STP Nuclear Operating Company

South Texas Project Electric Generating Station 4000 Avenue F – Suite A Bay City, Texas 77414

February 18, 2010
U7-C-STP-NRC-100045

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
<u>Response to Request for Additional Information</u>

Attached are the responses to the NRC staff questions included in Request for Additional Information (RAI) letter number 310 related to Combined License Application (COLA) Part 2, Tier 2, Section 9.2. This submittal completes the response to this RAI letter.

The three (3) attachments to this letter address the RAI questions listed below:

09.02.05-8 09.02.05-9 09.02.05-10

When a change to the COLA is indicated, it will be incorporated in 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 me at (361) 972-7206, or Bill Mookhoek at (361) 972-7274.

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

Executed on 2/18/2010

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

jaa
Attachments:

1. RAI 09.02.05-8 Response
2. RAI 09.02.05-9 Response
3. RAI 09.02.05-10 Response

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

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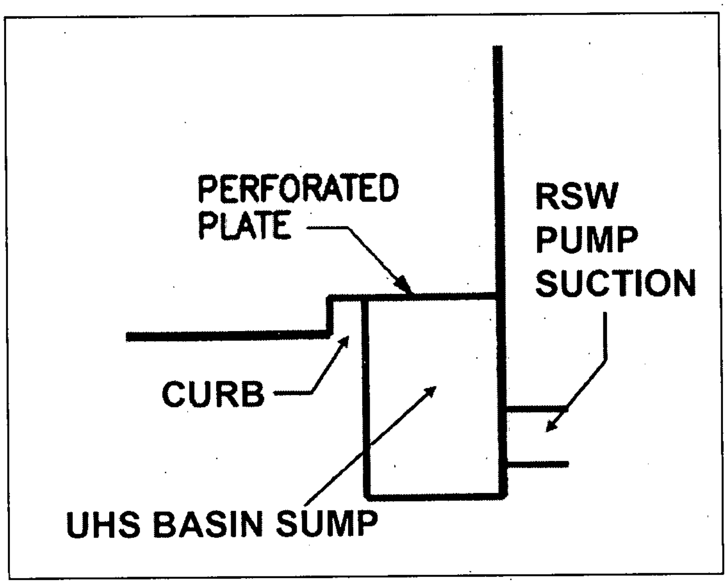
RAI 09.02.05-8

QUESTION:

GDC 44 requires reliable operation of the ultimate heat sink (UHS) under all anticipated conditions. In the COL application, Revision 2, different elevations related to the UHS were inconsistently reported. RAI 9.2.5-1 requested that the applicant address the inconsistency that appears in the COL application in regards to UHS water levels. The applicant responded to this RAI in a letter dated August 28, 2009 (Ref: U7-C-STP-NRC-090123). In this response, the applicant stated that the COL application will be modified to make all of the water levels cited within the application consistent. As part of the response the applicant included a new figure to replace COL Tier 2, Figure 1.2-35. However, the curb identified in the COL application, Tier 2, Section 9.2.5.2(5), and also identified in the version of Figure 1.2-35 in revision 2 of the application, has been eliminated from the new Figure 1.2-35. This curb is included to prevent sediment migration to the pump. No justification for the elimination of the curb has been provided. Provide justification for elimination of the curb.

RESPONSE:

The curb described in COLA Rev. 3, Tier 2, Section 9.2.5.5.2(5), and also identified in COLA Rev. 2, Figure 1.2-35, has not been eliminated from the Ultimate Heat Sink design. The curb exists as depicted below.



No COLA change is required as a result of this RAI response.

RAI 09.02.05-9

QUESTION:

The ultimate heat sink (UHS) system must be designed to reject the required amount of heat under all conditions to satisfy GDC 44. The applicant did not state nor justify the amount of the excess margins that are included in the design to account for uncertainties, component wear and aging effects, fouling of heat transfer surfaces and spray nozzles, strainer debris collection, etc. This generated RAI 9.2.5-3. In the applicants response to this RAI (letter dated August 28, 2009; Ref: U7-C-STP-NRC-090123) the applicant stated that design of the UHS has not been finalized, and thus margins could not be provided. The applicant stated that their goal was to provide margins, and provided margins for related systems. The applicant also stated that margins for the UHS will be included in the performance requirements within the procurement process. Review of this information must be performed prior to issue of the SER. Provide the schedule information as to the when the information will be available and how it will be made available for NRC review.

RESPONSE:

The Reactor Service Water (RSW) system, which is integral with the Ultimate Heat Sink (UHS), relies on four major components to transfer heat from the Reactor Building Cooling Water (RBCW) system heat exchangers to the UHS; the RSW system pumps, RSW system strainers, RSW system UHS cooling towers and the RBCW system heat exchangers.

The following is a listing of the preliminary margins, for the components listed above, to allow for uncertainties. The final values of these margins will be known upon equipment supplier selection and subsequent submittal of the final vendor documents. This information will be provided in a supplemental response to this RAI in the fourth quarter of 2011.

RSW System Pumps:

The RSW pumps are specified with 10% additional margin for head and flow rate over and above the calculated values in the hydraulic analysis of the RSW system.

RSW System Strainers:

The RSW system strainers are of the self-cleaning type, which limit the differential pressure loss across the strainer due to debris collection by initiating a cleaning cycle when the differential pressure reaches a predetermined set point. The strainers have also been specified to accommodate 110% of the operating flow rates through the strainers.

RSW System UHS Cooling Towers:

The RSW system UHS cooling towers have been specified so that sufficient space exists, between the top of the fill and the bottom of the water distribution system, to add 20% additional or reserve fill. Additionally, the water distribution system will be specified to be capable of operating with water flow rates of 15% above the design flow rate.

RBCW System Heat Exchangers:

The RBCW system heat exchangers design capacity has been specified to include a 20% margin above the minimum required for accident conditions, to allow for fouling. The heat exchangers have also been specified to include a conservatively sized frame, which can accommodate up to 25% additional plates.

No COLA revision is required as a result of this RAI response.

RAI 09.02.05-10

QUESTION:

STP COL FSAR Section 9.2.5.1(3), Interface Requirement, states that the ultimate heat sink (UHS) water chemistry limits will not be exceeded after operation for 30 days without makeup. However, the application does not demonstrate that the water chemistry is acceptable after 30 days of water loss without makeup. In a letter dated August 28, 2009 (Ref: U7-C-STP-NRC-090123) the applicant responded to RAI 9.2.5-5 and stated that the procurement process of the UHS equipment will obtain equipment that is designed to operate using the worst projected water that might exist in the UHS after 30 days of operation without makeup. The applicant also stated that the heat loads will be lower at the end of this time period, so the potential fouling will not cause the system to operate without significant margin. The staff finds this response inadequate since there are no calculations to demonstrate that the design can accommodate the potential change in the water chemistry. The applicant is asked to provide an estimate of the water chemistry that might be obtained after 30 days of evaporation and demonstrate that the final design can successfully operate with the worst possible water chemistry.

RESPONSE:

In order for the Reactor Service Water (RSW) system to meet the requirements of GDC 44, the components which comprise the RSW system must be able to dissipate the maximum possible total heat load under the worst combination of adverse environmental conditions.

To estimate the most limiting chemistry conditions, an analysis of the time dependant UHS water chemistry conditions during a period of 30 days of operation without makeup to the UHS has been prepared.

The initial water chemistry conditions represent the normal operating chemistry in the UHS in accordance with FASR section 9.2.5.4.1. This chemistry was determined on the basis of well water analyses shown in Environmental Report Tables 2.3.3-7(a) and 2.3.3-7(b). Consistent with the COLA, it was assumed that the UHS cooling towers would be operated at 3 cycles of concentration and using sulfuric acid addition to adjust the pH as needed for control of calcite scaling.

Water chemistry for UHS operation without makeup or chemical addition following a postulated LOCA was estimated for the worst-case 30-day evaporation conditions as described in FSAR section 9.2.5.5.2. Five factors were taken into account: (1) Forced evaporation due to plant heat load, (2) natural evaporation, (3) cooling tower drift losses, (4) seepage losses, and (5) pipe crack losses. Maximum water losses were used as summarized in FSAR section 9.2.5.6.

Time dependant forced evaporation rates due to heat load were obtained from FSAR Table 9.2-26 for Case D2. This case conservatively maximizes evaporation. Natural evaporation rates were assumed to be proportional to the forced evaporation rates. Cooling tower drift rates were determined based on a constant uniform rate throughout the 30-day period. Seepage losses declined with time and were determined proportional to the volume remaining in the UHS basin. Losses due to a pipe crack were conservatively assumed to occur as a single event at the start of the 30-day period to maximize final water chemistry concentrations. These rates determined the change in UHS volume with time.

Using these rates, net concentration factors for water remaining in the UHS were determined from time-dependant mass balances. Evaporation losses tended to concentrate residual constituents in the UHS. Drift and seepage functioned as blowdown and removed dissolved constituents from the UHS.

Time dependant chemistry conditions were evaluated utilizing the concentration factors and the initial UHS chemistry at the start of the 30-day period. These evaluations also accounted for carbon dioxide stripping at the cooling tower, and estimated alkalinities and pH. UHS heat loads and basin temperatures corresponding to each time dependant chemistry condition were taken directly from FSAR Table 9.2-26.The results of this analysis, and the time dependant heat loads, are summarized below.

Table 1 - UHS Water Chemistry Analysis Results for 30 Days of Operation without Makeup

Time (Days)	UHS Heat Load (MW)	Basin Temp (°C)	Conc Factor	pH	MO Alk (as CaCO3) mg/l	TDS mg/l	Calcium mg/l	Magnesium mg/l	Sodium mg/l	Chloride mg/l	Sulfate mg/l	Fluoride mg/l	Silica (as SiO2) mg/l
0	4600	32.2	1.0	8.0	60	1610	39	12	474	225	767	3	47
5	54.8	29.1	1.3	8.1	76	2032	50	15	599	284	968	4	59
10	51.3	29.1	1.6	8.0	94	2520	62	19	743	352	1200	5	73
20	48.1	29.2	2.9	8.1	174	4666	114	35	1375	651	2222	10	136
21	47.9	29.2	3.2	8.1	190	5097	125	39	1502	711	2427	11	148
22	47.7	29.3	3.5	8.1	209	5620	137	43	1656	784	2676	12	163
23	47.5	29.3	3.9	8.2	233	6264	153	48	1846	874	2983	13	182
24	47.4	29.3	4.4	8.2	263	7077	173	54	2086	988	3370	15	206
25	47.2	28.8	5.1	8.3	303	8133	199	62	2397	1135	3873	17	236
26	47.1	29.1	5.9	8.3	356	9565	234	73	2819	1335	4555	20	278
27	47.0	28.7	7.1	8.4	427	11472	281	87	3382	1601	5464	24	334
28	46.9	27.7	9.1	8.5	542	14568	356	111	4295	2033	6939	30	424
29	46.7	27.7	12.4	8.5	743	19979	489	152	5890	2789	9517	42	581
30	46.6	28.6	19.8	8.7	1185	31875	780	242	9400	4450	15187	66	927

The procurement specifications for the RSW equipment will specify that the components are to perform their safety related function given the chemistry conditions indicated above. Using this water chemistry will ensure that the RSW system components can transfer the design basis heat loads to the Ultimate Heat Sink during a 30 day period without makeup.

No COLA revision is required as a result of this RAI response.