Progress Energy

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

SHEARON HARRIS NUCLEAR POWER PLANT, UNITS 2 AND 3
DOCKET NOS. 52-022 AND 52-023
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 052 RELATED TO RAW WATER SYSTEM

Reference: Letter from Tanya Simms (NRC) to James Scarola (PEC), dated December 30, 2008, "Request for Additional Information Letter No. 052 Related to SRP Section 09.02.01 for the Harris Units 2 and 3 Combined License Application"

Ladies and Gentlemen:

Progress Energy Carolinas, Inc. (PEC) hereby submits our response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) provided in the referenced letter.

A response to the NRC RAIs is addressed in the enclosure. Enclosure 1 also identifies changes that will be made in a future revision of the Shearon Harris Nuclear Power Plant Units 2 and 3 (HAR) application.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (919) 546-6107.

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

Executed on February 13, 2009.

Sincerely,

Garry D. Miller
General Manager
Nuclear Plant Development

Enclosure

cc : U.S. NRC Director, Office of New Reactors/NRLPO
U.S. NRC Office of Nuclear Reactor Regulation/NRLPO
U.S. NRC Region II, Regional Administrator
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**Shearon Harris Nuclear Power Plant Units 2 and 3
Responses to NRC Request for Additional Information Letter No. 052 Related to SRP Section 09.02.01 for the Combined License Application, dated December 30, 2008**

NRC RAI #	Progress Energy RAI #	Progress Energy Response
09.02.01-6	H-0397	Response enclosed – see following pages
09.02.01-7	H-0398	Response enclosed – see following pages
09.02.01-8	H-0399	Response enclosed – see following pages

NRC RAI No.: HAR-RAI-LTR-052

NRC Letter Date: December 30, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 09.02.01-6

Text of NRC RAI:

In accordance with 10 CFR 50, Appendix A, General Design Criterion (GDC) 2, "Design Basis for Protection Against Natural Phenomena," GDC 4, "Environmental and Dynamic Effects Design Bases," and NRC policy considerations for passive plant designs, the staff confirms that raw water system (RWS) failures are not expected to adversely affect structures, systems, and components (SSCs) that are safety-related or designated for Regulatory Treatment of Non-Safety Systems (RTNSS), impact the control room, or result in excessive releases of radioactivity to the environment.

Although Final Safety Analysis Report (FSAR) Section 9.2.11.1.1, "Safety Design Basis," states that failures of the RWS will not affect the ability of safety-related systems to perform their intended functions, more detailed information is needed to adequately describe the consequences of RWS failures and to explain why safety-related SSCs are not affected. Likewise, additional information is needed to explain why a failure of the RWS will not adversely affect RTNSS systems and components or impact the control room, or result in an unacceptable release of radioactive material to the environment. Because the applicant did not adequately address these considerations, the staff is unable to confirm compliance with GDC 2, GDC 4, and NRC policy considerations that apply to passive plant designs. Therefore, FSAR Section 9.2.11 needs to be revised to address the impact of RWS failures accordingly, including development of plant-specific inspections, tests, analyses, and acceptance criteria; test program provisions; Technical Specifications; and availability controls as appropriate.

PGN RAI ID #: H-0397

PGN Response to NRC RAI:

The potential failures of the Raw Water System (RWS) and the corresponding impact on structures, systems, and components that are safety-related or AP1000 equipment Class D are described below.

<u>Failure of RWS piping in yard areas</u>

The RWS does not directly interface with any safety-related system. The RWS does interface with the Fire Protection System (FPS), Service Water System (SWS), Circulating Water System (CWS), Potable Water System (PWS), and Demineralized Water Treatment System (DTS). The piping is routed underground from the intake structure to the points of interface. The significant above ground portions of the RWS are at the intake structure, at the CWS cooling tower basin, and at the RWS filters. Underground branch lines provide alternate dilution flow to the CWS blowdown piping. This piping is not routed in close proximity to any safety-related systems, structures, or components. The only RTNSS system it is in close proximity to is the SWS. A resultant flood from a break in the RWS piping is bounded by the analysis for a break in the CWS piping. DCD Subsection 3.4.1.1.1 indicates that a failure of the CWS cooling tower, the SWS piping, or the CWS piping 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 AP1000 Class D structures, systems, or components.

Failure of RWS piping inside the Turbine Building

Short runs of RWS piping are routed outside in the yard area and inside the turbine building to the interface points with the SWS and DTS systems, respectively. The RWS-to-DTS interface is upstream of the DTS filters and DTS feed pumps. The primary source of flooding would be from the RWS water that discharges through the break prior to securing the RWS pumps. A break in the RWS piping to the DTS or the SWS is bounded by a break in the CWS piping. As discussed in DCD Subsection 3.4.1.2.2.3, the bounding flooding source inside the Turbine Building is a break in the CWS piping. Flow from any postulated pipe failures above DCD elevation 100'-0" (NGVD29 elevation 261'-0") would travel 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 SWS components on elevation 100'-0" which provide 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 RTNSS systems, structures, or components.

The RWS-to-SWS interface is at the SWS makeup control valve V009, as shown in DCD Figure 9.2.1-1. The SWS piping is routed from the control valve V009 to the top of the SWS cooling tower basin. There is an air gap between the SWS cooling tower basin water level and the discharge. The air gap ensures any break upstream of the raw water makeup water path will not result in the draining of the SWS cooling tower basin.

No chemical treatment is anticipated for the HAR RWS. Therefore, there are no chemical releases associated with RWS that could adversely impact control room habitability.

As noted in the response to RAI 09.02.01-5, Subsection 2.4.13 of the FSAR presents a conservative analysis of the effect of an accidental release of liquid effluents to the ground water environment through the postulated failure of the liquid waste system effluent hold-up tank. As noted in FSAR Subsection 2.4.13.1.5, the most probable groundwater pathway is a release to the surficial aquifer where activity flows to the Main Reservoir. FSAR Subsection 2.4.13.1.5 concludes the activity concentrations at the intake structure of a postulated hold-up tank failure are 14 percent of the effective dose equivalent allowed by 10 CFR 20.

The response to RAI 09.02.01-5 further notes the RWS has no interconnection with any system that contains potentially radioactive fluids. The RWS operates at a higher system pressure than those systems with which it directly interfaces (at the point of interface) and, therefore, in-leakage is not feasible. Thus, the possibility of releasing radioactivity from the RWS is remote.

In summary, failure of the RWS or its components will not affect the ability of any other safety-related systems to perform their intended safety functions nor will it adversely affect any RTNSS systems. Postulated breaks in the RWS piping will not impact safety-related components because the RWS is not located in the vicinity of any safety-related equipment and the water from the postulated break will not reach any safety-related equipment, result in impact to the control room, or result in a release of radioactivity to the environment.

Because the RWS is not safety-related and its failure does not lead to the failure of any safety-related systems, the requirements of GDC 2 and 4 and the guidance of SRP 9.2.1, regarding safety-related systems, do not apply.

RWS piping and structures are designed and constructed in accordance with nationally recognized codes and standards (such as ASME B31.1, AWWA, and IBC). Design features have been included (such as the use of buried piping and heat tracing) to ensure RWS is reliable and will be available to support normal plant operation and shutdown functions.

As noted in FSAR Subsection 14.3.2.3.3, this site-specific system (RWS) does not meet the ITAAC selection criteria. ITAAC screening was performed for the RWS, using the screening criteria of FSAR Subsection 14.3.2.3, which concluded that ITAAC is not applicable as indicated in FSAR Table 14.3-201.

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 NRC in the FSER (NUREG-1793), Chapter 16.

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

No change to the FSAR is proposed as a result of this response. The revised FSAR Subsection 9.2.11 is provided as part of the response to RAI 09.02.01-7, and addresses the information discussed in the response to this RAI as appropriate, consistent with NRC guidance provided in Regulatory Guide 1.206, Section C.III.

Associated HAR COL Application Revisions:

None.

Attachments/Enclosures to Response to NRC:

None.

NRC RAI No.: HAR-RAI-LTR-052

NRC Letter Date: December 30, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 09.02.01-7

Text of NRC RAI:

The raw water system (RWS) is relied upon for achieving and maintaining cold shutdown conditions which is necessary for satisfying Technical Specification requirements. In accordance with NRC policy considerations for passive plant designs, non-safety related active systems that are relied upon for achieving and maintaining cold shutdown conditions (i.e., transitioning from Mode 4 to Mode 5) should be highly reliable and able to accommodate single active failures without a loss of the cooldown capability that is needed. The staff found that Section 9.2.11 of the Final Safety Analysis Report (FSAR) does not provide a clearly defined design basis with respect to the RWS cooldown function, and the reliability and capability of the RWS to perform this function for the most limiting situations were not adequately described and addressed. For example, the minimum RWS flow rate, water inventory, temperature limitations, and corresponding bases for providing SWS makeup for the two Shearon Harris units were not described. Also, 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 were not addressed. Consequently, Section 9.2.11 of the FSAR needs to be revised to properly describe and address the RWS design bases in this regard and to include design specifications that are necessary to ensure the reliability and capability of the RWS to perform its cooldown function. The following guidance is generally applicable and should be considered as appropriate when revising the FSAR in response to this question:

a. The design bases should specifically recognize and describe cold shutdown functions that are credited, and applicable design considerations that pertain to these functions should be specified, such as reliability, redundancy, backup power, etc. Other parts of the DCD should not be referred to in lieu of providing a complete description of the design-bases in FSAR Section 9.2.11.
b. The system description should explain how the applicable design-bases considerations referred to in (a) are satisfied. For example:
   - the minimum required system functional capability and the bases for this determination should be described (note that a minimum of seven days worth of on-site water inventory should be available for reactor decay heat removal and spent fuel cooling);
   - the description should explain how design-bases considerations are satisfied;
   - the guidance in SRP Sections 9.2.1 and 9.2.5 that are relevant for ensuring the capability and reliability of the RWS to perform its design-bases functions should be considered and addressed as appropriate (materials considerations, net positive suction head, waterhammer, etc.);
   - operating experience considerations that pertain to the capability and reliability of the system to perform its design-bases functions needs to be addressed (note that the relevance of operating experience is independent of safety classification considerations);
   - in order to demonstrate adequate reliability, the system design should include (among other things) the capability of all necessary components (pumps, valves,

strainers, instrumentation and controls, etc.) to function during a loss of off-site power and redundancy for single active failure vulnerabilities;
- dual-unit considerations need to be addressed.

c. Major components and features that are important to ensure the capability and reliability of the system to perform its cooldown function should be described. Applicable industry codes and quality group designations that are commensurate with plant-specific RWS reliability considerations should be specified and reflected in Chapter 3, "Design of Structures, Components, Equipment, and Systems." Note that this may be different from what is specified for the standard plant design since it was based solely on regulatory treatment of non-safety systems considerations and did not include consideration of the cooldown function.
d. System design parameters that are important for performing the cold shutdown function should be specified, such as water inventory, flow rate, nominal pipe sizes, limiting flow velocities, and design temperatures and pressures.
e. The RWS operating modes for performing its cold shutdown function should be described, such as interlocks, protective features, and automatic action.
f. Limitations on the capability of the RWS to perform its cold shutdown function should be described, such as minimum required water inventory and temperature restrictions that apply.
g. Instrumentation (e.g., indication, controls, interlocks, and alarms) that are relied upon by plant operators in the main control room and at the remote shutdown panels for performing cooldown functions should be described.
h. System diagrams should show division designations, flow paths, major components and features, nominal pipe sizes, and instrumentation that is relied upon to ensure proper operation of the system by operators in the main control room and at the remote shutdown panels.
i. The more important periodic inspections that will be completed and specified frequencies for ensuring the capability and reliability of the system should be described. For example, design provisions and actions that will be implemented to periodically assess the condition of buried or otherwise inaccessible piping and components should be described.
j. The more important periodic tests that will be completed and specified frequencies for ensuring the capability and reliability of the system should be described. For example, periodic testing of pumps, valves, self-cleaning strainers, and vacuum breakers should be described.
k. Based on the Tier 2 description, plant-specific ITAAC should be established that are appropriate and sufficient for certifying the design of the RWS.
l. The initial test program should test all modes of RWS operation that are credited for performing its cooldown function and confirm acceptable performance for the most limiting assumptions. For example, confirmation that net positive suction head requirements are satisfied for minimum pump suction head and maximum water temperature conditions with all pumps running at full flow, and that waterhammer will not occur during situations when voiding is most likely to occur should be specified. It should be clear from the information provided in Section 9.2.11 of the FSAR what constitutes acceptable performance.

PGN RAI ID #: H-0398

PGN Response to NRC RAI:

As described in FSAR Subsection 9.2.11, the Raw Water System (RWS) provides a continuous supply of water from the Harris Reservoir for several plant services, including circulating water system fill and makeup, service water system (SWS) fill and makeup, demineralized water treatment system feed, and potable water storage tank fill and makeup. However, this response specifically focuses on the RWS interface with the SWS. This is because, as noted in the response to RAI 09.02.01-6, the other functions performed by RWS do not have a direct interface with any other system identified within the AP1000 which is safety-related, designated for Regulatory Treatment of Non-Safety Systems (RTNSS), or designated as AP1000 Class D.

The RWS provides a water fill/makeup function for the SWS. SWS has investment protection short-term availability controls as described in DCD Table 16.3-2 which are applicable in Mode 5 with the RCS pressure boundary open and in Mode 6 with the upper internals in place or cavity level less than full. Under these conditions, SWS is directly providing active core cooling and, as noted in the response to RAI 09.02.01-6, was evaluated by Westinghouse and determined to meet the RTNSS criteria as documented in NUREG-1793 and WCAP-15985. Unlike SWS, RWS does not directly provide core cooling and, as discussed in response to RAI 09.02.01-6, was evaluated in WCAP-15985 and determined to not meet the RTNSS criteria and to not require investment protection short-term availability controls.

In the unlikely event of a failure of RWS to provide adequate makeup flow to the SWS cooling tower basins during the short time period in which SWS is performing a RTNSS function as stated above, the remaining inventory in the service water cooling tower basins and the stored water which is available in the upper region of the secondary fire water tank provide ample time (more than 24 hours) to restore the RWS makeup flow or take the procedural actions necessary to exit the conditions for applicability. Therefore, RWS is not a RTNSS system or subject to investment protection short-term availability controls. However, as described below, the RWS is designed to be a highly reliable and robust system capable of operating during a loss of normal ac power to provide RWS makeup flow under normal and abnormal conditions. Procedural controls, which provide for continued operation of the RWS or re-establishment of operations under off-normal conditions, will be contained in operating procedures, where appropriate.

As defined in DCD Subsection 3.2.2.6, a structure, system or component is classified as Class D when:

- The SSC directly acts to prevent unnecessary actuation of the passive safety systems, or
- The SSC supports those SSCs which directly act to prevent the actuation of passive safety systems.

Class D has normally been applied to AP1000 systems, structures and components that perform defense-in-depth functions. While SWS is designated within the DCD as a defense-in-depth, Class D system, RWS is designated as a Class E system. The basis for this classification is:

- In the unlikely event of a failure of the RWS, the inventory in the service water cooling tower basin and available stored inventory in the upper region of the secondary fire water tank ensure that the SWS can maintain the required defense-in-depth cooling functions for an extended period of time.
- A failure of the RWS will not directly cause an actuation of a passive system nor will it initiate the failure of a SSC which directly acts to prevent the actuation of a passive safety system.

As described in DCD Subsection 5.4.7.1.2.1, the Normal Residual Heat Removal System (RNS) in conjunction with its associated support systems, Component Cooling Water System (CCS) and SWS, are used for shutdown heat removal. RWS provides indirect support for this function by providing a source of makeup water to the SWS cooling tower basins to compensate for evaporation, drift, and blowdown.

The RWS provides this makeup water to support the cooling requirements for SWS. During a normal plant cooldown, RNS and CCS reduce the temperature of the reactor coolant system from approximately 350°F to approximately 125°F within 96 hours after shutdown. Each unit's RWS is designed to provide ample makeup flow during these conditions using either the RWS pumps or ancillary raw water pumps. The smaller capacity ancillary raw water pumps provide 2,305 gpm each and the SWS design makeup flow is 800 gpm.

If cooldown to Cold Shutdown (Mode 5) is required within 36 hours to comply with a Limiting Condition for Operation in accordance with the Technical Specifications, heat will be transferred from the reactor coolant system via the steam generators to the main steam system for a longer period of time, allowing RNS to be placed in service at a lower temperature with lower decay heat levels. Because of the reduced RNS heat removal requirements associated with this cold shutdown sequence, the required RWS makeup flow to the SWS cooling towers is less than normal cooldown requirements.

An ample inventory of water is available to provide makeup to the SWS cooling tower basins. As noted in FSAR Subsection 2.4.1.2.1, the Harris Reservoir has a useable storage volume of over 177,000 acre-ft, and has sufficient capacity to support cooldown to cold shutdown conditions and maintain the station in Mode 5 for greater than 7 days.

The underground RWS piping will be high-density polyethylene (HDPE) which is not susceptible to corrosion. Therefore, periodic inspections of the underground RWS piping are not required.

The intake bays at the intake structure will be inspected periodically for silt buildup and cleaned as necessary based on operating experience from the Harris Nuclear Plant, Unit 1. Equipment that remains idle for extended periods of time (pumps, traveling screens, strainers) will be operated periodically in accordance with vendor recommended maintenance practices.

As discussed above, the lack of designation of RWS as RTNSS or Class D indicates there is no performance requirement for the system during a loss of normal ac power or in the event of a single active failure. Nonetheless, RWS is highly reliable based on its design, and a single failure of an active component in RWS would not affect normal plant cooldown. Each RWS pump and each ancillary raw water pump can deliver makeup flow to the SWS cooling tower basins to meet demand during all modes of operation. Failure of an operating pump, discharge valve, traveling screen, or strainer would not prevent the RWS from providing makeup to the SWS cooling towers. Similarly, redundant screen wash pumps service both the RWS pumps and the ancillary raw water pumps. Additionally, the power supplies for the ancillary raw water pumps, discharge valves, strainers, and their associated traveling screens and screen wash pumps are powered from the normal ac power system and have a back-up power supply from the diesel generators. In the event of a loss of normal ac power, the components are manually loaded onto the appropriate diesel bus and are manually started by the operator. The valves associated with flow to the four 50% media filters fail in a position to provide continuous RWS filtered flow. The RWS and ancillary pump discharge valves have handwheels to manually adjust the RWS flow as required. The RWS, therefore, continues to maintain the capability to provide makeup water to the SWS cooling tower basins during the loss of normal ac power events.

As discussed above, in the unlikely event that all RWS flow to the SWS cooling towers is lost, there is ample time to identify and correct the situation or to align alternate sources of water to provide that makeup flow, and RWS is shown to not be a RTNSS system nor subject to investment protection short-term availability controls. It is also important to note that neither the RNS, CCS, SWS, nor RWS are required to establish and maintain the AP1000 plant in a safe shutdown condition, since passive safety-related systems perform that function. This is explicitly recognized throughout the AP1000 DCD and NRC Final Safety Evaluation Report, NUREG-1793.

FSAR Subsection 9.2.11 will be revised to include additional details to address the applicable system attributes provided in (a) through (l) of the RAI. In addition, Attachment 1 has been prepared as a reviewer aid to identify whether the information requested in (a) through (l) is (1) provided in the response to RAI 09.02.01-7 or other RAI responses, (2) provided in the revised FSAR Subsection 9.2.11, or (3) not provided nor addressed. Where the information is not provided nor addressed, a basis for not providing the requested information, or clarification of the information provided, is supplied.

Associated HAR COL Application Revisions:

The following changes will be made to the HAR FSAR in a future amendment:

1. Revise HAR FSAR Subsection 9.2.11 from:

STD DEP 1.1-1 **"9.2.11 RAW WATER SYSTEM**

HAR SUP 9.2-1 The RWS provides water from the Harris Reservoir for makeup to the natural draft and mechanical draft cooling tower basins, to the demineralized water treatment system, potable water storage tank, and the fire protection system fire water storage tank.

9.2.11.1 Design Basis

9.2.11.1.1 Safety Design Basis

The RWS does not serve a safety-related function and therefore, does not have nuclear safety design basis.

Failure of the RWS or its components does not affect the ability of safety-related systems to perform their intended function.

No interconnections exist between the RWS and any potentially radioactive system.

9.2.11.1.2 Power Generation Design Basis

The RWS provides a continuous supply of water from the Harris Reservoir to the following services:

- Circulating water system (CWS) fill and makeup.
- Service water system (SWS) fill and makeup.
- Demineralized water treatment system (DTS) feed.
- Potable water storage tank.

In addition, the RWS performs the following functions:

- Filling of the fire protection system (FPS) fire water storage tanks.

- Providing the water for the main raw water and ancillary raw water pump discharge strainer back washes and for the screen back wash, wash pump suction source.

- Providing an alternate dilution source for liquid radwaste discharge when the CWS cooling tower blowdown is not available.

- Providing alternate makeup to the SWS from the secondary fire water tank clearwell.

9.2.11.2 System Description

9.2.11.2.1 General Description

The RWS is shown in Figures 10.4-201 and 10.4-202. Classification of components and equipment for the RWS is given in Section 3.2.

The source of water for the RWS is the Harris Reservoir.

The raw water pump house for the RWS pumps is located on the Thomas Creek branch of the Harris Reservoir, east of HAR 2 and 3. This structure is common for HAR 2 and 3. The intake structure is equipped with trash racks and traveling screens. The RWS for each unit consists of three RWS pumps, three automatic strainers, two ancillary raw water pumps, and piping to the systems requiring makeup water.

The RWS pumps discharge through strainers and supply water for the services and functions listed in Subsection 9.2.11.1.2.

9.2.11.2.2 Component Description

Trash Racks

Trash racks are installed on the inlet to each traveling screen to prevent large debris in the reservoir from entering the pump bay.

Traveling Screens

Traveling screens at the inlet of each of the main raw water pumps and the inlet of each pair of ancillary raw water pumps provide screening of floating and suspended solids in the reservoir water and minimize entrainment of aquatic life in the water entering the pump bay. The screens are sized so that the through screen velocity is less than 0.15 meters per second (0.5 feet per second) to reduce the impingement mortality of aquatic biota. Buildup of the screens is washed off with low pressure spray water sluiced to the lake. Each traveling screen is powered by an electric motor powered from the normal ac power system.

Screen Wash Pumps

Two screen wash pumps per unit draw strained water from the RWS pump discharge flow and provide spray water to remove debris and fish from the traveling screens for the main raw water pumps. Two screen wash pumps per unit perform the same function for the screens for each pair of ancillary raw water pumps.

RWS Pumps

Three 50% RWS pumps draw water from the Harris Reservoir to supply the required flow for the services and functions listed in Subsection 9.2.11.1.2. The pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system.

Automatic Strainers

The automatic strainers are located in the RWS pump discharge lines. These strainers can handle 100% of the pump discharge flow. Automatic valves facilitate cleaning the strainers by backwashing the strainer. The wash water from the cleaning sequence is discharged to the reservoir. Power for the strainers is provided from the normal ac power system.

Ancillary Raw Water Pumps

Two 100% ancillary raw water pumps are provided to draw water from the Harris Reservoir. One pump provides normal SWS and DTS makeup requirements while the other is on standby. Both pumps provide makeup during maximum SWS heat loads during the cooldown mode. The ancillary RWS pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system. The diesel generators provide backup power for these pumps.

Piping

The piping is designed to accommodate transient effects that may be generated by normal starting and stopping of pumps, opening and closing of valves, or other normal operating events. The system is designed so that high points do not lead to the formation of vapor voids upon loss of system pumping. Air release valves are provided in the makeup discharge piping to vent air on pump start.

9.2.11.3 System Operation

The RWS operates during normal modes of operation, including startup, power operation, cooldown, shutdown, and refueling.

Makeup flow to the CWS is not normally required after the plant is shutdown. . The RWS pumps are not available during a loss of off-site power (LOOP).

9.2.11.4 Safety Evaluation

The RWS does not have a safety-related function and, therefore, does not requiree a nuclear safety evaluation. It dos not have an interconnection with any system that contains radioactive fluids.

9.2.11.5 Tests and Inspections

System performance and structural and pressure integrity of system components is demonstrated by operation of the system, monitoring of system parameters such as flow and pressure, and visual inspections.

9.2.11.6 Instrumentation Applications

Pressure indication, with a low pressure alarm, is provided on the discharges of the RWS and ancillary RWS pumps. A low discharge pressure signal automatically starts the standby pump.

The automatic strainer backwash and flushing cycle is initiated by a timer or on high pressure across the strainer."

To read:

STD DEP 1.1-1 "9.2.11 RAW WATER SYSTEM

HAR SUP 9.2-1 The raw water system (RWS) provides strained water from the Harris Reservoir for makeup to the circulating water system (CWS) natural draft cooling tower basins and strained and filtered water from the Harris Reservoir for makeup to service water system (SWS) mechanical draft cooling tower basins, to the demineralized water treatment system (DTS), to the potable water storage tank, and to the fire protection system (FPS) fire water storage tanks.

9.2.11.1 Design Basis

9.2.11.1.1 Safety Design Basis

The RWS does not serve a safety-related function and therefore does not have a nuclear safety design basis.

Failure of the RWS or its components does not affect the ability of safety-related systems to perform their intended function.

The RWS does not have the potential to be a flow path for radioactive fluids.

9.2.11.1.2 Power Generation Design Basis

9.2.11.1.2.1 Normal Operation

The RWS provides a continuous supply of water from the Harris Reservoir for the following services:

- CWS cooling tower fill, make-up, and blowdown;
- SWS cooling tower fill, make-up, and blowdown;
- DTS feed; and
- Potable water storage tank feed.

In addition, the RWS performs the following functions:

- Filling and makeup of the FPS fire water storage tanks; and
- Providing the water for the main raw water and ancillary raw water pump discharge strainer back washes and for the screen back wash pump suction.

9.2.11.1.2.2 Outage Mode Operation

During plant outages, RWS provides the same continuous supplies as during normal operation with the exception of CWS cooling tower makeup.

The RWS provides inventory and SWS make-up flow to support normal plant cooldown. During this operational sequence, the component cooling water system reduces the temperature of the reactor coolant system from 350°F at approximately 4 hours after reactor shutdown to 125°F within 96 hours after shutdown by providing cooling to the normal residual heat removal system (RNS) heat exchangers.

9.2.11.2 System Description

The RWS is shown in Figures 10.4-201 and 10.4-202.

The source of water for the RWS is the Harris Reservoir.

The raw water pump house for the RWS pumps is located on the Thomas Creek branch of the Harris Reservoir, east of HAR 2 and 3. This structure is common to HAR 2 and 3. The intake structure is equipped with trash racks and traveling screens. The RWS equipment located in the raw water pump house for each unit consists of three RWS pumps and automatic strainers and their drivers, two diesel-backed ancillary raw water pumps and strainers and their drivers, screen wash pumps and drivers for the traveling screens, electrical power feed equipment, and appropriate instrumentation and controls for the system to allow remote operation from the main control room. Each RWS pump is located in a separate intake bay and has the capacity to provide 50% of the maximum raw water demand for a single unit. The RWS pumps can also be used during outages to provide alternate dilution flow for WLS discharge if dilution flow requirements are high. Each ancillary raw water pump is located in a separate intake bay. The ancillary raw water pumps are each sized to provide maximum design flow during outage conditions. The ancillary pumps also provide an alternate dilution flow for WLS discharges if dilution flow requirements are low.

The underground RWS piping will be high-density polyethylene (HDPE) which is not susceptible to corrosion. The RWS piping is designed to ASME Standard B31.1.

The flowpath for the functions described in the power generation design basis is from the Harris Reservoir, through the trash racks and intake screens and into the raw water supply pumps. The pumps discharge through strainers into a common header for each unit. The common discharge header provides suction for the RWS and ancillary raw water screen wash pumps.

Four media filters are upstream of the distribution headers for the SWS cooling tower makeup, the DTS feed, the fire water storage tanks, and the potable water storage tank. Each is sized to pass 50% of the maximum demand from those systems.

9.2.11.3 Component Description

<u>Intake</u>

The raw water intake structure supports the pumps and related equipment (i.e., intake screens, screen wash pumps, etc.) for the RWS. The intake structure has five (5) separate intake bays for each unit, one for each RWS pump and ancillary raw water pump. Each of the intake bays is equipped with a traveling screen and one steel bar/trash rack assembly.

As discussed in FSAR Subsection 2.4.7, historical temperature measurements indicate that ice formation on large bodies of water in Central North Carolina is expected to be limited to minor freezing along shorelines. Harris Lake is also a protected body of water. Therefore, the potential that ice jams, frazil ice formation, or floating debris would prevent the RWS makeup to SWS is remote.

Trash Racks

Trash racks are installed on the inlet to each intake bay, upstream of the traveling screens, to prevent large debris in the reservoir from entering the intake bay.

Traveling Screens

Traveling screens are located upstream of the main and ancillary raw water pumps in each intake bay. Buildup of debris on the screens is washed off with low pressure spray water sluiced to the Harris Reservoir. Each traveling screen is powered by an electric motor fed from the normal ac power system. The traveling screen assemblies for the ancillary raw water pumps have backup power feed from the diesel generators.

RWS Pumps

Three 50% capacity RWS pumps draw water from the Harris Reservoir to supply the required flow for the services and functions listed in Subsection 9.2.11.1.2. The pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system. The length of each pump barrel is sized to meet the minimum submergence and net positive suction head requirements for the pump during low water level conditions in Harris Reservoir. The standby pumps are normally isolated from the discharge header by a motor-operated valve. On a loss of normal ac power, the motor-operated valves can be manually opened or closed as required. Each pump is equipped with a pressure transmitter on the discharge piping that alarms in the control room on a low pressure condition. To start the standby pump, the operator opens the isolation valve and starts the pump. During plant outages, one RWS pump may be used to provide dilution flow for WLS discharge if the dilution flow requirements are high.

Ancillary Raw Water Pumps

Two 100% capacity ancillary raw water pumps are provided to draw water from the Harris Reservoir. One pump provides normal makeup requirements for the services and functions listed in Subsection 9.2.11.1.2 with the exception of CWS cooling tower makeup. One ancillary pump is on standby. The ancillary RWS pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system. The diesel generators provide backup power for these pumps and their discharge valves. The length of each pump barrel is sized to meet the minimum submergence and net positive suction head requirements for the pump during low water level conditions in Harris Reservoir. The standby pump is normally isolated from the discharge header by a motor-operated valve. The motor operated valves can be manually opened or closed as required. Each pump is equipped with a pressure transmitter on the discharge piping that alarms in the control room on a low pressure condition. To start the standby pump, the operator opens the isolation valve and starts the pump. During plant outages, one ancillary raw water pump may be used to provide dilution flow for WLS discharge if the dilution flow requirements are low.

Screen Wash Pumps

Two screen wash pumps per unit draw strained water from the RWS pump discharge flow and provide spray water to remove debris and fish from the traveling screens for the main raw water pumps. Two screen wash pumps per unit perform the same function for the screens for each pair of ancillary raw water pumps. Both sets of screen wash pumps are powered by electric motors fed from the normal ac power system. The screen wash pumps for the traveling screens supporting the ancillary raw water pumps have backup power feeds from the diesel generators.

Automatic Strainers

The automatic strainers are located in the RWS pump discharge lines and in the discharge lines of the ancillary raw water pumps. These strainers can handle 100% of the pump discharge flow. Automatic valves facilitate cleaning the strainers by backwashing the strainer. The wash water from the cleaning sequence is discharged to the reservoir. Power for the strainers is provided from the normal ac power system. The strainers for the ancillary raw water pumps have a backup power feed from the diesel generators.

Media Filters

Four 50% capacity media filters are located upstream of the supply feeds to the SWS cooling towers, the DTS, the fire water storage tanks, and the potable water storage tank. Flow transmitters in the supply piping detect plugging and timers control backwash. The valves for normal and backwash flow fail in a normal flow position to maintain flow through the system.

Piping

The discharges of the RWS pumps and ancillary raw water pumps are routed to a common header for each unit. Discharge check valves on the RWS pumps and ancillary raw water pumps limit reverse flow in the piping if pumps are tripped and restarted and the subsequent transient effects. A check valve between the RWS pump discharge header and the ancillary raw water pump discharge header prevents backflow to the CWS cooling tower basin when an ancillary raw water pump is operating. A normally closed, manual bypass valve is provided around the check valve for operational flexibility. The piping is designed to accommodate transient effects that may be generated by normal starting and stopping of pumps, opening and closing of valves, or other normal operating events. The system is designed so that high points do not lead to the formation of vapor voids upon loss of system pumping. Air release valves are provided in the piping at the pump discharges to vent air on pump start.

Valves

Motor operated valves are located on the discharge of each RWS and ancillary raw water pump. They are supplied from the normal ac power system in each unit. The discharge valves for the ancillary raw water pumps have backup power feed from the diesel generators. The RWS pump valves are motor-operated and are designed to fail "as-is" during a loss of normal ac power condition. Handwheels on the valve operators allow positioning of the valves locally.

9.2.11.4 System Operation

The RWS operates during normal modes of plant operation, including startup, power operation (full and partial loads), cooldown, shutdown and refueling. Makeup flow to the CWS is not normally required after the plant is shutdown. The RWS pumps are not available during a loss of normal ac power but the ancillary raw water pumps have a backup power supply from the diesel generators and provide normal system interface makeup requirements with the exception of CWS cooling tower makeup. The RWS is used to fill the CWS and SWS cooling tower basins.

9.2.11.4.1 Plant Startup

During plant startup, one ancillary raw water pump supplies strained water to the CWS cooling tower basin to fill the CWS piping and to replace evaporative losses as the CWS cooling tower is placed into operation. The ancillary raw water pump also provides strained water to the media filters for treatment before being directed to the potable water storage tank, to the fire water storage tank, to the DTS, and to the SWS cooling tower basin.

9.2.11.4.2 Power Operation

During normal operation, two RWS pumps normally supply strained water to the CWS cooling tower basin and to the media filters with one RWS pump remaining in standby. After filtration, the raw water is directed to the SWS cooling tower basin, to the DTS, to the potable water storage tank, and to the fire water storage tanks on an as-needed basis.

9.2.11.4.3 Plant Cooldown/Shutdown

The plant cooldown/shutdown operation uses the same system alignment as with normal power operation. As the plant approaches cold shutdown and the heat rejection from the CWS cooling tower decreases, one RWS pump will be stopped and placed in standby. System operation will be transferred to one of the ancillary raw water pumps when system demand has decreased sufficiently. The other ancillary raw water pump will remain in standby.

9.2.11.4.4 Refueling

During refueling, one ancillary raw water pump provides the required RWS supply with one ancillary raw water pump in standby. A higher capacity RWS raw water pump may be used for dilution of WLS discharge if the dilution capacity requirement is high.

9.2.11.4.5 Loss of Normal AC Power Operation

In the event of a loss of normal ac power, the ancillary raw water pumps, valves, strainers, backwash pumps, traveling screens, and the instrumentation associated with pump discharge pressure indication, intake bay level, and screen wash pump discharge pressure are loaded onto their assigned diesel buses. The pumps, strainers, and traveling screens are restarted from the control room. The valves for the media filters fail in the position that maintains the discharge flow, so the condition does not affect the position of automatic valves.

The flow control valve on the make-up line to the service water cooling towers, which is scoped within the service water system, isolates on a loss of normal ac power. The major piping runs are underground which, together with the check valves on the discharge of the RWS and ancillary raw water pumps, prevents the formation of voids in the make-up line and transient water hammer conditions when the pumps are restarted.

9.2.11.5 Safety Evaluation

The RWS does not have a safety-related function and, therefore, does not require a nuclear safety evaluation.

The RWS does not have the potential to be a flow path for radioactive fluids. The RWS operates at a higher system pressure than those systems with which it directly interfaces (at the point of interface) and, therefore, in-leakage is not feasible. The WLS discharge effluent is connected to the CWS cooling tower blowdown pipe downstream of the RWS interface. Per DCD 11.2.3.3, the WLS effluent is released offsite through a dilution flow stream. Dilution flow is routed from RWS to the CWS cooling tower blowdown during shutdown conditions. During normal power operation, the CWS circulating water pumps provide dilution flow to the cooling tower blowdown pipe. Contamination of the RWS is not possible since the WLS effluent enters the blowdown pipe downstream of the RWS interface.

9.2.11.6 Tests and Inspections

Initial test requirements for the RWS are described in Subsection 14.2.9.4.24. System performance and structural and pressure integrity of system components are demonstrated by operation of the system, monitoring of system parameters such as flow and pressure, and visual inspection.

9.2.11.7 Instrumentation Applications

The traveling screens and strainers are equipped with level transmitters to identify malfunctions. Trouble alarms are used by the control room to identify component failures and initiate actions.

Power actuated valves in the RWS are provided with valve position indication instrumentation.

A pressure transmitter, with high and low level alarms, is provided for the discharge of each RWS and ancillary raw water pump. Information is used by the control room to identify component failures and initiate actions.

Flow instrumentation is provided on the inlet to the media filters to identify conditions affecting the operation of the components."

2. Replace Figure 10.4-201, Revision 0, with Figure 10.4-201, Revision 02-10-09

3. Replace Figure 10.4-202, Revision 0, with Figure 10.4-202, Revision 02-10-09

Attachments/Enclosures to Response to NRC:

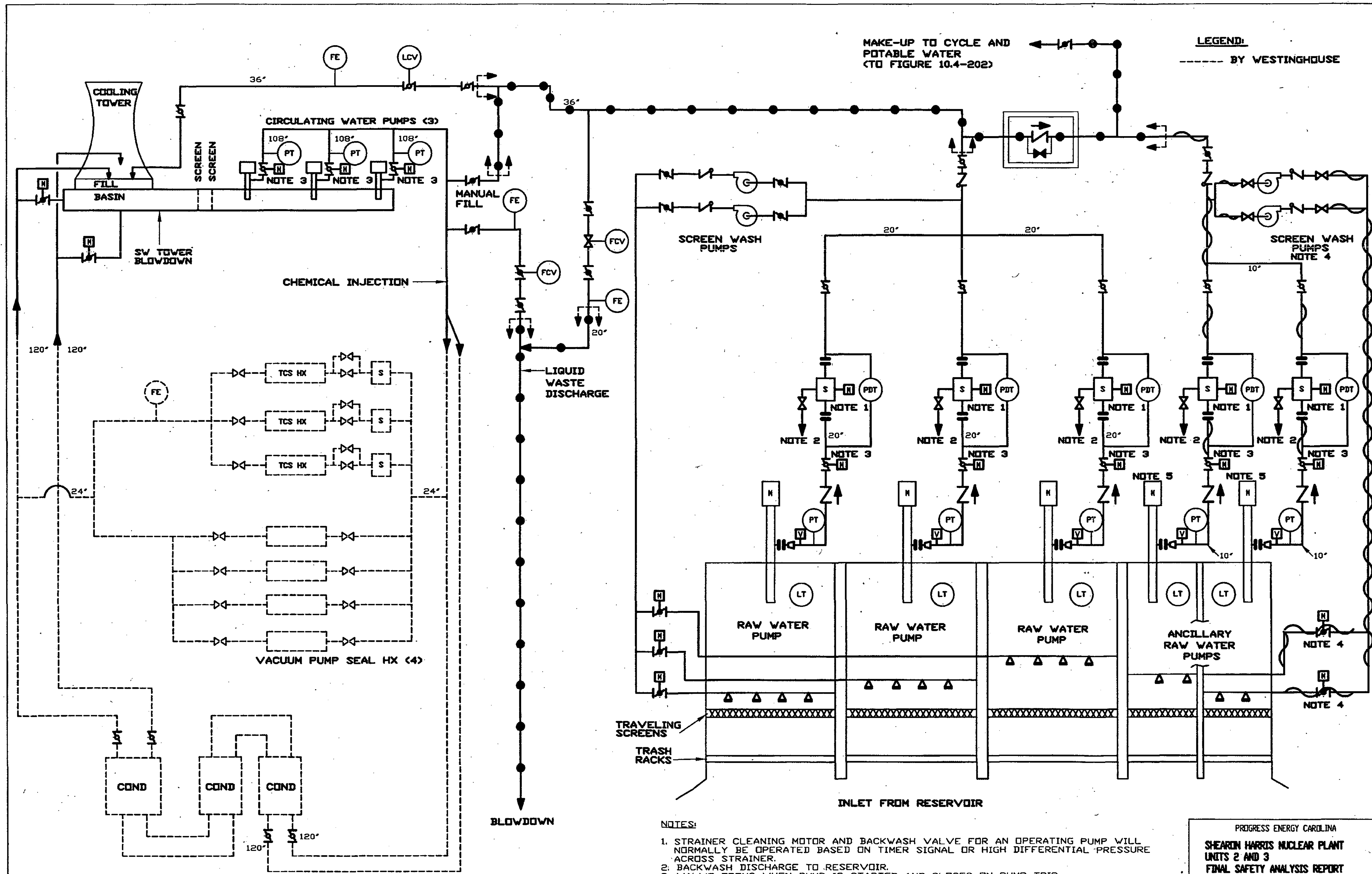
Revised FSAR Figure 10.4-201 (Revision 02-10-09) – Circulating and Raw Water Systems

Revised FSAR Figure 10.4-202 (Revision 02-10-09) – Raw Water Distribution System

Attachment 1 to RAI 09.02.01-7
Cross-Reference between RAI and RAI Responses

RAI 09.02.01-7 Subquestion	Where addressed in RAI Response	Basis for Not Providing Requested Information or Clarification of Information Provided
a.	Revised FSAR Subsection 9.2.11	The Harris COL Application incorporates the AP1000 DCD by reference, and is of necessity referenced in discussions of systems other than the Raw Water System (RWS) and in discussions of Technical Specifications (TS). Otherwise, the references to the DCD are minimized to the degree possible in describing the design basis, components, functions and operation of the RWS.
b.	Revised FSAR Subsections 9.2.11.2, 9.2.11.3, 9.2.11.4.5	• The seven-day water availability is addressed in the response to RAI 09.02.01-7. • In the third bullet of this Subquestion, the term "ensure" should be replaced by "provide" to appropriately represent the capability and reliability of this non-safety, but robust and highly reliable, system to perform its design bases functions. • Operating experience has been incorporated by virtue of the siltation inspections and periodic equipment operation addressed in the response to RAI 09.02.01-7 • As appropriate, water hammer prevention is addressed in Subsection 9.2.11.4.5, NPSH is addressed in Subsection 9.2.11.3 and materials are addressed in Subsection 9.2.11.2. • Single active failure is addressed in the response to RAI 09.02.01-7. • Loss of offsite power is addressed in Subsection 9.2.11.4.5. • RWS system functions are not shared between units, as described in Subsection 9.2.11.2.
c.	Response to RAI 09.02.01-6 Revised FSAR Subsection 9.2.11.2 Response to RAI 09.02.01-7	• In the third bullet of this Subquestion, the term "ensure" should be replaced by "provide" to appropriately represent the capability and reliability of this non-safety, but robust and highly reliable, system to perform its design bases functions. • Applicable industry codes and standards for this non-safety system are identified in the response to RAI 09.02.01-6 and revised FSAR Subsection 9.2.11.2; accordingly, no change is proposed to the list of codes and standards contained in FSAR Chapter 3. • No change is proposed in the current Class E classification of the RWS; the basis and justification is provided in the discussions of RTNSS applicability and Class D systems in the response to RAI 09.02.01-7.

d.	Revised FSAR Subsection 9.2.11	Design parameters are addressed as appropriate in the revised FSAR Section, except for limiting flow velocities, which is beyond the level of detail necessary to describe this non-safety system.
e.	Revised FSAR Subsection 9.2.11	RWS operating modes to the appropriate level of detail are discussed in the revised FSAR Section.
f.	Revised FSAR Subsection 9.2.11.3 Response to RAI 09.02.01-7	• Adequacy of water inventory is addressed in the response to RAI 09.02.01-7. • Maximum and minimum temperature restrictions on RWS operation are not applicable – see Subsection 9.2.11.3 for discussions of potential for icing.
g.	Revised FSAR Subsection 9.2.11.7	The RWS design does not incorporate indications and controls on a remote shutdown panel.
h.	Revised FSAR Subsection 9.2.11 Revised Figures 10.4-201 and 10.4-202	Division designations are not shown on the RWS flow diagrams nor typically on system flow diagrams in the FSAR and DCD.
i.	Response to RAI 09.02.01-7	Periodic inspections of the type identified in this subquestion are typically not discussed in the DCD or the FSAR for other non-safety systems. However, inspection requirements for HDPE piping and ancillary pump intake bays are provided in the response to RAI 09.02.01-7.
j.	Not specifically addressed in this response	Periodic, or surveillance, tests, as appropriate, are developed as a part of the procedures process under COL Information Item 13.5-1, in DCD and FSAR Subsection 13.5.
k.	Response to RAI 09.02.01-6	As described in the referenced RAI response, the RWS system screens out for ITAAC when the screening criteria of FSAR Subsection 14.3 are applied.
l.	Revised FSAR Subsection 9.2.11.6	The initial test requirements for the RWS are described in FSAR Subsection 14.2.9.4.24. The appropriate considerations for modes of RWS operation to provide assurance that the system will perform its design basis function under limiting conditions will be encompassed in the construction turnover and preoperational tests performed on the system.



NOTES:

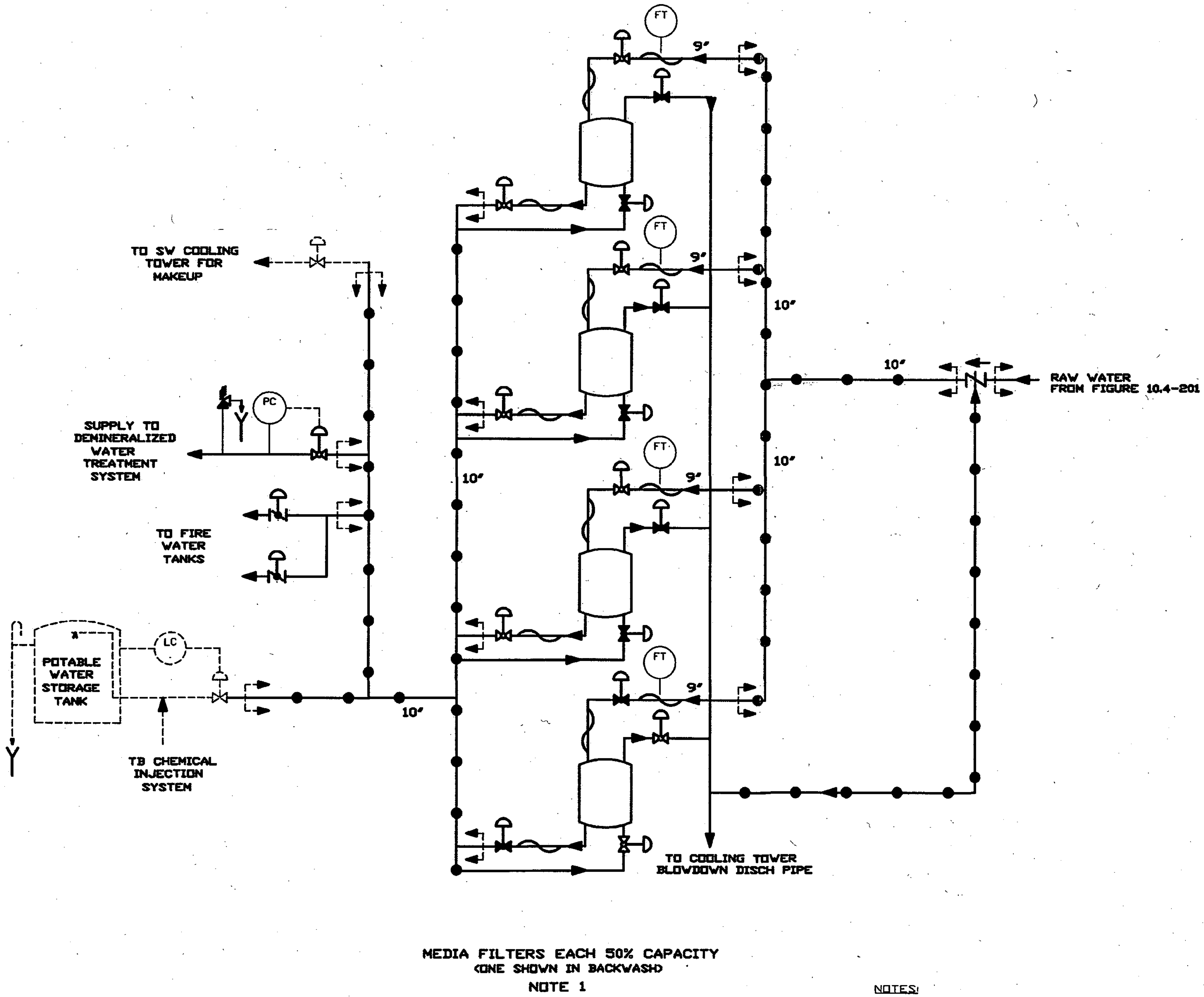
1. STRAINER CLEANING MOTOR AND BACKWASH VALVE FOR AN OPERATING PUMP WILL NORMALLY BE OPERATED BASED ON TIMER SIGNAL OR HIGH DIFFERENTIAL PRESSURE ACROSS STRAINER.
2. BACKWASH DISCHARGE TO RESERVOIR.
3. VALVE OPENS WHEN PUMP IS STARTED AND CLOSES ON PUMP TRIP.
4. TRAVELING SCREENS AND SCREEN WASH PUMPS/VALVES FOR ANCILLIARY RAW WATER PUMPS ARE PROVIDED DIESEL BACKED POWER.
5. ANCILLIARY RAW WATER PUMPS, THEIR DISCHARGE VALVES AND THEIR STRAINERS ARE PROVIDED DIESEL BACKED POWER.

PROGRESS ENERGY CAROLINA

SHEARON HARRIS NUCLEAR PLANT UNITS 2 AND 3 FINAL SAFETY ANALYSIS REPORT

CIRCULATING AND RAW WATER SYSTEMS

FIGURE 10.4-201 REV. 02-10-09



NOTES:

1. FILTER BACKWASH IS INITIATED FROM A TIMER AND THE VALVES WILL FAIL IN THE POSITION THAT MAINTAINS THE DISCHARGE FLOW ON A AIR OR ELECTRICAL FAILURE.

PROGRESS ENERGY CAROLINA
SHEARON HARRIS NUCLEAR PLANT
UNIT 2 and 3
FINAL SAFETY ANALYSIS REPORT

RAW WATER DISTRIBUTION SYSTEM

FIGURE 10.4-202 REV. 02-10-09

NRC RAI No.: HAR-RAI-LTR-052

NRC Letter Date: December 30, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 09.02.01-8

Text of NRC RAI:

The staff notes that while the service water system (SWS) is designated for regulatory treatment of non-safety systems (RTNSS) during reduced reactor inventory conditions, the raw water system (RWS) is evidently not needed to support the SWS cooling function during this condition, because RWS is not designated for RTNSS treatment. However, there is no explanation in Section 9.2.11 of the applicant's Final Safety Analysis Report (FSAR) as to why this is the case. Also, because the SWS cooling tower basins are limited in their capacity, it isn't clear why RWS makeup is not required for this situation. Consequently, Section 9.2.11 of the FSAR needs to be revised to explain why RWS makeup is not needed during reduced reactor inventory conditions and in particular, to describe controls that will be implemented to ensure that SWS makeup assumptions are valid for this situation.

PGN RAI ID #: H-0399

PGN Response to NRC RAI:

Please refer to the response to RAI 09.02.01-7, above, for an explanation of why RWS is not designated as RTNSS and makeup from the RWS to the SWS cooling tower basins is not required during reduced reactor inventory conditions. The referenced RAI response also discusses that procedural controls will be established to take the required actions to exit the conditions for applicability of the SWS as a RTNSS system, in the unlikely event of a failure to re-establish RWS makeup capability. Plant documentation, in the form of the system description for the RWS, will include the information addressed in these RAI responses, as appropriate.

Associated HAR COL Application Revisions:

None.

Attachments/Enclosures to Response to NRC:

None.