Charles R. Pierce
Regulatory Affairs Director

Southern Nuclear Operating Company, Inc.
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201

Tel 205.992.7872
Fax 205.992.7601

February 27, 2013

Docket Nos.: 50-424
50-425

NL-13-0322

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Vogtle Electric Generating Plant – Units 1 and 2
Response to NRC Request for Additional Information, Revision of Technical Specification 3.7.9 Ultimate Heat Sink

Ladies and Gentlemen:

By letter dated September 1, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML112450171), Southern Nuclear Operating Company (SNC) submitted a license amendment request for revision of Technical Specification (TS) 3.7.9 "Ultimate Heat Sink (UHS)." Subsequently, by letter dated January 11, 2012 (ADAMS Accession Number ML11355A007), the NRC submitted a Request for Additional Information (RAI) to enable completion of the review. The SNC responses to that RAI were provided in a series of letters dated February 10, 2012, April 30, 2012, and December 18, 2012.

By letter dated January 28, 2013, the NRC submitted another RAI to enable completion of the review. The enclosure of this letter provides the response to that RAI.

This letter contains no NRC commitments. If you have any questions, please contact Ken McElroy at (205) 992-7369.

Mr. Chuck Pierce states he is Regulatory Affairs Director of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and, to the best of his knowledge and belief, the facts set forth in this letter are true.

Sworn to and subscribed before me this 27th *day of* February, *2013.*

Laura L. Crumpton
Notary Public

My commission expires: 11-2-13

Respectfully submitted,

C. R. Pierce

C. R. Pierce
Regulatory Affairs Director

CRP/CLN/lac

Enclosure: Response to Request for Additional Information

cc: Southern Nuclear Operating Company
Mr. S. E. Kuczynski, Chairman, President & CEO
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer
Mr. T. E. Tynan, Vice President – Vogtle
Mr. B. L. Ivey, Vice President – Regulatory Affairs
Mr. B. J. Adams, Vice President – Fleet Operations
RType: CVC7000

U. S. Nuclear Regulatory Commission
Mr. V. M. McCree, Regional Administrator
Mr. R. E. Martin, NRR Senior Project Manager – Vogtle
Mr. L. M. Cain, Senior Resident Inspector – Vogtle

State of Georgia
Mr. J. H. Turner, Environmental Director Protection Division

Vogtle Electric Generating Plant – Units 1 and 2
Response to NRC Request for Additional Information, Revision of Technical Specification 3.7.9 Ultimate Heat Sink

Enclosure

Response to Request for Additional Information

RAI - 1

Calculation X4C1202V70, Version 3, uses 97 degrees Fahrenheit (°F) as the design basis temperature for the cooling tower basins. The Updated Final Safety Analysis Report (UFSAR) states that 95°F is the maximum design temperature. Acknowledging the exception on Page 9.2-22 of the UFSAR where basin temperature remains above 95°F for periods of 20 or 35 hours considering only residual heat removal operation, calculation X4C1202V70 Version 3, allows basin temperature to exceed 95°F for up to 54 hours.

a. What are the effects of other loads cooled by nuclear service cooling water if 95°F is exceeded for such a long period of time?

b. Can the diesel generators operate satisfactorily with cooling water above 95°F for that many hours?

c. Does the diesel generator vendor support SNC's answer?

SNC Response To RAI - 1a:

It has been determined that the Nuclear Service Cooling Water (NSCW) temperature above 95°F for the duration per the referenced calculation will not have a significant adverse effect on the equipment that is cooled by the NSCW. This conclusion is based on a Request for Engineering Review (RER) completed in July of 2012 to evaluate the impact of a peak NSCW basin temperature of 99.5°F during a Loss of Offsite Power (LOSP). The RER was performed in response to a condition that reported insufficient documentation to support the FSAR Section 9.2.5.2.4. The FSAR states that the peak basin temperature during three-fan cooldown operation will exceed the nominal basin design maximum temperature of 95°F, reaching approximately 97°F for Unit 1 and 98 °F for Unit 2 after residual heat removal (RHR) initiation following an LOSP event.

The RER evaluated NSCW cooled equipment operating during an LOSP and the effect the temperature increase would have on operation of this equipment. The equipment included in the scope of this RER was based on equipment aligned per Abnormal Operating Procedure 18017-C, "Abnormal Grid Disturbances/Loss of Grid" and the specific design basis calculation that determines NSCW LOSP heat loads. The RER concluded that increasing the NSCW basin temperature from 95°F to 99.5°F would not have a significant adverse effect on the equipment operating during an LOSP. This steady state evaluation was conducted at the peak temperature of 99.5°F with one train in operation. Specific heat exchanger evaluations were performed in the RER to determine the temperature rise across the heat exchanger and/or the effective area of the specific heat exchanger required. The specific heat exchangers evaluated in the RER were the engineered safety features (ESF) chillers, NSCW pump motor coolers, component cooling water (CCW) pump motor coolers, diesel generator jacket water coolers, containment coolers, reactor cavity coolers, piping penetration area room coolers, the auxiliary component cooling water (ACCW) heat exchangers, the ACCW pump motor coolers, centrifugal charging pump lube oil coolers, centrifugal charging pump motor air coolers, CCW heat exchanger, spent fuel pool (SFP) heat exchanger, RHR heat exchanger, residual heat pump motor air coolers, letdown heat exchangers, and the seal water heat exchangers (some of these components were evaluated by Westinghouse in support of the RER, which are discussed later in this response to RAI-1a). For some equipment, a comparison was made to the maximum vendor recommended NSCW temperature to the postulated 99.5°F NSCW supply. The evaluation was performed at 99.5°F because that is the peak temperature the NSCW basin will experience during a 130 percent LOSP heat load with 3 fans in operation, as determined by an existing analysis that evaluates the sensitivity of heat load increases on the cooling tower fan performance. This 130 percent heat load and the resulting 99.5°F supply is a bounding case for the statements made in the FSAR Section 9.2.5.2.4 as well as the calculation X4C1202V70, Version 3, which is the basis for the License Amendment Request (LAR). This temperature was evaluated for continuous operation against the temperature criteria for each system component cooled by the NSCW. In each case, the NSCW supply resulted in either meeting the vendor's temperature criteria or the resulting heat exchanger outlet temperature was judged to be acceptable.

As part of the RER discussed above, an evaluation was also conducted by Westinghouse for the equipment of the nuclear steam supply system (NSSS) and/or Westinghouse supplied equipment, such as charging pump coolers, RHR coolers, RHR heat exchanger, SFP heat exchanger, etc. Westinghouse modeled the components with the Ultimate Heat Sink (UHS) temperature profile for 130 percent LOSP heat load with the peak basin temperature of 99.5°F using RHRCOOL computer code. Westinghouse concludes in their evaluation that equipment supplied by Westinghouse that is in service following an LOSP is designed for a NSCW normal cooling water supply temperature of 105°F and a maximum temperature of 150°F for 4 hours. Westinghouse restates the NSCW temperature acceptance criteria and concludes that all acceptance criteria can be met with the increased NSCW temperature profile. Furthermore, Westinghouse demonstrates that the RHR system can meet the acceptance criterion to cooldown the reactor coolant system (RCS) to 200°F within 36 hours after reactor shutdown. The RHRCOOL model determined that it is possible to align RHR system at 4 hours after reactor shutdown and with a single train of RHR and cooldown the RCS to 200°F within 23 hours after reactor shutdown.

It is noted that the evaluation of the RER bounds the analysis conducted per calculation X4C1202V70 Version 3, which limits the peak basin temperature to 97°F.

This RER was completed where design control requirements of NQA-1-1994 were invoked for associated engineering activities in conjunction with this RER response.

SNC Response To RAI - 1b:

The diesel generator can operate satisfactorily with cooling water above 95°F for the duration determined in X4C1202V70, Version 3. The diesel generator jacket water coolers are directly cooled by NSCW upon exiting the ACCW heat exchanger. Based on the evaluation of the ACCW heat exchanger conducted in the RER discussed above in response RAI 1a, the new exit temperature of the cooling water being supplied to the diesel generator jacket water coolers would be 100.9°F. To be conservative, the evaluation included an additional 2°F for any additional heat gain the cooling water may experience while in the piping system. This yields a cooling water inlet temperature to the diesel generator jacket water coolers of 102.9°F. The diesel generator jacket water coolers are designed for a continuous maximum cooling water temperature of 105°F at 1500 gpm per the vendor's jacket water heat exchanger specifications. Since the cooling water inlet temperature to the diesel generator jacket water coolers is less than this specified maximum and the required flow rate is exceeded by approximately 200 gpm, the diesel generators would not be adversely affected by the increased cooling water temperature.

SNC Response To RAI - 1c:

The diesel generator vendor has not been contacted for input on the supply of NSCW above 95°F. The jacket water heat exchanger specification sheet clearly specifies the maximum cooling water temperature to be supplied. This temperature is greater than the supply temperature determined as a result of the RER evaluation that considers a peak NSCW basin temperature at 99.5°F. Therefore, it was decided that this information was sufficient in making the determination without direct vendor input. As stated above, this evaluation bounds the analysis conducted per calculation X4C1202V70 Version 3, which limits the peak basin temperature to 97°F.

RAI - 2

Calculation X4C1202V70, Version 3, does not consider the first 4 hours after a loss of offsite power (LOSP). However, when a tornado occurs and causes a LOSP, the fan loss occurs immediately at which time the cooling towers have heat loads from diesel generators of about 17 million British thermal units per hour (M BTU/hr), containment cooling at about 10.5 M BTU/hr and spent fuel pool cooling at about 24 M BTU/hr. Calculation X4C1202V70, Version 3, does not include the fan loss and heat loads from 0 to 4 hours. Please explain why SNC did not account for the first 4 hours after LOSP when computing values for the new Figure 3.7.9-1.

SNC Response To RAI - 2:

Calculation X4C1205V03, "Verification of NSCW Constant Heat Loads and Flows and Cooldown Heat Loads", compiles and calculates constant heat loads and minimum required cooling water flow rates for all equipment cooled by the NSCW system. This calculation shows that the Total NSCW Heat Load at time 0 hours into the LOSP event is 92.7×10^6 Btu/hr including diesel generator loads. The total heat load decreases during the first 4 hours as ACCW loads are removed from service followed by a total heat load increase to 257.82×10^6 Btu/hr beginning at time t = 4 hours, due to decay and sensible heat. Existing ACCW heat load design calculations show an 80 percent reduction in ACCW heat loads from normal operations to no load at hot shutdown with an LOSP. This ACCW reduction is greater than the heat load of the diesel generator added at LOSP; thus, a net decrease in heat load is experienced by the NSCW during the first four hours of a LOSP event.

This reduction in heat load during the first four hours of an LOSP event is also demonstrated in the analysis referred to in the response to RAI 1a that determined the basin temperature profile and basin peak temperature (99.5°F) for a 130 percent LOSP heat load with 3 fans in operation. As stated, this existing analysis evaluates the sensitivity of heat load increases (100 percent to 130 percent) on the cooling tower fan performance. Per the results of this analysis, the NSCW basin temperature profiles as a function of hours after shutdown for these loads, starting at 0 hours, all show a reduction in the basin temperature during the first 4 hours of the event; thus, confirming a net reduction in the NSCW heat load during the first 4 hours of an LOSP from normal power operation.

Therefore, based on the net reduction in the total NSCW heat and the reduction of the basin temperature during the first 4 hours of an LOSP event per existing design analysis, it was determined the calculation X4C1202V70, Version 3, did not need to consider the first 4 hours after an LOSP.