## PMSTPCOL PEmails

**From:** Bense, Richard [rhbense@STPEGS.COM]
**Sent:** Thursday, April 01, 2010 6:17 PM
**To:** Muniz, Adrian; Dyer, Linda; Wunder, George; Tonacci, Mark; Eudy, Michael; Kallan, Paul; Plisco, Loren; Anand, Raj; Foster, Rocky; Joseph, Stacy; Govan, Tekia; Tai, Tom
**Subject:** Transmittal of STPNOC Letter U7-C-STP-NRC-100067
**Attachments:** U7-C-STP-NRC-100067.pdf

Good Evening,

Attached is an electronic copy STPNOC letter U7-C-STP-NRC-100067, which provides the response to an NRC staff question included in Request for Additional Information (RAI) letter number 326, related to Combined License Application (COLA) Part 2, Tier 2, Section 2.5S, "Geology, Seismology, and Geotechnical Engineering." This letter also includes a supplement to the response to RAI 08.02-23 and a revision to the response to RAI 08.03.01-12.

The official version of this correspondence will be placed in today's mail.

If you have any questions, please contact me at 215-353-8857 or Bill Mookhoek at (361) 972-7274.

Dick Bense
Licensing Engineer, STP 3 & 4

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April 1, 2010
U7-C-STP-NRC-100067

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

Attached is the response to an NRC staff question included in Request for Additional Information (RAI) letter number 326, related to Combined License Application (COLA) Part 2, Tier 2, Section 2.5S, "Geology, Seismology, and Geotechnical Engineering." Also attached are a supplement to the response to RAI 08.02-23, which was previously submitted in STPNOC letter U7-C-STP-NRC-090228, dated December 30, 2009 (ML100050184), and a revision to the response to RAI 08.03.01-12, which was previously submitted in STPNOC letter U7-C-STP-NRC-090071, dated July 22, 2009 (ML092050077). A fourth attachment identifies an RAI question that requires an extension to the response date.

Attachments 1 through 3 provide the responses to the RAI questions listed below:

| | | |
|---|---|---|
| 02.05.04-34 | 08.02-23, Supplement 1 | 08.03.01-12, Revision 1 |

Attachment 4 identifies a question from RAI letter number 326 that requires an extension to the response date, provides the reason why the extension is needed, and provides the date by which the response is expected to be submitted to the NRC staff.

There are no commitments in this letter.

If you have any questions, please contact me 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 4/1/10

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

rhb

Attachments:
1. RAI 02.05.04-34
2. RAI 08.02-23, Supplement 1
3. RAI 08.03.01-12, Revision 1
4. Response Date Extension for RAI Question

cc: w/o attachments and enclosure except*

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**RAI 02.05.04-34**

**QUESTION**:

The response to RAI 2.5.4-33 contains Table 2.5S.4.5.3-1, Quality Control Recommendations for Structural Fill, which specifies the frequency of testing on borrow materials during backfill placement. The table specifies one moisture-density relationship for each borrow area and material type, and each time the material changes. Additional moisture-density tests are specified for every 40th field density test, where density tests are specified for every 500 cubic yards with a minimum of 1 per layer. However, the table does not specify the source of the borrow, other than to say it will be an approved source. The staff has four concerns that need to be addressed:

a. Please verify the frequency of in-place density testing of backfill supporting Category 1 structures. The staff notes that the proposed frequency is less than the US Army Corps of Engineers' requirements for backfills supporting non-critical structures.

b. Please justify your proposed frequency of moisture-density testing (modified Proctor tests) and how your frequency will ensure that changes in material properties are recognized quickly.

c. The backfill ITAACs that you propose for ensuring that the backfill meets or exceeds your assumed values in the engineering analyses do not address all of the soil parameters used in the static and dynamic analyses, such as those that are normally verified during laboratory testing from planned borrow sources.

   Please either provide the laboratory testing results and analysis as specified in RG 1.138, or provide and also justify the use of alternative criteria, testing methods and frequencies to verify the parameters assumed in the engineering analysis will be met.

d. FSAR Section 2.5.4.7.3.7 refers to Section 2.5.4.5 as providing the relationships assumed for shear modulus degradation and damping ratio versus strain for the backfill to be used in determining the site response and SSI analyses, but the dynamic properties are not reported in that section. Please add those relationships to this section.

This question refers to Open Item 2.5.4-33.

**RESPONSE:**

STPNOC letter U7-C-STP-NRC-100012, dated January 21, 2010 (ML100250137) provided a response to RAI 02.05.04-33 that included a proposed revision to COLA Part 2 (Tier 2) Section 2.5S.4.5.3. The proposed revision to the STP Units 3 and 4 COLA Part 2, Section 2.5S.4.5.3, included a commitment that stated, "Prior to placing the materials as backfill, an engineering report will be prepared to confirm that the materials, construction equipment and methods used to construct the test pad are capable of producing acceptable and consistent results." The intent of this commitment was to respond to the request made in this RAI for the

applicant to "provide additional information for the FSAR that specifies types of tests, frequency of testing and how your quality control program will ensure that assumed soil parameters used in design are bounded by as-built backfill soil parameters." Since a source of backfill material has not yet been identified for STP Units 3 and 4, the specific engineering properties of this material are not available. The January 21, 2010, response proposed that, after the backfill source is identified, a test pad will be constructed, laboratory and field testing conducted, and an engineering report developed confirming that the proposed backfill materials have engineering properties that bound the values used in the design calculations for Seismic Category I structures.

Following a telephone call with the NRC staff on January 28, 2010, STPNOC submitted a supplemental response to RAI 02.05.04-33 (STPNOC Letter U7-C-STP-NRC-100057 dated March 15, 2010, ML100770389). Supplement 1 to STPNOC's response to RAI 02.05.04-33 proposed an additional ITAAC (beyond the ITAAC proposed in the original response to RAI 02.05.04-33) to require that an engineering report be prepared to document that the engineering properties of the backfill material bound the engineering parameters used in the engineering analysis and design calculations of Seismic Category I structures. This ITAAC was added to strengthen the commitment made in STPNOC's original response to RAI 02.05.04-33 that once a source of backfill material is identified, that material will be tested to ensure that its properties bound the engineering parameters used in the design analyses of Seismic Category I structures.

The supplemental response to RAI 02.05.04-33 also proposed changes related to structural backfill quality control requirements specified in COLA Part 2 (Tier 2) Section 2.5S.4.5.3, Table 2.5S.4.5.3-1, Quality Control Recommendations for Structural Fill. The changes to Table 2.5S.4.5.3-1 revised the frequency of testing for consistency with Subpart 2.5 of NQA-1 (1994). The "STP 3 & 4 Quality Assurance Program Description, Revision 1, as referenced in COLA Part 2 (Tier 2), Section 17, includes a commitment to comply with the requirements of Subpart 2.5 of NQA-1 (1994) for inspection requirements for construction.

The specific concerns enumerated in this RAI are addressed below:

a. <u>Frequency of In-Place Density Testing of Backfill Supporting Category I Structures</u>

   Supplement 1 to STPNOC's response to RAI 02.05.04-33 provided a proposed change to COLA Part 2 (Tier 2) Table 2.5S.4.5.3-1 that increased the minimum frequency of density testing to once per 200 cubic yards for backfill in trenches and surrounding structures. This frequency is consistent with the requirements of NQA-1 (1994), Subpart 2.5, Section 5.6, In-Process Tests on Compacted Fill, and exceeds the testing frequency recommended in UFGS-31, Unified Facilities Guide Specifications – Division 31 – Earthworks, dated August 2008 (once per lift per 500 cubic yards).

b. <u>Frequency of Moisture-Density Testing (Modified Proctor Tests)</u>

   Supplement 1 to STPNOC's response to RAI 02.05.04-33 provided a proposed change to COLA Part 2 (Tier 2) Table 2.5S.4.5.3-1 that increased the minimum frequency of moisture-density testing to once per 10 field density tests. This frequency is consistent with the requirements of NQA-1 (1994), Subpart 2.5, Section 5.6, In-Process Tests on Compacted Fill.

c. Conformance of Backfill Properties with Assumed Values in Engineering Analyses

Supplement 1 to STPNOC's response to RAI 02.05.04-33 included a proposed change to COLA Part 9, Section 3, Table 3.0-11 to add an ITAAC related to backfill. This new ITAAC includes a design requirement that the engineering properties of backfill under Seismic Category I structures bound the values used in site-specific design analysis. The acceptance criteria for this ITAAC requires that an engineering report exist concluding that the engineering properties of the backfill (unit weight, phi angle, shear strength, compressibility, shear modulus degradation and damping ratio) bound the values used in the site-specific design analyses of Seismic Category I structures.

d. Assumed Relationships for Shear Modulus Degradation and Damping Ratio Versus Strain

COLA Part 2 (Tier 2) Section 2.5S.4.5.3, Compaction Specifications, revised as proposed in STPNOC's response to RAI 02.05.04-33, provides details of the quality control methods and testing to be performed on backfill material. As described in Item c above, an ITAAC has been proposed in STPNOC's supplemental response to RAI 02.05.04-33 that requires that the properties of the backfill be shown to be consistent with the assumptions in engineering analyses regarding the shear modulus degradation and damping ratio versus strain used in the SSI analyses.

Regarding the description of dynamic properties of backfill material in COLA Part 2 (Tier 2), revisions will be incorporated into the STP Units 3 and 4 COLA Part 2 (Tier 2), Section 2.5S.4.7.3.7, as indicated in the following markup:

### 2.5S.4.7.3.7 Dynamic Properties of Structural Fill

~~Refer to Subsection 2.5S.4.5 for structural fill requirements.~~ Confirmation that the properties of proposed fill material under Seismic Category I structures meet the values of engineering parameters used in the site-specific design analyses of these structures will be documented in an engineering report as required by COLA Part 9, Section 3.0, Table 3.0-11, Backfill Under Category I Structures.

**RAI 08.02-23, Supplement 1:**

**QUESTION**:

In response to RAI 08.02-11, the applicant stated that the switchyard control cables at STP are routed in concrete modular trench with drain holes in the bottom and trench covers at grade to facilitate cable installation. The applicant also stated that at South Texas the water table is about six feet below grade and that the switchyard elevation would be increased by at least a foot above grade to facilitate runoff during heavy rainfall. Additionally, the trenches will be mounted on 6-8 inches of crushed stone with a top layer of 2-3 inches of sand to facilitate leveling of the trench and further improve natural drainage of potential water accumulation in the trench. Lastly, the applicant indicated that the cables used at STP are designed for wet/dry environments and should not be challenged since they will not be continuously submerged. However, this response does not meet the intent of Generic Letter 2007-01 to describe inspection, testing, and monitoring programs to detect the degradation of inaccessible or underground power cables that support equipment and other systems that are within the scope of 10 CFR 50.65 (the Maintenance Rule). Indicate whether there are any plans to implement a program for inaccessible or underground power, control, and instrumentation cables for testing and inspection; and indicate the frequency for such testing and inspection or provide justification for not developing such program.

**SUPPLEMENTAL RESPONSE:**

STPNOC responded to RAI 08.02-23 in letter U7-C-STP-NRC-090228, dated December 30, 2009. The following supplements that response.

**Description of raceway design associated with offsite power system feeds and safety related cabling between the Reactor Building and exterior structures:**

The normal preferred feeds from the unit auxiliary transformers are routed around the Turbine Building in an electrical tunnel from the unit auxiliary transformers to the Turbine Building switchgear rooms as shown on FSAR Figure 8.2-1. (An underground duct bank is an acceptable alternate.) The tunnel or duct bank manholes are subjected to periodic inspections and provided with sump pumps and high water level alarms. The feeds to the Reactor Building exit the Turbine Building and cross the roof on the Divisions I and III side of the Control Building (FSAR Figure 8.2-1, Sheet 3). The feeds then drop down the side of the Control Building in the space between the Control and Reactor Buildings and then enter the Reactor Building and continue through the Division I and III side of the Reactor Building to the associated Class 1E switchgear rooms in the Reactor Building.

The alternate preferred feeds from the reserve auxiliary transformers are routed inside the Turbine Building. The Turbine Building switchgear feed from the reserve auxiliary transformer is routed directly to the Turbine Building switchgear rooms. The feed to the Control Building is routed in corridors outside of the Turbine Building switchgear rooms. It

exits the Turbine Building and crosses the Control Building roof on the side opposite from the route for the normal preferred power feeds. The alternate preferred power feed turns down between the Control and Reactor Building and enters the Reactor Building on the Division I side. From there, the alternate preferred feeds continue to the respective switchgear rooms in the Reactor Building.

Safety-related cables routed from the Reactor Building to the Reactor Service Water (RSW) Pump house are routed via three underground tunnels - one tunnel for each safety division. The cables are routed in cable trays in the tunnel above the RSW pipes and are accessible. This design is illustrated in FSAR Figure 1.2-36.

The safety-related cables from the Reactor Building to the Diesel Generator Fuel Vaults are routed via underground ducts with manholes at each end of the duct. The ducts share a common concrete wall with the tunnels carrying fuel from the Diesel Generator Fuel Vaults to the Reactor Building. The manholes include sump pumps and level monitoring.

As noted above, most cable raceways are above grade and the cables are not subject to submergence. In cases where the cables are below grade, the manholes are subjected to periodic inspections and provided with sump pumps and high water level alarms.

**Testing and Monitoring**

**Scope**

STPNOC will meet the intent of Generic Letter 2007-01 for onsite safety and non safety related power cables covered by the Maintenance Rule (chapter 8.3) by monitoring and/or testing cables which are installed below grade and potentially subjected to submergence.

The offsite power system (chapter 8.2) will be evaluated against the requirements of RG 1.160. Those cables that fall within the scope of the maintenance rule, and their associated manholes, will be included in a monitoring and/or inspection program.

Control and instrumentation cables and associated raceways are not included in the Unit 3 and 4 monitoring and/or testing programs, which is consistent with STP Units 1 and 2.

**a. Monitoring**

Monitoring includes inspection of the manholes for water level above the lowest layer of cable, confirmation of sump pump functionality, confirmation that manhole covers are properly seated, and, if required, sealed to prevent/minimize water ingression.

**b. Testing**

Testing will be conducted as follows:

1. STP Units 3 & 4 utilize 4.16 kV safety related and non-safety related systems and 13.8 kV non-safety-related medium voltage AC distribution systems covered by the Maintenance Rule. Testing of medium voltage power cables will be performed as part of routine preventive and corrective maintenance activities associated with the end device including load centers and transformers. This testing will be performed using a DC megger or other acceptable method based on the cable type/construction. Motor and transformer testing is normally performed from the switchgear. The method described above is done at the source and as such confirms the health of both the cable and the end device. If a low megger reading is obtained at the end device, the (load) is separated from the cable and they are then individually tested to determine which item has degraded (i.e., the cable or the end device).

2. Testing of 480 volt power cables will be performed by DC megger as part of routine preventive and corrective maintenance activities associated with the end device including loads and motor control centers. The 480 volt power cables will not have a shield which will limit the kind of testing that can be performed effectively. The meggering will be performed at the source end and will capture both the cable and the end device. If a low megger reading is obtained, the end device (load) is separated from the cable and they are then individually tested to determine which item has degraded (i.e., the cable or the end device).

3. STP Units 3 and 4 will use grounded 120 volt AC and ungrounded 125 volt and 250 volt DC systems. No routine testing of power cables is performed because these are low potential cables and STP does not have any history of failures; however, cables may be tested as part of troubleshooting or corrective action activities. The DC systems will be equipped with permanently installed continuous ground detection systems that provide local and control room alarms in the event of a system ground. Additionally, surveillance tests, which periodically demonstrate functional capability of the equipment supported by these cables, demonstrate that the cables are functional.

STPNOC will continue to evaluate using the latest testing technology for performance of the tests described above.

**Inspection/testing frequency**

STPNOC will perform testing and inspections of the cables and manholes that are included in the Maintenance rule. The cables will be tested every five years when equipment is taken out of service for maintenance and the manholes will be inspected every year.

COLA Part 2, Tier 2, Section 8.3.3 will be revised as follows:

8.3.3.2.1S Testing of Power Cables

Medium voltage and 480 volt power cables which are inaccessible and which support equipment covered by the maintenance rule will be tested every 5 years. Testing will consist of DC megger tests or other acceptable methods based on the cable type and installation.

8.3.3.9S Monitoring of Manholes

Monitoring systems are installed in manholes to identify high water level due to failure of the pumps. Additionally, manholes will be inspected every year to ensure water levels are below the lowest layer of cables, to confirm sump pump and alarm functionality, and to ensure proper seating of manhole covers. If required, manhole covers will be sealed to minimize water ingression.

**RAI 08.03.01-12, Revision 1**

**QUESTION**:

STP DEP T1 2.15-2 RBSRDG HVAC revises DCD Tier 1 Subsection 2.15.5 DG engine room maximum temperature limit during DG operation from 50°C to 60°C. Discuss the effect of temperature increase from 50°C to 60°C on (1) DG performance (DG rating, effects on electronic components associated DG control system, etc.), (2) Cable ampacity, (3) mild environment equipment qualification, and (4) operation of other equipment in the room if any.

**RESPONSE:**

STPNOC originally responded to RAI 08.03.01-12 in letter U7-C-STP-NRC-090071, dated July 22, 2009. The following replaces the original response to RAI 08.03.01-12 in its entirety:

1. The equipment to be installed in the DG room is being specified and procured to be suitable for the DG room environmental conditions. DG equipment which may not be suitable for the DG room environmental conditions is being specified and procured to be located outside the DG room. For example, control cabinets which may not be suitable for the DG room temperature are specified to be located outside the DG room.

2. The cables to be routed in the DG room shall have suitable ampacity for the area consistent with the ampacity guidelines with temperature correction factors applied for a 60°C ambient temperature. This will be confirmed by DCD Tier 1, Inspections, Tests, Analyses and Acceptance Criteria 2.12.1.14, which is the acceptance criteria for EPD system cable sizing.

3. The safety-related equipment to be installed in the DG room is being specified and procured to be suitable for the DG room environmental conditions consistent with the guidance of DCD Tier 2 Section 3.11.2, Qualification Tests and Analyses.

4 The safety-related equipment to be installed in the DG room is being specified and procured to be suitable for the DG room environmental conditions.

The following sections were identified to be affected by the DG room temperature departure, STD DEP T1 2.15-2. These changes to the FSAR will be made in a future COLA revision.

In FSAR Section 3I, the following text will be added to the list of standard departures for the section:

STD DEP T1 2.14-1 (Table 3I-13)

STD DEP T1 2.15-2 (Table 3I-4 and Table 3I-14)

STD DEP T1 3.4-1 (Table 3I-13 note)

In FSAR Table 3I-4, the following line corresponding to Diesel generator room Temperature will be changed as shown below:

**Table 3I-4 Thermodynamic Environment Conditions Inside Reactor Building (Outside Secondary Containment) Plant Normal Operating Conditions**

| Plant Zone/Typical Equipment | Pressure[1] kPaG | Temperature °C | Relative Humidity |
|---|---|---|---|
| Diesel generator rooms [Figs. 1.2-8/9.5-6] | 0 | Max ~~50~~ **60**<br>Min 10 | Max 90<br>Min 10 |

In FSAR Table 3I-14, the following line corresponding to Diesel generator room Temperature will be changed as shown below:

**Table 3I-14 Thermodynamic Environment Conditions Inside Reactor Building (Outside Secondary Containment) Plant Accident Conditions**

| Plant Zone/Typical Equipment | Pressure[1] kPaG | Temperature °C | Relative Humidity |
|---|---|---|---|
| Diesel generator room [Figs. 1.2-8/9.5-6] | 0 | Max ~~50~~ **60**<br>Min 10 | Max 90<br>Min 10 |

In Part 7 Departures Report Section 2.1, the second paragraph in the Description of STD DEP T1 2.15-2 RBSRDG HVAC will be changed as shown below:

> ABWR DCD Tier 2 Subsections 9.4.5.4.1.2 and 9.4.5.5.5 describe the R/B Safety-Related Electrical Equipment HVAC System and Diesel Generator HVAC System design bases, respectively, including the maximum design temperature limit of the DG Engine rooms. This change also revises Subsections 9.4.5.4.1.2 and 9.4.5.5.5 to state that the indoor temperature in the diesel generator (DG) engine rooms during DG operation is maintained below 60°C. FSAR Tables 3I-4 and 3I-14 are revised to state that the diesel generator (DG) engine rooms maximum temperature is 60°C.

Response Date Extension for RAI Question

| RAI Question | Reason for Extension | Extended Response Date |
|---|---|---|
| 02.05.04-35 | Additional time is needed to complete calculations of dynamic bearing capacity factors for Category 1 structures and coordinate the design review of the RAI response and associated FSAR revision. | 04/28/2010 |