PMNorthAnna3COLPEmails Resource

From: Patel, Chandu
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To: 'na3raidommailbox@dom.com'
Cc: PMNorthAnna3COLPEmails Resource; Weisman, Robert; Wheeler, Larry; Kallan, Paul; Nold, David
Subject: Draft RAI 6402, FSAR Section 9.2.5, North Anna 3 COLA (52-017)
Attachments: Draft RAI 6402.doc

Hi All,

Please see attached draft RAI 6402 (Section 9.2.5), for North Anna 3 COLA. I would like to request Dominion to let me know if it needs any clarification on this RAI before COB April 18, 2012. Otherwise, it will be issued as final after April 18, 2012. For other people, it is for information only.

Thanks,
Chandu Patel, Lead Project Manager
North Anna 3 COLA

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Created By: Chandu.Patel@nrc.gov

Recipients:
"PMNorthAnna3COLPEmails Resource" <PMNorthAnna3COLPEmails.Resource@nrc.gov>
Tracking Status: None
"Weisman, Robert" <Robert.Weisman@nrc.gov>
Tracking Status: None
"Wheeler, Larry" <Larry.Wheeler@nrc.gov>
Tracking Status: None
"Kallan, Paul" <Paul.Kallan@nrc.gov>
Tracking Status: None
"Nold, David" <David.Nold@nrc.gov>
Tracking Status: None
"'na3raidommailbox@dom.com'" <na3raidommailbox@dom.com>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

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Request for Additional Information No. 6402 (Draft)

North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 09.02.05 - Ultimate Heat Sink
Application Section: 9.2.5

QUESTIONS for Balance of Plant and Technical Specifications Branch (BPTS)

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Items 9.2(3) and 9.2(28) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, “Cooling Water”.
The applicant does not provide an evaluation or discussion in the COL FSAR for possible cooling tower plume interference and recirculation effects with other safety related air intakes and other cooling towers in the vicinity.
Specifically, the applicant is requested to address in the FSAR:

1. UHS cooling tower interference (tower effluent being drawn into the air inlet of a downwind tower). This should include interference among all cooling towers at the three unit site, related to the design performance of the UHS cooling towers.
2. Cooling tower plume recirculation effects with other safety-related air intakes at the site.

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Items 9.2(3) and 9.2(28) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, “Cooling Water”.
Specifically, the applicant is requested to address in the FSAR:
UHS piping materials (including the UHS transfer piping material) which is not adequately described in the FSAR. For the UHS piping system, outside the scope of the ESWS, describe the materials to be utilized (carbon or alloy), ASME Code class, and if the system is internal lined and/or has cathodic protection. This FSAR description should be similar to the description in US-APWR DCD and COL FSAR Sections 9.2.1.2.2.5, “Piping” (ESWS).

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(18) finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, “Cooling Water”.
Specifically, the applicant is requested to address in the FSAR:

1. The applicant stated in several places (for example FSAR 9.2.5.2.1 and 9.2.5.2.3), that the cooling towers are designed for 12,000 gpm whereas Table 9.2.1-1R, “Ultimate Heat Sink System Design Data,” states the design flow rate of the ESWS pumps is 13,000 gpm. This discrepancy needs to be clarified.

2. COL FSAR Section 9.2.5.2.2 describes that the UHS transfer pump and the ESW pump from the same basin do not operate simultaneously. Describe what controls are in place, such as interlocks or operator actions, during quarterly UHS transfer pump testing (COL FSAR Table 3.9-202, "Site-Specific Pump IST Requirements"), that prevent the ESWS pumps from operating simultaneously with the UHS transfer pump; for instance, if there were an automatic start signal of the ESWS pumps during a ECCS actuation signal, as described in DCD Section 9.2.1.2.3.2, "Emergency Operations."
3. Describe any negative consequences on the ESWS if both pumps remain running during accident conditions.
4. Describe in the FSAR if the UHS transfer system remains full of water or is placed in 'layup' after UHS transfer pump testing and what chemical controls (to prevent pipe wall thinning) are used if extended wet layup conditions are utilized.

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(19) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, "Cooling Water".
Specifically, the applicant is requested to address in the FSAR:

1. Neither COL FSAR Section 9.2.5 nor Section 8.3 clearly states what are the power supplies for the UHS transfer pumps, associated pump discharge motor operated valves (MOVs), and associated basin inlet MOVs since no reference drawings, figures, or tables could be found in the COL FSAR. This information should be provided in the FSAR.
2. The applicant is requested to discuss how electrical separation will be maintained in the ESW pump house considering there may be multiple trains of safety related power in the same room susceptible to flooding or fire.
3. Since the UHS cooling tower fans are automatically activated by automatic signals, describe in the COL FSAR the consequences to the fans of the automatic accident start signal if the fans are previously operating in reverse for freeze protection.

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(20) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, "Cooling Water".
COL FSAR Section 3.6.1.3, "Postulated Failure Associates with Site-Specific Piping," states that there is no site-specific high-energy piping within the protective walls of the ESWPT and UHSRSs and therefore, high-energy pipe breaks are not postulated for site-specific piping within these protective walls. The site-specific moderate-energy piping systems are the ESWS and the fire
protection water supply system (FSS).
NUREG-0800, NRC Branch Technical Position 3-3, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," Revision 3 states that:

A. General Design Criterion (GDC) 2, "Design Bases for Protections Against Natural Phenomena," requires that SSCs important to safety be designed to withstand the effects of natural phenomena such as earthquakes. The BTP 3-4 does not consider full-circumferential breaks in moderate-energy piping, only through-the-wall cracks.

It is the intent of this design approach that postulated piping failures in fluid systems should not cause a loss of function of essential safety-related systems and that nuclear plants should be able to withstand postulated failures of any fluid system piping outside containment, taking into account the direct results of such failure and the further failure of any single active component, with acceptable offsite consequences.

In NUREG-0800, NRC Branch Technical Position 3-3, Appendix A to J.F. O'Leary Letter of July 12, 1972, C.2.a. the following leakage cracks are postulated at the locations specified by the criteria listed under B.

Moderate-Energy Fluid Systems: a. through-wall leakage cracks in piping and branch runs exceeding a nominal pipe size of 1 inch, where the crack opening is assumed as ½ the pipe diameter in length and 1/2 the pipe wall thickness in width.

COL FSAR Section 3.6, does not specially address the UHS transfer system or classify the UHS transfer system (high-energy or moderate-energy). Since the UHS transfer two header system connects all four UHS transfer trains, the staff is unable to determine if the UHS transfer system is designed for through-wall cracks.

Specifically,

1. Describe in the FSAR the ‘energy’ classification of the UHS transfer system; reference US-APWR DCD Section 3.6.1.1, “Design Basis”, and Table 3.6-1, “High and Moderate Energy Fluid Systems”.
2. Describe in the FSAR how the UHS transfer system is designed against postulated piping leak paths in the UHS transfer portions. Also describe the bounding conditions related to piping leak size and locations.
3. Describe in the FSAR the consequences of such a piping leak path in the common UHS, with consideration of the UHS water transfer between UHS basins, for freeze protection and post DBA.
4. Describe in FSAR Table 9.2.5-4R, “Failure Modes and Effects Analysis for the UHS,” this failure mode and the effects on the UHS system safety function.

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2 (19, 20, 22, and 32) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, “Cooling Water”.

Specifically, the applicant is requested to address in the FSAR:

1. The applicant states two different dimensions for the UHS Basin (approximately 123 ft x 123 ft) in FSAR Section 9.2.5.2.1 and 120 ft X 120 ft in FSAR Section 9.2.5.3. This needs to be clarified.
2. FSAR Section 9.2.5 is unclear about which UHS instrumentations are safety related and which have safety grade electrical power. Instrumentation of concern includes: basin water level, basin water temperature, conductivity, flow/pressure, and cooling tower fan vibration. Note: Part 10 (ITAAC - Table A.1-2) of the COL only has the UHS basin level and water temperature as safety class 1E and seismic category I.
3. Figure 9.2.5-1R describes that each UHS basin has two level instruments with high and low alarms. Since the UHS transfer pumps have different power

supplies than the ESWS pump in the same pump house, describe the respective power supplies for the redundant UHS basin water level instruments. Since the ESWS A pump is supplied by bus A and the UHS transfer pump A is powered from bus C or D, describe in the FSAR the basis for concluding that, in the event of loss of a single power supply (say A), basin level indication is still available for level determination to operated the UHS transfer pump powered from bus C or D.

4. Table 9.2.5-4R, “Failure Modes and Effects Analysis for the UHS,” does not adequately describe the ‘safety function’ related to the effects on system safety function capability related to the loss of the UHS transfer pumps and discharge/inlet valves.
5. Table 9.2.5-4R, “Failure Modes and Effects Analysis for the UHS,” describes failure to close for ESW-HCV-010, 011, 012, and 013. Typically, control valves do not have low valve seat leakage characteristics. Since the closing of these valves isolates the safety-related to nonsafety pressure boundaries, describe in the FSAR the reasoning for choosing control valves verse a gate valve for this pressure boundary isolation. Table 9.2.5-4R states that the effects of an uncontrolled blowdown if these valves fail to close are insignificant if the valves are closed within 30 minutes. Besides MCR valve position, what other means are available to the operator (such as blowdown flow, blowdown pressure, pipe temperature, etc.) that would indicate that these valves may not have closed on demand, such as from a low basin water level or accident signal. This discussion of alternate indications should be added to the FSAR with a discussion that operational procedures are to be developed for closure of these valves within the time frame discussed.
6. Table 9.2.5-4R, “Failure Modes and Effects Analysis for the UHS,” describes failure of MOV-506A, B, C, D, but does not indicate that these valves may be utilized for normal operations and winter mode. Alternate paths are missing for valves MOV-506s and MOV-503s.
7. Table 9.2.5-4R, “Failure Modes and Effects Analysis for the UHS,” describes MOV-509s and MOV-510s. Figure 9.2.5-1R indicates MOV-509s are locked open and MOV-510s are locked closed. If these valves are locked into position (assuming their power is disconnected when locked) for either normal operations or winter mode, the FMEA should be corrected to clarify that these valves are normally locked.
8. Section 9.2.1.2.3.1 does not adequately describe why the UHS does not have a void detection system, reference Comanche Peak COL FSAR Section 9.2.5.5 which states;

   > Level switches are installed in the vertical piping upstream of the cooling tower spray header to annunciate if system inventory reduction occurs. The factors considered for detector position are the allowable leakage rate for the ESW pump discharge check valve and motor-operated butterfly valve, allowable voiding volume and maintenance durations.

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(21) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 2, “Design Basis for Protection Against Natural Phenomena and GDC 44, “Cooling Water”.

Specifically, the applicant is requested to address in the FSAR:
1. Given a possible seismic event, describe if a UHS basin siphon event is possible (drain-down event) from the interconnection with the nonsafety-related normal water basin makeup from the circulating water system (CWS) (Figure 9.2.5-1R).

2. Describe how normal make-up from the CWS is isolated during accident conditions to preclude flooding the UHS basins.
3. Clarify location of the makeup control valves shown on Figure 9.2.5-1R, since they appear to be between the two cooling towers.
4. Chemical treatment (used to limit biological film formation) of the UHS basin during normal operations and accident conditions is not clearly described in Sections 9.2.5 or 10.4.5.2.2.8 of the FSAR. Section 9.2.1 of the FSAR points to Section 10.4.5.2.2.8 which has insufficient information refating to the UHS basin and chemical injection.

09.02.05-***

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(2) finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 2, “Design Basis for Protection Against Natural Phenomena" and GDC 44, “Cooling Water”.
FSAR 9.2.5.3 states that heat tracing is provided for exposed stagnant piping in the unheated areas.
Specifically, the applicant is requested to address in the FSAR:

1. Locations of unheated areas.
2. The safety classification of the heat tracing and associated low temperature alarm.
3. If this heat tracing is determined to be safety related, determine if the heat tracing should be addressed in COL Chapters 8 (electrical) and Chapter 16 (TS). Note, ITAAC and Chapter 14 testing is addressed in other questions as part of this RAI.

09.02.05-***

The UHS must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with the requirements of GDC 44. The capability of the UHS as described in FSAR Section 9.2.5 was reviewed by the NRC staff to assess the adequacy of the UHS for performing its heat removal functions.
DCD Section 9.2.1.2.3.1 states that voiding upstream of the pump discharge check valve in any train may occur during loss of offsite power and subsequent pump trip, particularly at a low UHS water level. To maintain the pressure at this portion above the saturation pressure to preclude steam void formation which leads to water hammer, vacuum breakers shall be installed between the pump discharge and its check valve. Air entering the piping cushions any abrupt water flow filling the voids and water hammer will not take place at pump actuation. The entering air then discharges through the automatic vent valve installed in the strainer. The motor-operated pump discharge valve, being powered by a safety DC power source, is unaffected by the loss of offsite power and will close when the pump stops. [[Water in the cooling tower spray header will drain to the UHS.]] The check valve located in the pump discharge pipe will prevent water flowing

back through the pump into the intake structure. In order to preclude water hammer on pump restart, the motor operated valve at the discharge of each pump is interlocked to close when the pump is not running or is tripped.
The bracket statement appears to be out of place since the paragraph is addressing voiding of the piping system at the ESWS pumps and draining of the cooling tower spray header may be in error in this section. The COL applicant should clarify this issue related to the spray header drain in their FSAR.

09.02.05-***

The UHS must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with the requirements of GDC 44. The UHS description and piping and instrumentation diagram (P&ID) were reviewed to assess the design adequacy of the UHS for performing its heat removal functions. However, the NRC staff found that some of the descriptive information that was provided for the UHS is confusing, incomplete, inaccurate, or inconsistent. In order for the NRC staff to complete this assessment, the applicant is requested to address the following items and revise the FSAR related to COL Item 9.2(20), as appropriate to reflect this information:

1. COL FSAR Figure 9.2.5-1R indicates that overflow protection for the basin is provided by a spillway or drain line, but this is not described in FSAR Section 9.2.5, and design specifications, size requirements, and other design details are not provided.
2. FSAR Figures 1.2-206 and 1.2-210 appear to show a single transfer pump discharge pipe header while Figure 9.2.5-R1 indicates two transfer pump discharge pipe headers. FSAR Figures 1.2-206 and 1.2-210 should be revised to agree with Figure 9.2.5-R1 and FSAR Section 9.2.5 should be revised to state that there are two transfer pump discharge pipe headers and to state the importance of the two headers. COL Figure 2.8-200 series also should be clarified with respect to the transfer headers.

09.02.05-***

The UHS must be capable of removing heat from SSCs important to safety during normal operating and accident conditions over the life of the plant in accordance with the requirements of GDC 44. FSAR Section 9.2.5.2.1 indicates that the normal makeup water source for the cooling tower basins is Lake Anna. Lake water can cause silt accumulation and the introduction of fish, clams, algae, grass, and other aquatic organisms and biofouling agents. These things can degrade the operation of ESWS pumps, heat exchangers, and UHS transfer pumps; cause clogging of spray nozzles and fill material; and ultimately degrade the capability of the ESWS and UHS to remove heat. While chemical treatment can address corrosion and biofouling issues to some extent, it does not address all of the problems that can occur. Therefore, the applicant is requested to provide additional information in FSAR Section 9.2.5 to address these considerations.

09.02.05-***

Based on the staff's review of NAPS Unit 3, Revision 4, Part 10 - ITAAC, Appendix A.1, "Ultimate Heat Sink System (UHSS) and Essential Service Water system (ESWS) (Portions Outside the Scope of the Certified Design)," several items needed to be further addressed by the applicant.

1. Site-specific ITAAC should clearly describe testing of the UHS transfer pumps and associated MOVs from their various safety-related power supplies.
2. Site-specific ITAAC should clearly describe testing of the ESWS/UHS heat tracing.
3. Site-specific ITAAC should clearly describe testing of the ESWS/UHS freeze protection features, including fans in reverse speed.
4. Site-specific ITAAC should clearly describe and conclude that the UHS fans are designed to withstand the effects of design basis tornado differential pressure.
5. Site-specific ITAAC (see ITAAC #18) should clearly describe the UHS its capable of performing its safety function without exceeding the maximum temperature limit of the water in the UHS basin.
6. Site-specific ITAAC should clearly describe that the UHS spray nozzles and orifices are adequate design with consideration for blockage. Note, DCD 9.2.1.2.2 states that the ESWS strainer mess is 3 mm to assure that potential clogging of the cooling tower nozzles is avoided.