Nuclear Operating Company

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

June 22, 2010
U7-C-STP-NRC-100145

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

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

Reference: Letter, Scott Head to Document Control Desk, "Response to Request for Additional Information", dated April 8, 2010: U7-C-STP-NRC-100077 (ML101040253)

Attached is a supplemental response to an NRC staff question included in Request for Additional Information (RAI) letter number 325, related to Combined License Application (COLA) Part 2, Tier 2, Section 5.4. The attachment supplements the response to RAI 05.04.06-3, previously submitted in the referenced letter.

The indicated change to the COLA will be incorporated in the next routine revision submitted following NRC acceptance of the revised response.

There are no commitments in this letter.

If you have any questions regarding this response, 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 6/22/2010

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

rhs
Attachment: RAI 05.04.06-3 Supplement

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NRO

STI 32693520

cc: w/o attachment except*
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RAI 05.04.06-3 Supplement

QUESTION

ECCS pumps suction strainer design was incorporated on STP 3&4 (STD DEP 6C-1) with a cassette type strainer. The applicant submitted the technical bases for the pumps NPSH change in response to RAI 2570 (RAI 05.04.06-1) in letter dated July 2, 2009 (U7-STP-NRC-090062). The response did not provide the pump NPSH margin and hence this issue is not resolved. The symbols H_F and H_{ST} were provided without numerical values because the new strainer head loss had not been determined. The applicant needs to submit the results of the pump NPSH calculations showing the available NPSH margin when the new strainer head loss is determined.

SUPPLEMENTAL RESPONSE

This supplemental response is being provided as a result of several discussions with the NRC after submittal of the initial response in STPNOC Letter No. U7-C-STP-NRC-100077 dated April 8, 2010 (ML101040253). In those discussions, the NRC requested that additional information be provided in this response to ensure that NPSH margin exists for the STP 3&4 RCIC pump.

Although the results of the STP 3&4 Reactor Core Isolation Cooling (RCIC) pump NPSH calculations are not yet final, the combined head loss due to the piping (H_F) and strainer (H_{ST}) is expected to be bounded by the DCD value of 2.10m, which is shown in DCD Tier 2, Section 5.4, Table 5.4-1a. This is based on head loss analyses for a reference Japanese ABWR (RJ-ABWR) and Japanese BWRs with similar suction piping configurations and smaller or same size suction strainer surface areas as compared with STP 3&4. The calculated losses in the Japanese plants assumed the suction strainers were 50% blocked, which is consistent with the requirements of RG 1.82, Rev. 0, and is consistent with DCD Tier 1, Section 2.4, Table 2.4.4. For the STP 3&4 RCIC system, the 50% blocked strainer criterion is conservative because: (1) initial suction for the RCIC is taken from the condensate storage tank (CST), which is a clean water source and the mission time for the RCIC is only a few hours (so suction from the suppression pool is minimized), (2) the fraction of total flow (and therefore LOCA-generated debris) going to the RCIC strainers is small compared to the flow/debris going to a minimum of two Residual Heat Removal (RHR) and one High Pressure Core Flooder (HPCF) pumps, (3) when the RCIC strainers in the RJ-ABWR, which had been sized based on the 50% blocked criterion, were re-evaluated for the RG 1.82 Rev. 1 requirements that consider debris generation, transport and resulting head loss, they were more than adequately sized, and (4) the RJ-ABWR strainer head losses are bounding with respect to the STP 3&4 strainer head losses because STP 3&4 does not allow the use of fibrous or calcium silicate materials inside primary containment, and these materials (which exist in the RJ-ABWR) are significant contributors to strainer head loss. It should also be noted that for the Station Blackout (SBO) scenario, which relies on the RCIC, there is no associated LOCA and no LOCA-generated debris, so the 50% blocked strainer head loss is a bounding value for that scenario.

As noted in the response provided on April 8, 2010, the ITAAC in STP 3&4 COLA Part 2, Tier 1 Subsection 2.4.4, Table 2.4.4 Design Commitment j will require that an analysis be performed

based upon the as-built system, to ensure that sufficient NPSH exists for the RCIC pump. The implementation of this ITAAC will ensure that the RCIC pump NPSH calculations will demonstrate adequate NPSH margin using the cassette strainer design. Closure of this item through ITAAC will be subject to the NRC's construction inspection program.

As a result of this response, the undefined values for H_F and H_{ST} which currently exist in COLA Revision 3 will be removed and replaced with the DCD value for combined piping and strainer head loss. A markup of STP 3&4 COLA Revision 3, Part 2, Tier 2, Table 5.4-1a is provided below with gray shading showing the changes.

Table 5.4-1a Net Positive Suction Head (NPSH) Available to RCIC Pumps

A *Suppression pool is at its minimum depth, El. -3740 mm.*

B. ~~*Centerline of pump suction*~~NPSH Reference level *is at El. -7200 mm.**

C. *Suppression pool water is at its maximum temperature for the given operating mode, 77°C.*

D. *Pressure is atmospheric above the suppression pool.*

E. *Minimum suction strainer area as committed to by Appendix 6C methods.*

NPSH available = H_{ATM} + H_S - H_{VAP} -H_F ~~(H_F + H_{ST})~~

where:

H_{ATM}	=	*Atmospheric head*
H_S	=	*Static head*
H_{VAP}	=	*Vapor pressure head*
H_F	=	*Maximum frictional head including strainer*~~excluding strainer frictional head~~

~~*H_{ST} = Strainer frictional head*~~

Minimum Expected NPSH RCIC pump flow is 182m³/h

The maximum suppression pool temperature is 77°C. However, for conservatism, 100°C is used to calculate the following values.

H_{ATM}	=	~~*10.62m*~~10.77m
H_S	=	*3.46m*
H_{VAP}	=	~~*4.33m*~~4.39m
H_F	=	*2.10m*

*NPSH available = ~~*10.26*~~10.77+3.46 - ~~*4.33*~~ 4.39-2.10=~~7.65m~~4.39* ~~(H_F + H_{ST})~~

NPSH available = ~~9.84 (H_F + H_{ST}) 7.74~~m

*NPSH required = ~~*7.3m*~~7.0 m*

*Margin** = ~~*0.35m*~~0.74m2.84m ~~(H_F + H_{ST})~~ = $NPSH_{available}$ - $NPSH_{required}$*

**NPSH Reference ~~Point~~level is 1m above the pump floor level*

**The final system design will meet the required NPSH with adequate margin.