OM-2004)," will be revised as follows:

(a) A column for pump type will be added to the first part of the table.

(b) The definition for stroke test ("S") in Note (e) will be revised to distinguish between exercise testing for check valves per ISTC-5221 and full-stroke timed exercise testing for POVs per ISTC-5121, 5131, 5141 and 5151.

(c) The definition for position verification test ("P") in Note (e) will be revised to clarify that all valves with remote position indication will be tested.

(d) Table 6.2-7 provides the specific justification for each containment isolation valve which does not receive a local leak rate test, as indicated by Note (k4). P41-F003, P41-F005 and P54-F012 will be leak tested in accordance with ISTC-3130 as indicated by Note (k3).

(e) The definition for relief valve testing ("R") in Note (e) will be revised to specify the requirement that a minimum of 20% of each valve group be tested every 24 months (for Class 1) or 48 months (for Class 2 and 3) per I-1320 and I-1350, respectively.

(f) All check valves in Table 3.9S-1 will be classified as Active valves.

(g) The TIP Ball Valve (C51-J004) and TIP Purge Valve (C51-J011) are both power operated valves. Both valves will have a Code Category of A (seat leakage limited), and valve function of A (Active) and I (Primary Containment Isolation). Both J004 and J011

will be leak tested in accordance with 10CFR50 App. J. Both Table 3.9S-1 and Table 6.2-7, Containment Isolation Valve Information, have been revised to reflect this information.

(h) The test frequencies for E22-F001 will be revised to reflect 2 years for Test Parameter "P" and 3 months for Test Parameter "S."

(i) P41-F010 will be reclassified as an Active valve.

(j) Note E1 (operational convenience) for P41-F015 will be deleted. The frequency for the position verification test ("P") will be revised to 2 years.

The impacted sections of Tables 3.9S-1 and 6.2-7 are provided below:

## Table 3.9S-1, Inservice Testing Program Plan (OM-2004)

| No. | Qty | Description (h) (i) | Safety Class (a) | Code Category (j) | Type | Test Para (b) | Test Freq (f) | Biennial Comprehensive Tests | Tier 2 Fig. (g) |
|---|---|---|---|---|---|---|---|---|---|
| **System Pumps** | | | | | | | | | |
| C41-C001 | 2 | Standby Liquid Control System Pump | 2 | B | Positive Displacement Pump | Q | 3 mo | P, Q , Vd or Vv | 9.3-1 |
| E11-C001 | 3 | Residual Heat Removal System Pump | 2 | A | Vertical Centrifugal Pump | ΔP, Q, Vv | 3 mo | ΔP, Q, Vv | 5.4-10 (Sh. 3, 4, 6) |
| E11-C002 | 3 | Residual Heat Removal System Fill pump (i1) | 2 | A | Vertical Centrifugal Pump | ΔP, Vv | E10 | ΔP, Vv | 5.4-10 (Sh. 3, 4, 6) |
| E22-C001 | 2 | High Pressure Core Flooder pump | 2 | B | Vertical Centrifugal Pump | ΔP or Q | 3 mo | ΔP, Q, Vd or Vv | 6.3-7(Sh. 2) |
| E51-C001 | 1 | Reactor Core Isolation Cooling pump | 2 | B | Horizontal Centrifugal Pump (Variable Speed) | ΔP or Q, N | 3 mo | N, ΔP, Q, Vd or Vv | 5.4-8(Sh. 1) |
| P21-C001 | 6 | Reactor Building Cooling Water pump | 3 | A | Horizontal Centrifugal Pump | ΔP, Q, Vv | E10 | ΔP, Q, Vv | 9.2-1 (Sh.1,4,7) |
| P25-C001 | 6 | HVAC Emergency Cooling Water System pump | 3 | A | Horizontal Centrifugal Pump | ΔP, Q, Vv | E10 | ΔP, Q, Vv | 9.2-3 (Sh. 1, 2, 3) |
| P41-C001 | 6 | Reactor Service Water System pump | 3 | A | Horizontal Centrifugal Pump | ΔP, Q, Vv | E10 | ΔP, Q, Vv | 9.2-7 (Sh. 1, 2, 3) |
| Y52-C001 | 6 | Standby D/G Fuel Oil Transfer Pump | 3 | B | Vertical Centrifugal Pump | ΔP or Q | 3 mo | ΔP, Q, Vd or Vv | 9.5-6 |

| No. | Qty | Description (h) (k) | Valve Type (l) | Safety Class (a) | Code Cat. (c) | Valve Func. (d) | Test Para (e) | Test Freq (f) | Tier 2 Fig. (g) |
|---|---|---|---|---|---|---|---|---|---|
| **C51 Neutron Monitoring System Valves** | | | | | | | | | |
| J004 | 3 | Isolation valve assembly:<br>ATIP Ball Valve (k1) | MOV | 2 | A | I, A | L, P, S | 2yr, RO, E2 | 7.6-1 sh. 3 |
| J011 | 1 | Purge Isolation Globe Valve (k1) | SOV | 2 | A | I, A | L, P, S | 2yr, RO, E2 | 7.6-1 sh. 3 |
| **E11 Residual Heat Removal System Valves** | | | | | | | | | |
| F048 | 2 | Check valve line from MUWC | CV | 2 | C | A | | E1 | 5.4-10 sh. 5,7 |
| **E22 High Pressure Core Flooder System Valves** | | | | | | | | | |
| F001 | 2 | Condensate Storage Tank (CST) suction line MOV | MOV | 2 | B | A | P, S | 2yr, 3mo | 6.3-7 sh. 2 |
| **P11 Makeup Water (Purified) System Valves** | | | | | | | | | |
| F142 | 1 | Inboard isolation valve (k1) | CV | 2 | A, C | I, A | L | RO | 9.2-5 sh. 2 |
| **P41 Reactor Service Water System Valves** | | | | | | | | | |
| F003 | 9 | Service water inlet valve to RCW System heat exchanger (k3) | MOV | 3 | A | A | L, P, S | 2yr, 2yr, E2 | 9.2-7 sh. 1,2,3 |
| F005 | 9 | Service water outlet valve from RCW heat exchanger (k3) | MOV | 3 | A | A | L, P, S | 2yr, 2yr, E2 | 9.2-7 sh. 1,2,3 |
| F007 | 9 | Supply line from Potable Water check valve | CV | 3 | C | A | | E1 | 9.2-7 sh. 1,2,3 |
| F008 | 9 | Supply line from Potable Water check valve | CV | 3 | C | A | | E1 | 9.2-7 sh. 1,2,3 |
| F010 | 9 | RCW Hx tube side (service water side) relief valve | RV | 3 | C | A | R | 10yr | 9.2-7 sh. 1,2,3 |
| F015 | 3 | Discharge line to discharge canal MOV | MOV | 3 | B | A | P, S | 2yr, E2 | 9.2-7 sh. 1,2,3 |

| No. | Qty | Description (h) (k) | Valve Type (l) | Safety Class (a) | Code Cat. (c) | Valve Func. (d) | Test Para (e) | Test Freq (f) | Tier 2 Fig. (g) |
|---|---|---|---|---|---|---|---|---|---|
| **P54 High Pressure Nitrogen Gas Supply System Valves** | | | | | | | | | |
| F003 | 2 | Nitrogen bottles N2 supply line | CV | 3 | C | A | S | E2 | 6.7-1 |
| F005 | 2 | N2 bottle supply line PCV | CV | 3 | C | A | S | E2 | 6.7-1 |
| F012 | 2 | MOV at safety/non-safety boundary (k3) | MOV | 3 | A | A | L, P, S | 2yr, 2yr, 3mo | 6.7-1 |

Notes:

(e) Valve test parameters per ASME Code in (c) above:

P - (Position Indication Test) All valves with remote position indication will be tested in accordance with ISTC 3700

R - Relief valve test including visual examination, set pressure and seat tightness testing (Mandatory Appendix I). For Class 1 valves, 20% from each group will be tested every 24 months in accordance with I-1320, and for Class 2 and 3 valves, 20% from each group will be tested every 48 months in accordance with I-1350.

S - (Stroke / Exercise Test): All check valves are exercised in accordance with ISTC-5221. All active POVs are stroke tested in accordance with ISTC-5121, -5131, -5141 or -5151.

**Table 6.2-7 Containment Isolation Valve Information**
**Neutron Monitoring System**

| **Valve No.** | **C51-J004XXXA** | **C51-J004XXXB** | **C51-J004XXXC** | **C51-J011XXX** |
|---|---|---|---|---|
| Type C leak Test | Yes~~No~~ | Yes~~No~~ | Yes~~No~~ | Yes~~No~~ |
| Valve Type | Ball | Ball | Ball | Globe~~Ball~~ |
| Operator | Motor | Motor | Motor | Solenoid~~Globe~~ |
| Primary Actuation | Electrical | Electrical | Electrical | Electrical~~Solenoid~~ |
| Closure Time(s) | <3 | <3 | <3 | Instantaneous |