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Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4 Combined License Application
Response to Request for Additional Information Letter No. 003

Ladies and Gentlemen:

By letter dated March 28, 2008, Southern Nuclear Operating Company (SNC) submitted an application for combined licenses (COLs) for proposed Vogtle Electric Generating Plant (VEGP) Units 3 and 4 to the U.S. Nuclear Regulatory Commission (NRC) for two Westinghouse AP1000 reactor plants, in accordance with 10 CFR Part 52. During the NRC's detailed review of this application, the NRC identified a need for additional raw water information required to complete their review of the COL application's Final Safety Analysis Report (FSAR) Subsections 9.2.11, "Raw Water System." By letter dated October 6, 2008, the NRC provided SNC with Request for Additional Information (RAI) Letter No. 003 concerning this raw water information need. This RAI letter contains three RAI questions numbered 09.02.01-1, 09.02.01-2 and 09.02.01-3. The enclosure to this letter provides the SNC response to these RAIs.

If you have any questions regarding this letter, please contact Mr. Wes Sparkman at (205) 992-5061.

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NRO

Mr. J. A. (Buzz) Miller states he is a Senior Vice President 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.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

Joseph A. (Buzz) Miller

Sworn to and subscribed before me this 4th *day of* November, *2008*

Notary Public: Dana M. Williams

My commission expires: 12/29/2010

JAM/BJS/dmw

Enclosure: Response to NRC RAI Letter No. 003 on the VEGP Units 3 & 4 COL Application Involving Raw Water

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Southern Nuclear Operating Company

AR-08-1691

Enclosure

Response to NRC RAI Letter No. 003

on the VEGP Units 3 & 4 COL Application

Involving Raw Water

FSAR Subsection 9.2.11, Raw Water System

eRAI Tracking No. 1247

NRC RAI Number 09.02.01-1:

Although the RWS is not safety-related, failures of this system and related components could result in severe and unacceptable flooding consequences. As discussed above in the Regulatory Evaluation Section, the staff's evaluation includes a review of the impact that RWS-related flooding has on structures, systems and components (SSCs) that are either designated as safety-related or subject to regulatory treatment of non-safety systems (RTNSS). If SSCs important to safety can be adversely affected by RWS failures, the staff confirms that design provisions have been included to address vulnerabilities that have been identified in this regard and to minimize hydraulic transients and their effects upon the functional capability and the integrity of these systems. Because the applicant did not identify and address the potential consequences of RWS-related failures on safety-related and RTNSS equipment, the staff is unable to confirm compliance with GDC 4 and RTNSS policy considerations. The staff requests that the applicant provide additional information to address the impact of flooding on safety-related and RTNSS equipment, including plant-specific inspections, tests, analyses, and acceptance criteria (ITAAC), test program, technical specification, and availability control considerations as appropriate. Provide additional information in the FSAR. Provide any markups of the Final Safety Analysis Report (FSAR) and other parts of the application as applicable to facilitate the staff's evaluation.

SNC Response:

As described in the FSAR Subsection 9.2.11, the raw water system (RWS) river water subsystem provides makeup to the circulating water system (CWS) natural draft cooling tower and provides an alternate source of dilution water to the blowdown sump (to be used when CWS blowdown is unavailable). The RWS well water subsystem provides makeup to the service water system (SWS) cooling towers and provides water supplies for the fire water system (FPS) fire water tanks, the demineralized water treatment system (DTS), and the potable water system (PWS). The RWS also provides well water to the yard fire water system (YFS) fire water tanks and to the CWS pumps for pump lubrication and cooling, as well as well water for miscellaneous uses such as equipment washdown. None of the systems interfacing with the RWS (CWS, SWS, FPS, DTS, PWS & YFS) have a safety-related function.

The FPS provides water supplies for manual fire fighting in areas containing safe shutdown equipment, provides water supplies for automatic fire suppression in areas containing selected non-safety-related equipment and provides a non-safety-related water source for containment spray to reduce offsite dose following a severe accident. The SWS is credited with a RTNSS function during MODES 5 and 6 per DCD Tier 2, Table 16.3-2, Item 2.4. Therefore, these systems may be considered to be important to safety.

The potential failures of the RWS and the corresponding impact on structures, systems and components important to safety are described below.

1. Failure of RWS piping in yard areas

The river water subsystem of the RWS does not directly interface with any safety-related system or any systems that are important to safety. The piping is routed underground from the river intake structure to the main cooling towers. The only above ground portions of the river water subsystem are at the river intake structure and at the CWS cooling tower basins. Branch lines provide alternate dilution flow to the

blowdown sump. This piping is not routed in close proximity to any safety-related or important to safety systems, structures or components. A break in the RWS river water piping is bounded by a break in the CWS. DCD Tier 2, Subsection 3.4.1.1.1 indicates that a failure of the cooling tower, the SWS or the CWS piping under the yard could result in a potential flood source. However, these potential sources are located far from safety-related structures and the consequences of a failure in the yard would be enveloped by the analysis described in DCD Subsection 10.4.5 for failure of the CWS. Site grading will carry water away from safety-related or important to safety structures, systems or components.

The well water subsystem of the RWS interfaces with the FPS and SWS. As discussed above, these systems may be considered important to safety because of the "defense in depth" functions of FPS and the RTNSS functions of SWS. The well water subsystem is supplied from two wells located south of the CWS cooling towers that pipe water to the well water storage tank, also located south of the CWS cooling towers. Well water from the storage tank is then pumped via the well water transfer pumps to the various system demand points located throughout the power block and yard area. The well water transfer pumps are located in the well water pump house, which is located near the well water storage tank. This piping is primarily routed underground. The only above ground portions would be at the plant wells, the well water pump house and where the piping interfaces with the demand point. RWS interfaces with CWS, YFS, PWS and FPS are located in the yard. This piping is not routed in close proximity to safety-related systems, structures or components.

The RWS is routed in close proximity to the FPS because it provides the water supply to the fire water tanks. As described in DCD Tier 2, Subsection 9.5.1.2.1.3, two redundant fire water tanks are provided. The fire pump suction piping is arranged to allow the FPS pumps to take suction from either or both tanks. In addition, the arrangement is such that a failure in one tank or its piping cannot cause both tanks to drain. Therefore, a failure of either the tank or the RWS piping will not prevent the FPS from performing any defense in depth functions.

The interfaces with FPS are in relatively close proximity to the buried CWS pipes. A break in the RWS well water piping in the yard area is bounded by a break in the CWS. As discussed in DCD Tier 2, Subsection 3.4.1.1.1, a failure of the cooling tower, the SWS or the CWS piping under the yard could result in a potential flood source. The consequences of a failure in the yard would be enveloped by the analysis described in DCD Tier 2, Subsection 10.4.5 for failure of the CWS. Site grading will carry the water away from safety-related or important to safety structures, systems or components.

2. Failure of RWS well water piping inside the turbine building

Short runs of RWS piping from the well water subsystem are routed inside the turbine building to the interface points with the SWS and DTS systems. The RWS to SWS interface is at the SWS makeup control valve V009 (Refer to DCD Tier 2, Figure 9.2.1-1). The SWS piping is routed from the control valve to the top of the SWS cooling tower basin. This arrangement will prevent any backflow from the basin to the break. Therefore, any flooding will be from RWS water that discharges through the break prior to securing of the RWS well water subsystem. The RWS to DTS interface is upstream of the DTS filters and DTS feed pumps. A break in RWS would reduce pressure in the DTS pipe which would cause the DTS feed pumps to stop. Therefore, there would be minimal DTS water that would flow through a break. The primary source of flooding would be from the RWS water that discharges through the break prior to the securing of the RWS well water subsystem. A break in the RWS well water piping to the DTS or the SWS is bounded by a break in circulating water piping. As discussed in DCD Tier 2, Subsection 3.4.1.2.2.3, the bounding flooding source inside the turbine building is a break in the circulating water piping. Flow from any postulated ruptures above elevation 100'-0" (VEGP El. 220'-0") flows down to elevation 100'-0" via floor gratings and stairwells. There is also no safety-related equipment in the turbine building. The component cooling water and service water components on

elevation 100'-0" which provide the RTNSS support for the normal residual heat removal system are expected to remain functional following a flooding event in the turbine building since the pump motors and valve operators are above the expected flood level. Therefore, a failure of the RWS piping within the turbine building will not adversely impact any safety-related or important to safety systems, structures or components.

No COLA revisions have been identified associated with this response.

NRC RAI Number 09.02.01-2:

The RWS well water subsystem is relied upon for providing defense-in-depth heat removal for the reactor and spent fuel by supplying makeup water for the service water system (SWS) cooling tower basins via the RWS well water subsystem. Likewise, the RWS well water subsystem may also be needed for RTNSS considerations during reduced reactor coolant system inventory conditions. The staff's evaluation confirms that the RWS well water subsystem is capable of performing its defense-in-depth and RTNSS functions (as applicable). While Tier 2 FSAR Section 9.2.11 generally discusses the RWS well water subsystem and contingencies that exist for providing makeup for the SWS cooling tower basins, a clearly defined RWS well water subsystem design basis for assuring the defense-in-depth and RTNSS capabilities for the most limiting situations was not provided and measures were not described for assuring the functional capability of the RWS well water subsystem over time, with and without offsite power available. For example:

- The minimum RWS well water subsystem flow rate, water inventory, temperature limitations, and corresponding bases for providing SWS makeup for the two Vogtle units need to be described, and backup power sources for all components need to be identified.

- The suitability of RWS materials for the plant-specific application and measures being implemented to resolve vulnerabilities and degradation mechanisms to assure RWS functionality over time need to be addressed.

- The reliability and capability of the RWS well water subsystem to provide sufficient makeup for the SWS over the life of the plant, including monitoring and periodic surveillance tests that will be performed in this regard, need to be addressed.

- The lack of redundancy for the single well water tank needs to be justified.

- Periodic surveillance testing of the secondary firewater tank clearwell SWS makeup gravity drain valve needs to be described.

SNC Response:

As indicated in FSAR Subsection 9.2.11.1.1, the RWS serves no safety-related function and has no identified RTNSS (Regulatory Treatment of Non-Safety Systems) functions. Failure of the RWS or its components does not affect the ability of safety-related systems to perform their intended function. There are no features or functions of this system credited for mitigation of design basis events. RWS is not credited for long term decay heat removal in the FSAR. Safety-related long term decay heat removal for the AP1000 is achieved through passive plant features only.

The RTNSS is not relevant to RWS and, therefore, measures for assuring the functional capability of the RWS over time do not apply.

Licensing Basis and Design Criteria for RWS are as follows:

1. As stated in NUREG-1793 (FSER), Section 22.5, Westinghouse used the process described in WCAP-15985, Revision 2, dated August 2003 to determine which non-safety-related systems in the AP1000 should be subject to regulatory treatment and under what conditions that treatment should apply. As described by the AP1000 DCD and approved by the NRC, the RWS was not identified as a system requiring regulatory treatment. Therefore, no additional evaluation of the RWS is required.

2. In addition, as stated in the AP1000 DCD, Tier 1, Section 4.0, no Tier 1 interfaces were identified for any systems outside the design certification scope of the AP1000 standard plant design. Therefore, the RWS does not require special treatment. Also, Tier 2 DCD Revision 16, Table 3.2-3, Sheet 29 of 65 identifies the raw water system as Class E. Per DCD Table 3.2-1, systems identified as Class E (Other) have no special design requirements.

ITAAC:

Per FSAR Subsection 14.3.2.3.3, this site-specific system (i.e., RWS) does not meet the ITAAC selection criteria. ITAAC screening was performed for the RWS, which concluded that ITAAC is not applicable as indicated in FSAR Table 14.3-201.

Initial Test Program Provisions:

Initial test requirements for the RWS are included in FSAR Section 14.2.9.4.24. The raw water system component and integrated system performance is observed to verify that the system functions as described in FSAR Subsection 9.2.11 and in applicable design specifications. The individual component and integrated system tests include:

a. Operation of the system pumps, traveling screens, automatic strainers, and valves is verified.

b. Operation of the system instrumentation, controls, actuation signals, alarms, and interlocks is verified.

c. Operation of heat tracing on system piping is verified.

Technical Specifications:

No specific Technical Specifications are required for the RWS and none are applicable. Technical Specifications for the AP1000 are provided in FSAR Chapter 16, DCD Section 16.1 and were evaluated by the NRC in NUREG-1793 (FSER), Chapter 16.

Availability Controls:

There are no availability controls for the RWS and they are not required, based on the RTNSS evaluation in NUREG-1793 (FSER) Chapter 22 and WCAP-15985, Rev 2. Also, FSAR Chapter 16 and DCD Chapter 16 do not identify any availability requirements for RWS.

Standard Review Plan Requirements

The scope of SRP Section 9.2.1 Service Water System (SWS) review is not applicable to RWS for the following reasons:

1. RWS does not supply essential cooling water to safety-related equipment.

2. There is no safety-related function associated with the RWS and it does not have equipment required to prevent or mitigate the consequences of postulated accidents.

The scope of SRP Section 9.2.5 Ultimate Heat Sink (UHS) review is not applicable to the RWS for the following reasons:

1. RWS water supply is not credited as a water source required for dissipating reactor decay heat and essential station heat loads. Therefore, the RWS is not part of the UHS.

2. There is no safety-related function associated with the RWS.

System Description

FSAR 9.2.11.1.2 provides a list of functions supported by the RWS.

RWS Interface with SWS

As described in FSAR 9.2.11, the well water subsystem of the RWS provides normal makeup to the SWS cooling towers to replace inventory lost to evaporation, drift and blowdown. The RWS ensures a high level of reliability for the makeup function through a design that utilizes a reliable water source, and diversity in delivery equipment and power supplies.

The standard plant design of the Service Water System includes water inventory to assure operation without normal makeup. As discussed in AP1000 DCD Section 9.2.1.2.2 and depicted on DCD Figure 9.2.1-1 and Figure 9.5.1-1, Sheet 1, SWS inventory is stored in the upper portion of the secondary fire water tank, and in the SWS cooling tower basin. As described in Westinghouse RAI-SRP9.2.1-SBPA-03, these sources support a minimum of 24 hours of decay heat removal operation without the availability of the normal makeup supply from RWS.

As shown on Table 2.4.1-10 of the Vogtle Early Site Permit (ESP) Application, Part 2 – Site Safety Analysis Report (SSAR), the maximum makeup requirement for the service water systems in both units is 2,353 gpm (1,177 gpm per unit). Note that this value was a conservative value that was developed for the Vogtle ESP Application. Based on current Westinghouse AP1000 design data the maximum makeup requirement for the service water system for both units is 1,660 gpm (830 gpm per unit), which includes a blowdown flow of 205 gpm per unit. This flow represents a design maximum as it would occur four hours after a simultaneous shutdown of both units, when the maximum SWS heat load is encountered at the beginning of cooldown. The flow rate is very conservative as the decay heat load decreases during cooldown with an accompanying decrease in makeup requirements.

As discussed in FSAR Subsection 9.2.11.2, and shown on FSAR Figure 9.2-201, Sheet 2 of 2, the RWS well water subsystem is supplied by two deep wells. The wells are located a minimum of 1000 feet apart. The well water pumps discharge to a common well water storage tank with a minimum storage capacity of 300,000 gallons. The well water storage tank is a passive component and is designed to industry standards (AWWA D100), and does not support any safety-related or RTNSS functions as discussed above, therefore, no redundant tank has been provided. Four well water transfer pumps, each with a capacity of 750 gpm, are provided to distribute well water to the various demands, including SWS cooling tower makeup.

Power to the RWS well water subsystem is provided by the Offsite Retail Power System (ZRS). A dedicated package diesel generator provides power to the well water pumps, the well water transfer pumps and required supporting equipment in the event of a loss of normal power.

VEGP will utilize the inventory in the secondary fire water tanks only in the unlikely event that the RWS well water subsystem is not available. The RWS well water subsystem is capable of supporting peak heat removal from the SWS cooling towers continuously for an indefinite period using the groundwater from the aquifer.

The RWS well water subsystem design for VEGP has diversity in delivery equipment and power supplies to ensure the availability of the makeup to the SWS cooling towers. There are two well water pumps, each with a design flow rate of 1500 gpm. In the event of a pump failure a single well water pump is sufficient to provide SWS makeup to both units by adjusting the blowdown rate as required. There are four 750 gpm capacity well water transfer pumps. A failure of one well water transfer pump leaves 2,250 gpm of pumping capacity which is more than adequate to provide for SWS makeup. It should also be noted that an RWS flow of approximately 108 gpm will provide sufficient makeup to account for evaporation and drift losses from the SWS cooling tower following the first 28 hours of a loss of offsite power (LOOP) scenario. This would equate to 216 gpm for two units. This value is well below the 1,500 gpm capability of a single well water pump and 750 gpm capacity of a single well water transfer pump. Therefore, as stated in FSAR Section 9.2.11.3.2, one well water pump and one well water transfer pump will support both units in a LOOP scenario.

The RWS well water subsystem is designed with sufficient component redundancy to address normal and extended makeup requirements for the SWS cooling towers. The design of the well water pumps and the well water transfer pumps can accommodate a component failure. The pump design flows are substantially larger than the peak makeup demands for the SWS cooling towers to provide margin for performance degradation over time. In the case of the secondary fire water tank, makeup water is provided through gravity feed. Should normal power be lost to the well water subsystem, a diesel backup power supply is provided to ensure makeup flow can be maintained to the SWS cooling towers.

No COLA revisions have been identified associated with this response.

NRC RAI Number 09.02.01-3:

As specified by 10 CFR 20.1406, COL applicants are required to describe how facility design and procedures for operation will minimize the generation of radioactive waste and contamination of the facility and environment, and facilitate eventual plant decommissioning. Although the RWS has no interconnections with any systems that contain radioactive fluids, industry experience has shown that this alone may not be sufficient to prevent the RWS from becoming contaminated. For example, unplanned leaks or release of contaminated fluids as a result of component failures or transport, drainage problems in contaminated areas, and the migration of contamination through soils and other porous barriers over time have caused systems and areas of the plant that are not directly connected with contaminated systems to become contaminated. Therefore, additional information is needed to describe design provisions and other measures that will be implemented to satisfy the requirements specified by 10 CFR 20.1406 requirements, including measures that will be implemented to monitor the RWS for contamination and corrective actions that will be taken to eliminate any radioactive contamination that is identified. Regulatory Guide (RG) 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning," provides guidance that may be used for addressing the requirements specified by 10 CFR 20.1406.

SNC Response:

As described in FSAR Subsection 9.2.11, the raw water system (RWS) provides river water for makeup to the natural draft circulating water system (CWS) cooling tower basins and provides an alternate source of dilution water to the blowdown sumps for dilution of liquid radwaste (WLS) when the CWS blowdown

is unavailable. The RWS also supplies well water for makeup to the service water system (SWS) cooling tower basins and provides water to the fire protection system (FPS) fire water tanks, the demineralized water treatment system (DTS), potable water system (PWS) and the yard fire water system (YFS). The RWS also supplies well water to the CWS pumps for lubrication and cooling and provides well water for miscellaneous uses such as equipment washdown.

Potential failures of the plant systems causing external and internal flooding are described in DCD Tier 2, Section 3.4 and potential sources that could transport contaminants to the RWS are monitored per DCD Tier 2, Section 11.5 as described below.

As described in DCD Section 11.5, the radiation monitoring system (RMS) provides plant effluent monitoring, process fluid monitoring, airborne monitoring and continuous indication of the radiation environment in plant areas where such information is needed.

The RMS is designed to support the requirements of 10 CFR 20.

AP1000 Features Applicable to 10 CFR 20.1406:

In support of Combined License Application pre-application activities, Westinghouse has submitted to the NRC the report, AP1000 Standard Combined License Technical Report APP-GW-GLN-098, Revision 0 "Compliance with 10 CFR 20.1406," dated April 10, 2007. This report summarizes the design approach and features incorporated into the AP1000 standard plant design that demonstrate compliance with 10 CFR 20.1406. The plant features described in this report will minimize contamination and radioactive waste generation for the AP1000 design.

As discussed below, contamination of the RWS piping is not plausible based on the RWS design and the configuration relative to potential sources of contamination. No unique design provisions or other features are required for RWS compliance with 10 CFR 20.1406.

Groundwater Transport:

Accidental releases of radioactive liquid fluids in ground and surface waters are addressed in Subsection 2.4.13 of the Vogtle Early Site Permit (ESP) Site Safety Analysis Report (SSAR). In accordance with the discussion, any releases from the AP1000 power block to groundwater would tend to flow northward towards Mallard Pond. Per ESP SSAR Subsection 2.4.13.1.2.1, the postulated release is assumed to occur at the lowest level of the auxiliary building which has a floor elevation of approximately 186.5. It is also noted in this subsection that the floor elevation is approximately 25 to 35 feet above the groundwater table. As discussed, the groundwater flow in the water table aquifer is primarily horizontal.

The only buried RWS piping which is located directly north of the power block is a short portion of the RWS well water subsystem supplying well water demands in the turbine building. The buried elevation of this piping is several feet above the auxiliary building lower floor elevation and well above the groundwater table. The various well water demands, especially makeup to the SWS cooling tower basins, require the system to be in almost constant operation, even during plant outages. Because of this, the piping is almost constantly pressurized. Therefore, migration of any potential contamination from the power block into the piping is considered very unlikely.

RWS well water makeup wells are located well to the south of the power block and are screened in the Cretaceous aquifer which is located below the Blue Bluff Marl. The Cretaceous aquifer is considered to be confined because of the low permeability of the Blue Bluff Marl (Ref. ESP SSAR Subsection 2.4.13). Therefore, in the unlikely event of a radioactive fluids release into the groundwater above the Blue Bluff Marl, contamination of the RWS well water subsystem is considered to be very unlikely.

Interfaces with other Plant Systems

The RWS has no interconnection with any systems that contain potentially radioactive fluids as indicated in FSAR Subsection 9.2.11.1.1 and shown in FSAR Figure 9.2-201, Sheets 1 and 2. The RWS operates at a higher system pressure than those systems that it directly interfaces with and therefore, in-leakage is not feasible when the system is in operation. During normal operations, the interfacing systems for the RWS river water subsystem are CWS and the WWS (at the blowdown sumps). The interfacing systems for the RWS well water subsystem are the SWS, FPS fire water tanks, DTS, PWS and YFS. The CWS, SWS, FPS, DTS, PWS and YFS do not have any interfaces with radioactive systems.

As previously discussed, the RWS river water subsystem supplies an alternate source of dilution water to the waste water system (WWS) for use in diluting the WLS effluent stream. To accomplish this, branch lines from the river water supply piping provide water to the WWS blowdown sump. The blowdown sump is an atmospheric sump that is located near the top of the bluff overlooking the Savannah River. The discharge from the blowdown sump is directed to the river via an outfall pipe that discharges the water by gravity to the river. The WLS connection to the outfall piping is located at an elevation approximately 100 feet below the elevation of the blowdown sump. The outfall piping has no valves located between the blowdown sump and the river. Contamination of the RWS piping via the WLS piping is considered not credible because of the differential head between the RWS and the WLS connection because the flow is in the opposite direction.

Conclusion:

Because the buried RWS piping is located above groundwater pathways and the source water for the RWS well water subsystem is from a confined (Cretaceous) aquifer, and because the RWS operating pressure is above the SWS and CWS pressures, contamination of the RWS is considered not plausible; therefore, no contamination is postulated. No unique design provisions or other measures are required for RWS compliance with 10 CFR 20.1406 and no provisions to monitor the RWS system for contamination are provided.

No COLA revisions have been identified associated with this response.