ArevaEPRDCPEm Resource

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Subject: U.S. EPR Design Certification Application RAI No. 345 (4021), FSAR Ch. 9
Attachments: RAI_345_SBPA_4021.doc

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 10, 2009, and discussed with your staff on March 4, 2010. Drat RAI Questions 09.02.01-31, 09.02.01-47, and 09.02.01-48 were modified as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
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3/04/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.01 - Station Service Water System
Application Section: 9.2.1

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

09.02.01-26

Follow-up to RAI 119, Question 9.2.1-01

The essential service water system (ESWS) must be able to withstand natural phenomena without the loss of function in accordance with 10 CFR 50, Appendix A, General Design Criterion (GDC) 2 requirements. The criteria that are specified in Tier 2 of the Final Safety Analysis Report (FSAR), Section 3.2, indicate that non-safety-related parts of the ESWS should be designated as Seismic Category II if a failure under seismic loading conditions could prevent or reduce the functional capability of a safety-related structure, system, or component (SSC). The staff found that insufficient information was provided to determine if the seismic designation for non-safety-related parts of the ESWS is appropriate. Also, the staff noted that the information on Tier 2 Figure 9.2.1-1, "Essential Service Water System Piping & Instrumentation Diagram," (P&ID) was inconsistent with the information in Tier 2 FSAR Table 3.2.2-1, "Classification Summary," in that the table (Sheet 94) shows that the dedicated ESWS pump is classified as non-safety-related supplemental grade (NS-AQ), Seismic Category II and the P&ID shows the dedicated ESWS pump as simply non-safety-related. The applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to fully explain why the non-safety-related parts of the ESWS are not classified as Seismic Category II (i.e., why the assumed simultaneous failure of all non-safety-related ESWS piping will not adversely affect safety-related parts of the ESWS or any other safety-related SSCs that are in the same general area as the non-safety-related ESWS piping), and to explain the inconsistency noted above with respect to the Seismic Category II designation for the dedicated ESWS pump, and why other parts of the dedicated ESWS are not similarly designated as NS-AQ, Seismic Category II in Table 3.2.2-1 and on the P&ID...

Based on the staff's review response to RAI 119, Question 9.2.1-01 and an audit by the staff conducted on October 27, 2009, the following items remain open and require further resolution and/or clarification by the applicant requiring Tier 1 FSAR changes.

As part of the FSAR markup for this RAI, FSAR Tier 1 Table 2.7.11-2 "ESWS I&C and Electrical Design" has been modified to identify alternate power from the SBO diesel generators for some but not all of the dedicated train powered components. For example;

a. For dedicated train components, such as MOVs 30PEB80 AA015 (pump recirculation) and AA016 (basin blow down), an alternate power source is not

identified; therefore, these components will not be functional under conditions when alternate power is necessary.

b. Dedicated train filter is needed to assure operability of the dedicated train; therefore, an alternate power source should be identified for this equipment. However, Table 2.7.11-2 does not include this information.

c. Tier 1 Tables 2.7.11-1 and 2.7.11-2 incorrectly identifies valve 30PEB80 AA003 as the "dedicated train emergency blow down isolation valve," since this valve is actually located at the inlet to the dedicated CCWS heat exchanger as shown in Figure 2.7.11-1 (sheet 5).

d. The description of the dedicated train filter blow down valve (30PEB80 AA009) and the basin blow down valve (30PEB80 AA016) shown in Table 2.7.11-1 is inconsistent with the information in Figure 2.7.11-1.

09.02.01-27

Follow-up to RAI 119, Question 9.2.1-02

The ESWS must be able to withstand natural phenomena without the loss of function in accordance with GDC 2 requirements. The system description does not explain the functioning and maximum allowed combined seat leakage of safety-related boundary isolation valves to ensure ESWS integrity and operability during seismic events and other natural phenomena. Consequently, the applicant needs to include additional information in Tier 2 Section 9.2.1 of the FSAR to fully describe: (a) how ESWS integrity and operability is assured by the safety-related boundary isolation valves so that common-cause simultaneous failure of all non-safety-related ESWS piping will not compromise the ESWS safety functions during seismic events, (b) what the maximum allowed combined seat leakage is for the safety-related ESWS boundary isolation valves (including check valve for the non-safety-related dedicated ESWS cooling water supply for the Division 4 ESWS room cooler) and periodic testing that will be performed to ensure that the specified limit will not be exceeded, and (c) a description of any other performance assumptions that pertain to the boundary isolation valves or other parts of the system that are necessary to assure the capability of the ESWS to perform its safety functions during natural phenomena.

Based on the staff's review of response RAI 119, Question 9.2.1-02 and an audit by the staff conducted on October 27, 2009, the following item remains open and requires further resolution and/or clarification by the applicant.

In regard to part (b), valve seat leakage, the staff found the applicant's explanation that valve leakage was accounted for in determination of the volume required to support the first 72 hours of post accident UHS cooling tower operation as partially acceptable, including the referenced criteria used to determine valve leakage. The provided markup of FSAR Section 9.2.1.3.5 was acceptable to the staff and confirmed to have been incorporated in Revision 1 of the application. Additionally, Tier 2 FSAR Table 3.9.6-2, "In-service Valve Testing Program Requirements," was reviewed by the staff and found to include all the boundary valves relevant to the cooling tower basin. However, the applicant should address valve seat leak testing (LT) which is not specified for these

ESWS boundary isolation valves by the In-service Valve Testing Program per FSAR Tier 2 Table 3.9.6-2.

09.02.01-28

Follow-up to RAI 119, Question 9.2.1-04

The ESWS 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 GDC 44 requirements. The ESWS description and P&ID were reviewed to assess the design adequacy of the ESWS for performing its heat removal functions. While the P&ID shows the ESWS components and identifies the boundaries between safety-related and non-safety-related parts of the system, some of the information is incomplete, inaccurate, or inconsistent. Consequently, the applicant needs to revise the FSAR to address the following considerations in this regard:

Part (a)- Pipe sizes are not shown on the P&ID, and the system description does not explain the criteria that were used in establishing the appropriate pipe sizes (such as limiting flow velocities).

Part (b)- The system description does not provide design details such as system operating temperatures, pressures, and flow rates for all operating modes and alignments.

Part (c)- The P&ID does not show where indications are displayed (e.g., local, remote panel, control room), and what instruments provide input to a process computer and/or have alarm and automatic actuation functions.

Part (d)- The P&ID does not show what the normal valve positions are, what valves are locked in position, and what valves have automatic functions; and these design features are not described.

Part (h)- The P&ID does not show specific set point for alarms, relief valves, vacuum breakers, air release valves, automatic functions such as filter backwash, etc., and the bases for these set points are not explained in the system description.

Based on the staff's review of response to RAI 119, Question 9.2.1-04 and an audit by the staff conducted on October 27, 2009, Parts a, b, c, d and h remain open and require further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the remaining open items.

With regard to items a, b, c, d and h of RAI-response 9.2.1-04 above, the staff found that in general, the applicant stated that details would be developed later in the design process. The staff noted that the applicant provided some new information for parts (a) and (c) including: (1) criteria that will be used for determination of pipe sizes, and (2) a description of the normal functions for system valves. However, the requested details would be developed later in the design process. While the staff found the partial response to part (c) an improvement over the descriptions currently included in U.S.EPR FSAR Tier 2 Section 9.2.1, the applicant stated that the FSAR will not be updated as a result of this question. The applicant should include the requested information in the FSAR when the design is completed.

The applicant should identify what the maximum return temperatures are coming out of the heat exchangers and going to the cooling tower.

The applicant should identify the continuation of the dedicated blowdown line from Figure 9.2.1-1, Sheet 4 of 4.

09.02.01-29

Follow-up to RAI 119, Question 9.2.1-04 (e)

The ESWS 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 GDC 44 requirements. The ESWS description and P&ID were reviewed to assess the design adequacy of the ESWS for performing its heat removal functions. While the P&ID shows the ESWS components and identifies the boundaries between safety-related and non-safety-related parts of the system, some of the information is incomplete, inaccurate, or inconsistent. Consequently, the applicant needs to revise the FSAR to address the following considerations in this regard:

Part (e)- The P&ID shows ESWS pump recirculation, emergency blowdown, and normal blowdown flow paths, but the functions and uses of these flow paths are not described and the flow rates are not provided.

Based on the staff's review of response to RAI 119, Question 9.2.1-04 and an audit by the staff conducted on October 27, 2009, Part (e) remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The staff noted that while some new information was provided in this response relative to the purpose and function of the recirculation line, other technical information was missing, such as the initiating signals for the pump recirculation function and whether automatic accident signals are provided. Further, the staff noted that the applicant's response indicated that the FSAR would not be revised as a result of this question. The staff concluded that a functional description is necessary in the FSAR for key system flow paths including the associated valves to provide sufficient information to support a conclusion relative to GDC 44.

09.02.01-30

Follow-up to RAI 119, Question 9.2.1-04 (f)

The ESWS 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 GDC 44 requirements. The ESWS description and P&ID were reviewed to assess the design adequacy of the ESWS for performing its heat removal functions. While the P&ID shows the ESWS components and identifies the boundaries between safety-related and non-safety-related parts of the system, some of

the information is incomplete, inaccurate, or inconsistent. Consequently, the applicant needs to revise the FSAR to address the following considerations in this regard:

Part (f)- The P&ID does not show a flow indicator for the ESWS pump room coolers and additional discussion is needed to explain how the ESWS flow rate through the pump room coolers will be periodically verified and confirmed to be adequate.

Based on the staff's review of response to RAI 119, Question 9.2.1-04 and an audit by the staff conducted on October 27, 2009, Part (f) remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The staff reviewed the applicant's response to part (f) of RAI-response 9.2.1-04 above relative to means of periodic confirmation of the adequacy of ESW pump room cooler flow. In this response, the applicant stated that temporary flow instrumentation will be installed for the performance of periodic cooler surveillance testing and testing after repairs. The staff found this response to be unacceptable since plant operators will not have valuable information related to ESWS possible degraded flow rates or degraded heat exchanger performance. This instrumentation should be described in the FSAR.

09.02.01-31

Follow-up to RAI 119, Question 9.2.1-04(j)

The ESWS 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 GDC 44 requirements. The ESWS description and P&ID were reviewed to assess the design adequacy of the ESWS for performing its heat removal functions. While the P&ID shows the ESWS components and identifies the boundaries between safety-related and non-safety-related parts of the system, some of the information is incomplete, inaccurate, or inconsistent. Consequently, the applicant needs to revise the FSAR to address the following considerations in this regard:

Part (j)- Confirm that the ESWS backwash filter motor and power supply are classified as safety-related, Class1E.

Based on the staff's review of response Response to RAI 119, Question 9.2.1-04 and an audit by the staff conducted on October 27, 2009, Part (j) remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

In part (j) of RAI 9.2.1-04, the staff requested that the applicant confirm that the ESWS filter motor and its power source are classified as safety-related, class 1E. The applicant's response confirmed this information, however Tier 1 Table 2.7.11-2 was not updated to reflect this information, as the filter motor should be listed as an IEEE Class 1E component for the four divisions.

09.02.01-32

Follow-up to RAI 119, Question 9.2.1-05

The ESWS 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 GDC 44 requirements. In order for the staff to confirm that the ESWS has been adequately sized, the applicant needs to include additional information in Tier 2 of the FSAR, Section 9.2.1, to fully describe and explain what the minimum system heat transfer and flow requirements are for normal operating, refueling, and accident conditions, the bases for these requirements including limiting assumptions that apply (such as temperature considerations, recirculation flow, and blowdown flows), the degree of excess margin available and the method used to determine the margin, and the limiting system temperatures and pressures that are assumed with supporting basis.

Based on the staff's review of response to RAI 119, Question 9.2.1-05 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant**.** The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The applicant stated that final margin and limiting system temperatures and pressures will be determined later in the design process incorporating vendor information. The staff review of this response found that the applicant's response did not address the bases for heat transfer, assumptions, degree of excess margin and the method used to determine the margin.

09.02.01-33

Follow-up to RAI 119, Question 9.2.1-07

The ESWS 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 GDC 44 requirements. With respect to ESWS flow requirements, Tier 2 FSAR Table 9.2.1-1 states that the safety related ESWS pump normal flow rate is 73.2 m^3/min (19,340 gpm) at 0.55 MPa (185 feet) of water. Each ESWS train includes parallel connected flow paths to one CCWS heat exchanger (HX), one emergency diesel generator (EDG) and an ESWS pump room cooler. ESWS flow appears to be continuously supplied to all components for both normal and accident conditions. Tier 2 FSAR Table 9.2.5-1 indicates that nominal CCWS HX flow is 4.31×10^6 Kg/hr (9.504×10^6 lbm/hr) and EDG flow is 0.48×10^6 Kg/hr (1.06×10^6 lbm/hr). No flow rate information (or heat load) is provided for the pump room cooler. However, the total ESWS flow rate for the EDG plus the CCW HX at <32.2 °C (90 °F) converts roughly to 80.25 m^3/min (21,200 gpm), which exceeds the normal pump flow of 73.2 m^3/min (19,340 gpm). In order for the staff to confirm that the ESWS has been adequately sized, the applicant needs to provide additional information in the FSAR to address this apparent inconsistency.

Based on the staff's review of response to RAI 119, Question 9.2.1-07 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The staff noted an inconsistency with the new flow rate units (gpm) for the ESW Pump Room Coolers, which do not match the mass flow units identified for other components in the Table or the units (10^6 lbm/hr) identified by the column heading. The applicant should revise the FSAR to address this inconsistency in the units.

09.02.01-34

Follow-up to RAI 119 Question 9.2.1-08

The ESWS 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 GDC 44 requirements. In order to satisfy system flow requirements, the ESWS design must assure that the minimum net positive suction head (NPSH) for the ESWS pumps will be met for all postulated conditions, including consideration of vortex formation. The staff found that the NPSH requirement for the ESWS pumps was not specified and Tier 2 FSAR Section 9.2.1 did not describe how the ESWS design will assure that the NPSH requirement for the ESWS pumps is satisfied (including consideration of vortex formation) and how much excess margin is provided by the ESWS design for the most limiting assumptions. Consequently, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to specify the minimum NPSH requirement for the ESWS pumps and fully explain how the minimum NPSH requirement by the system design when taking vortex formation into consideration is satisfied. In addition, excess margin available for the most limiting case should be provided. Sufficient information is needed to enable the staff to independently confirm that the design is adequate in this regard, including limiting assumptions that were used along with supporting justification.

Based on the staff's review of response RAI 119 Question 9.2.1-08 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The staff's found several points in the response and proposed FSAR markup that require further explanation, clarification or additional information. These points are provided below and require resolution to support completion of the staff's evaluation of this subject.

a. The minimum worst case cooling tower basin water level after 72 hours of post accident operation (reference Tier 2, FSAR Section 9.2.5.3.1, "Mechanical Draft Cooling Towers,") needs to be identified in order to address the actual margin between NPSH available and NPSH required. This approach will provide a more meaningful assessment of NPSH margin.

b. The response indicates that the basin water level necessary for vortex suppression was found to be more limiting than that required to satisfy NPSH but does not specifically state what levels were determined.

c. Related to the item above, the applicant needs to state the basis for the "height for minimum pump submergence" of 3.0 m (119 inches) (identified in Figure 09.02.01-17-1). This height is inconsistent with the height of 2.4 m (95 inches) identified in the FSAR markup. Clarify the discrepancy.

d. With regard to the markup of U.S FSAR Tier 2 Table 9.2.1-1, the description for the new line item states "Required Minimum Water Level in the Basin" does not agree with the corresponding "Technical Data," which indicates that 2.4 m (95 inches) is from the suction inlet. This comment also applies to the corresponding addition to U.S.EPR FSAR Table 9.2.1-2 for the dedicated ESW pump. In order to completely define basin water level, the distance between the pump suction inlet and the bottom of the basin needs to be clearly identified.

e. Identify the assumptions used for calculating available NPSH (e.g. atmospheric pressure, centerline elevation of inlet to the first stage impeller etc). Sufficient information along with the supporting justification is needed to enable the staff to confirm the results in accordance with SRP 9.2.1.

09.02.01-35

Follow-up to RAI 119, Question 9.2.1-09

The ESWS 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 GDC 44 requirements. System design features, operating procedures, and surveillance testing must provide adequate assurance that the ESWS safety functions will not be compromised due to damaging water hammer events. Two of the four safety-related trains are normally in operation with the remaining two trains in standby. All valves in the main flow path of each train, including the two trains in standby, are kept open (Tier 2 FSAR Section 9.2.1.4). Since the cooling tower spray nozzles are located at an elevation that is well above the cooling tower basin water level, there is a potential for the standby loops to drain to their respective cooling tower basins and create a large air void in the piping of the ESWS standby trains. If this occurs, an automatic actuation of the standby ESWS trains could result in a water hammer.

Any loop seals in the ESWS that are caused by component design or piping configuration would tend to result in a much more severe water hammer event. The ESWS description does not adequately consider and address water hammer vulnerabilities (such as this) in the FSAR and does not explain how system design features, operating procedures, and periodic surveillance testing provide adequate assurance that the ESWS safety functions will not be compromised by water hammer events. Accordingly, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to address water hammer considerations. If system valves are relied upon to prevent excessive back-leakage, the ESWS description in the FSAR needs to fully explain and justify the maximum amount of back-leakage that is allowed, and specify the

leakage acceptance criteria that will be established in the in-service testing program for these valves along with the basis for this determination.

Based on the staff's review of response to RAI 119, Question 9.2.1-09 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The staff found the applicant's response, proposed actions and conclusions to be reasonable, but not complete. The applicant should address the following items.

a. Provide the hydraulic transient analysis or provide an Tier 1 ITAAC item in Section 2.7.11.

b. The RAI-response provided a description that the ESWS pumps will be rotated on a bi-weekly bases (or as determined by the hydraulic transient analysis) as part of the strategy for preventing water hammer events in the ESWS. The applicant should provide this information in the FSAR or provide a COL item for this activity.

c. Provide in the FSAR the mechanism for how plant operators will determine the water level in case the ESWS water column is drained sooner than the assumed 14 days. For example, more rapid draining could occur if debris was to get lodged between the seat and disc at the time of valve closure. Provide a description of instrumentation and alarms to the control room of level indication of the water column to operability determination.

d. Provide a revised markup of U.S. EPR FSAR Section 9.2.1.3.5. The proposed markup only identified pump discharge check valve leakage criteria and that a hydraulic transient analysis will be performed. The staff found this FSAR markup to be insufficient since the design features described in this response that are relied upon for water hammer mitigation (e.g. limiting check valve leakage, auto closing of pump discharge valve(s), riser air release path etc) were not addressed in the FSAR. The staff concluded that for a full understanding of this subject a description is necessary in the FSAR including the automatic valve actions that take place upon ESWS pump trip and restart and the intended design function of vacuum breaker (AA191) and air release (AA190) valves.

e. FSAR Tier 2 Section 3.9.6.3 presently indicates that both MOVs 30PEB10/20/30/40 AA005 and 30PED 10/20/30/40AA010 are listed as ASME 0M Code Category "B," for which seat leakage in the closed position is inconsequential to fulfill their required functions. The concerned that such seat leakage could create a system drain down that may lead to water hammer vulnerability. Therefore, the applicant should consider revising Tier 2 Table 3.9.6-2 "In-service Valve Testing Requirements," for pump discharge check valve 30PEB10/20/30/40 AA204 as well as for MOVs 30PEB10/20/30/40 AA005 and 30PED 10/20/30/40 AA010 by adding Leakage Testing (LT).

f. The staff has identified a potential drain path between the pump discharge check valve and the discharge MOV that could lead to increasing the potential for a water hammer event. Provide an FSAR description addressing water volume loss from the pump discharge pipe and the normally open ESWS pump room cooler path (i.e. in addition to valve leakage).

g. The staff noted that Rev 1 of the U.S. EPR FSAR revised the description in FSAR 9.2.1.4.1 from "during standby...valves in the main line are open" to "during standby...manual valves in the main line are open." The RAI-response 9.2.1-09 or the related FSAR markup did not explain this change in wording. The change to the FSAR should be explained.

09.02.01-36

Follow-up to RAI 119, Question 9.2.1-10

The ESWS 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 GDC 44 requirements. Also, 10 CFR 52.47(a)(22) requires including in the FSAR information demonstrating the incorporation of operating experience insights into the plant design. Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment," was issued to address the observed degradation over time of service water systems. The GL called for licensees to implement programmatic controls, surveillance, and routine inspection and maintenance requirements to assure that the performance capability and integrity of service water systems are adequately maintained over time. However, the staff noted that the ESWS description in the FSAR does not explain the implementation of the provisions of GL 89-13 for the EPR design. Also, while Tier 2 FSAR Table 9.1-3, "U.S. EPR Conformance with TMI Requirements (10 CFR 50.34(f)) and Generic Issues," (NUREG-0933) indicates that Issue 51, "Proposed Requirements for Improving the Reliability of Open-Cycle Service Water Systems," and Issue 153, "Loss of Essential Service Water in LWRs," are applicable to the EPR standard plant and refers to Tier 2 FSAR Section 9.2.1, there is no discussion in Section 9.2.1 addressing these issues. Issue 51 and Issue 153 are included within the scope of GL 89-13. Consequently, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to describe the implementation of GL 89-13, the allowance for component degradation, and procedures that will be implemented to identify and correct unacceptable conditions.

Based on the staff's review of response to RAI 119, Question 9.2.1-10 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The RAI-response and the resulting FSAR markup note provisions for: chemical treatment to reduce biological challenges; provisions to permit regular, periodic inspections, preventative maintenance, testing and performance trending; the use of

best design practices for piping material selection and layout to minimize erosion and corrosion; and administrative controls in the form of operating, maintenance and emergency procedures. The staff notes that these provisions will be required of the COL applicants; therefore, they should be identified as COL items.

In addition, the applicant should address in the FSAR that chemical treatment has other benefits, such as the minimization of corrosion and scaling.

The applicant should also describe in the FSAR the maximum allowed concentrations for salts and other impurities in the ESW/cooling tower basin to ensure adequate cooling tower performance over a 30 day period.

The applicant should also describe in the FSAR how chemical treatment will be provided when using emergency makeup or demonstrate that chemical treatment is not needed for long term heat removal, post accident.

09.02.01-37

Follow-up to RAI 119, Question 9.2.1-11

The ESWS 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 GDC 44 requirements. Also, 10 CFR 52.47(a)(22) requires that information demonstrating the incorporation of operating experience insights into the plant design be included in the FSAR. During a recent review of industry operating experience, the staff found that some licensees were experiencing significant wall thinning of pipe downstream of butterfly valves that were being used to throttle service water flow. In order to assure that this will not occur in the ESWS for the EPR design, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to describe the extent to which the butterfly valves will be used to throttle ESWS flow and the design provisions that will be implemented to prevent consequential pipe wall thinning from occurring.

Based on the staff's review of response to RAI 119, Question 9.2.1-11 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The applicant should consider the use of non-destructive examinations (NDE) in the determination of the pipe wall thinning condition during the life of the plant. The applicant should also consider treating this information as a COL information item.

09.02.01-38

Follow-up to RAI 119, Question 9.2.1-12

The ESWS must be designed so that periodic inspections of piping and components can be performed to assure that the integrity and capability of the system will be maintained over time in accordance with GDC 45 requirements. The staff finds the design to be

acceptable if the FSAR describes inspection program requirements that will be implemented and are considered to be adequate for this purpose. While Tier 2 FSAR Section 9.2.1.6 indicates that periodic inspections will be performed, the extent and nature of these inspections and procedural controls that will be implemented to assure that the ESWS is adequately maintained over time were not described. Furthermore, the accessibility and periodic inspection of buried ESWS piping is of particular interest and needs to be addressed. Consequently, the applicant needs to provide additional information in the FSAR to describe the extent and nature of inspections that will be performed and procedural controls that will be implemented commensurate with this requirement.

Based on the staff's review of response to RAI 119, Question 9.2.1-12 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

a. Testing in accordance with ASME XI, IWA-5244, "Buried Components," needs to be addressed by the COL.
b. Based on past operating experiences, the applicant should consider implementing periodic inspections under maintenance programs for larger diameter buried pipe to ensure ongoing material condition. EPRI has a recommended program for buried piping which should be considered as a COL information item. This program is considered good practice to inspect the buried piping system in addition to the requirements of IWA-5244.
c. FSAR Tier 2 Section 9.2.1.6 "Testing and Inspections" for ESWS does NOT include pointers to the appropriate FSAR Sections for ISI, IST and Surveillance Testing that are present in 9.2.2.5. Section 9.2.1.5 only states "after the plant is brought into operation periodic inspections and tests of the ESWS components and subsystems are performed**.**

09.02.01-39

Follow-up to RAI 119, Question 9.2.1-14

Means must be provided for monitoring effluent discharge paths and the plant environs for radioactivity that may be released in accordance with GDC 64 requirements. Also, 10 CFR 52.47(a)(6) and 10 CFR 20.1406 require applicants for standard plant design certifications to describe facility design and procedures for operation that will minimize contamination of the facility and the environment. The staff's review criteria (SRP Section 9.2.1, Paragraph III.3.D) specify that provisions should be provided to detect and control leakage of radioactive contamination into and out of the ESWS. The design is considered to be acceptable by the staff if the ESWS P&IDs show that radiation monitors are located on the ESWS discharge and at components that are susceptible to leakage, and if the components that are susceptible to leakage can be isolated. However, the staff noted that Tier 2 FSAR Section 9.2.1 and the ESWS P&ID do not include radiation monitors in the system design and the NRC regulations in this regard have not been addressed. Therefore, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to address the NRC requirements referred to above.

Based on the staff's review of response to RAI 119, Question 9.2.1-14 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

Cooling tower blow down stream (includes filter backwash) provides the source of effluent from the system. Accordingly, the applicant's response was not complete to address provisions for monitoring of cooling tower blow down effluent and to reconcile these requirements with those of SRP 11.5 Table 2 and U.S. EPR Tier 2 Table 11.5-1. In addition, SRP Section 9.2.1, Paragraph III.3.D was not completely addressed in that provisions should be provided to detect and control leakage of radioactive contamination into and out of the ESWS.

09.02.01-40

Follow-up to RAI 119, Question 9.2.1-15

Criteria are specified in 10 CFR 50.36 for establishing Technical Specification (TS) requirements. Proposed TS requirements are evaluated in part to confirm consistency with the Standard TS (STS) requirements that have been established as reflected in NUREG 1431 "Standard Technical Specifications Westinghouse Plants," Rev. 3. EPR TS 3.7.8, "Essential Service Water (ESW) System," provides limiting conditions for operation (LCO) and surveillance requirements (SR) for the ESWS and the UHS. The staff noted that TS 3.7.8 is misleading in that it includes requirements for both the ESWS and the UHS, while the TS title only refers to the ESWS. Therefore, the applicant should revise the title for TS 3.7.8 to also include the UHS.

Based on the staff's review of response to RAI 119, Question 9.2.1-15 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

During the staff review of the applicant's response to RAI 119, it was determined that the applicant's response to RAI 119 conflicted with the applicant's response to RAI 166. The staff noted that the resulting FSAR markup in response to RAI 166 had split out T.S. 3.7.8 into two different sections, UHS (TS 3.7.19) and ESWS (TS 3.7.8). The staff considers the response to RAI 166 to sufficiently address the staff's question. Therefore, the applicant should revise its response to RAI 119 to be consistent with the response to RAI 166.

09.02.01-41

Follow-up to RAI 119, Question 9.2.1-17

With respect to Surveillance Requirement (SR) 3.7.8.1, Tier 2 FSAR Figure 3.8-101 shows that the normal cooling tower basin water level is at 3.05 meters (10 feet) above

grade elevation. SR 3.7.8.1 requires that the water level in the ESWS basin be maintained greater than or equal to 8.29 meters (27.2 feet) above the bottom of the basin. However, Figure 3.8-101 shows the bottom of the basin to be -4.88 meters (-16 feet) below grade. Therefore, Figure 3.8-101 shows that the normal basin water level is at 3.05+4.88=7.93 meters (16+10= 26 feet) above the bottom of the basin, which conflicts with the SR value of 8.29 meters (27.2 feet). The applicant needs to provide additional information in the FSAR to correct this apparent inconsistency.

Based on the staff's review of response to RAI 119, Question 9.2.1-17 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The staff reviewed the RAI response and determined that additional information is required related to basin water level as noted below.

a. Provide an explanation of the basis and technical justification for the changes which amount to about a 13 percent reduction in minimum stored water volume. At a minimum, the explanation should justify the acceptability of reduced margins for: (1) cooling tower basin minimum water level that remains after 72 hours of post accident operation and the minimum level required for pump operability, and (2) the cooling tower basin maximum temperature after 72 hours when compared to the maximum basin water temperature of 35°C (95°F) based on an assumed pre-event temperature at the maximum permitted by TS 3.7.19 of 32.2°C (90°F).

b. Provide an explanation or clarification of the basin water level at which the ESWS pumps will still be able to perform their intended safety related function since it appears based on Figure 09.02.01-17-1 that at elevation 6.92' (minimum 72 hours water losses volume), the ESWS pumps remain operable at this level. Add to the table NPSH and vortex water level elevation from RAI 9.2.1-08.

c. Provide an explanation or clarification of the basin water level control system during torrential rains and hurricanes since blowdown piping is considered non-safety.

d. The applicant should consider providing Figure 09-02-01-17-1 as a DCD figure since this is an important part of the licensing basis of the ESW pumps defining margins related to NPSH and vortexing, alarms, operating bands, related to the UHS basin.

09.02.01-42

Follow-up to RAI 119, Question 9.2.1-18

Surveillance requirements are established in accordance with 10 CFR 50.36 requirements to assure that the necessary quality of systems and components is maintained, that operation will be within safety limits, and that the LCOs will be met. Also, GDC 46 requires periodic pressure and functional testing of components to assure

the structural and leak tight integrity of system components, the operability and performance of active components, and the operability of the system as a whole and performance of the full operational sequences that are necessary for accomplishing the ESWS safety functions. SR 3.7.8.6 establishes a requirement to verify that each ESWS pump and cooling tower fan starts automatically on an actual or simulated actuation signal every 24 months. This test does not adequately demonstrate ESWS operability, especially with respect to water hammer considerations and the proper functioning of vacuum breakers during loss of power and ESWS drain down scenarios, and demonstrating that the ESWS flow balance is properly set. Furthermore, the staff noted that surveillance requirements are also not proposed for demonstrating proper functioning of the ESWS vacuum breakers. Therefore, the proposed surveillance requirement does not satisfy GDC 46 requirements and the applicant needs to provide additional information in the FSAR to resolve this issue.

Based on the staff's review of response to RAI 119, Question 9.2.1-18 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

a. FSAR Tier 2 Section 9.2.1 does not presently include adequate functional descriptions (including any special performance requirements) for several key system valves (e.g. open/ closed stroke time for AA005, AA010, air release valve AA190, vacuum breaker valve AA191 etc.). Valve functional descriptions (and any special performance requirements) are essential to support development of In-service Testing program requirements (IST) that properly represent their intended design function, and thus, the functional descriptions should be provided in the FSAR.
b. SAR Tier 2 Section 14.2 pre-operational Test #048 does not specifically addresses water hammer performance or verifies proper function of vacuum breaker or air release valves etc. This information should be added to Test #048 of the FSAR. Water hammer testing is included in other Chapter 14 preoperational testing including; Chapter 14.2.12.16.3, "Main, Startup and Emergency Feed Water Systems (Test #195)" and Chapter 14.2.12.3.10, "Steam Generator Down Comer Feed Water System Water Hammer (Test #033)".

09.02.01-43

Follow-up to RAI 119, Question 9.2.1-19

The Bases for TS 3.7.8 (Page B 3.7.8-1) states that for an accident: "The pumps aligned to the critical loops are automatically started upon receipt of a safety injection signal, and all essential valves are aligned to their post accident position." However, no description of what the critical loops are or what valves must be realigned is provided in Tier 2 FSAR Section 9.2.1 or in the TS Bases. Therefore, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to fully describe these design features and operating considerations.

Based on the staff's review of response to RAI 119, Question 9.2.1-19 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

No response or FSAR markup was provided by the applicant with regard to identification of "essential valves that must be realigned to their post accident position." As previously identified, FSAR Tier 2 Section 9.2.1 does not presently include sufficient functional descriptions for several key system valves that automatically re-align in response to an accident or a pump start/ stop (e.g. AA005, AA010 etc.).

09.02.01-44

Follow-up to RAI 119, Question 9.2.1-20

Applications for standard plant design approval must contain proposed inspections, tests, analyses, and acceptance criteria (ITAAC) in accordance with 10 CFR 52.47(b)(1) requirements. Tier 1 FSAR Section 2.7.11, "Essential Service Water System," provides EPR design certification information and ITAAC for the ESWS and UHS. The staff noted that the title for Tier 1 FSAR Section 2.7.11 is misleading in that it includes requirements for the UHS along with those that are specified for the ESWS. However, the ESWS and the UHS each involve significant safety considerations that are described separately in Tier 2 of the FSAR and are reviewed separately by the staff in this report. Therefore, consistent with the approach that is used in Tier 2 of the FSAR, the applicant needs to provide the required Tier 1 information for the ESWS and the UHS in their own respective sections.

Based on the staff's review of response to RAI 119, Question 9.2.1-20 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

a. Tier 1 Section 2.7.11 title, "Essential Service Water System," is still misleading since it includes "PEB" and "PED" equipment.
b. UHS equipment such as the UHS fans (for example 30PED10 AN001 and AN002) are not listed or described in any Tier 1 tables.
c. UHS is not fully discussed in Tier 1, Section 2.7.11, Section 1.0, "Description," Section 2.0, "Arrangement," Section 3.0. Mechanical Design Features," and etc for the UHS fans.

09.02.01-45

Follow-up to RAI 119, Question 9.2.1-21

Applications for standard plant design approval must contain proposed ITAAC in accordance with 10 CFR 52.47(b)(1) requirements. Proposed ITAAC for the ESWS are

provided in Tier 1 FSAR Section 2.7.11. The staff reviewed the descriptive information, arrangement, design features, environmental qualification, performance requirements, and interface information provided in Tier 1 FSAR Section 2.7.11 to confirm completeness and consistency with the plant design basis as described in Tier 2 Section 9.2.1. The staff found that the Tier 1 information is incomplete, inconsistent, inaccurate, or that clarification is needed and the applicant needs to revise the Tier 1 information to address the following considerations in this regard:

Part 2 question: In the listing of safety-related functions, the first bullet does not include the capability to remove heat from the ESWS pump room cooler. This is not consistent with the ESWS design basis.

Based on the staff's review of response to RAI 119, Question 9.2.1-21 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The applicant should reconsider adding back the 'EDG cooling' to Tier 1. The applicant had removed EDG cooling as part of this RAI response from the Tier 1 list of ESW system safety-related functions. The applicant states that "safety significance" is used to determine if a design function is of sufficient importance to be included in the Tier 1 list of safety-related functions and provides criteria used to determine safety significance. One such criterion provided by the applicant states key features that provide functions credited in the key safety analyses. Since the availability of on-site class 1E power is a basic assumption of typical DBA analysis and the EDGs cannot function without cooling water, the applicant should reconsider the removal of the EDG cooling function from Tier 1, and ITAAC Item 7.1 and 7.6 should be restored to recognize that the flow rate specified as acceptance criteria includes flow to individual heat exchangers including the CCWS HX, EDG and ESW pump room coolers.

09.02.01-46

Follow-up to RAI 119, Question 9.2.1-21

Applications for standard plant design approval must contain proposed ITAAC in accordance with 10 CFR 52.47(b)(1) requirements. Proposed ITAAC for the ESWS are provided in Tier 1 FSAR Section 2.7.11. The staff reviewed the descriptive information, arrangement, design features, environmental qualification, performance requirements, and interface information provided in Tier 1 FSAR Section 2.7.11 to confirm completeness and consistency with the plant design basis as described in Tier 2 Section 9.2.1. The staff found that the Tier 1 information is incomplete, inconsistent, inaccurate, or that clarification is needed and the applicant needs to revise the Tier 1 information to address the following considerations in this regard:

a. Part 6 Question: Specifications to assure that the filters satisfy design and performance requirements, and to confirm alarm functions, were not provided.

b. Parts 16 and 17 Question: Table 2.7.11-2, “Essential Service Water System Equipment I&C and Electrical Design,” did not include information pertaining to the ESWS filter motors and corresponding power supplies. Similar to Parts 6 and 16, Part 17 pointed out that Tables 2.7.11-1 and table 2.7.11-2 did not describe the ESWS pump downstream filters.

Based on the staff’s review of response to RAI 119, Question 9.2.1-21 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff’s evaluation of the applicant’s initial response and justification for these items remaining open.

In the applicant’s response to parts 6, 16 and 17 of RAI 9.2.1-21, it is stated that filters (and filter motors) in the ESWS are solely provided for equipment protection and are not credited in safety analyses; therefore, they are not 'safety significant' and do not require Tier 1 treatment. The applicant also refers to guidance provided by SRP 14.3 (ITAAC), Appendix C, Fluid Systems Review Checklist, item (4) in support of this position.

Depending on water quality for many operating plants, cooling water pump discharge filter (strainer) performance can have a direct impact on service water pump and heat exchanger operability and can therefore affect the ability of the system to fulfill its design functions. These are large safety-related components that are provided with class 1E motors and active controls that are intended to protect the system safety functions by removing debris before it can challenge system operation. The applicant should reconsider the importance of these components to the system and the filters should be identified in FSAR Tier 1 Tables 2.7.11-1 and 2.7.11-2.

Proper strainer function must be specifically addressed in the initial test program of U.S. EPR FSAR Tier 2 Section 14.2 Test #48. This test does not presently include a specific requirement to confirm proper strainer function (e.g. backwash, alarms etc.).

09.02.01-47

Follow-up to RAI 119, Question 9.2.1-22

Applications for standard plant design approval must contain proposed ITAAC in accordance with 10 CFR 52.47(b)(1) requirements. Proposed ITAAC for the ESWS are provided in Tier 1 FSAR Section 2.7.11. The staff reviewed the information provided in Table 2.7.11-3, "Essential Service Water System Inspections, Tests, Analyses, and Acceptance Criteria," to confirm that the proposed ITAAC are adequate for EPR design certification. In addition to the items referred to in RAI 9.2.1-1 through -9 and RAI 9.2.1-21, some of which involve ITAAC considerations, the staff found that the proposed ITAAC are incomplete, inconsistent, inaccurate, or that clarification is needed and the applicant needs to revise the Tier 1 information to address the following considerations in this regard:

Part 3- Item 7.2 needs to specify that ESWS pump testing to demonstrate adequate net positive suction head will be completed at the maximum ESWS flow rate

conditions, with the inventory in the cooling tower basin at the lowest allowable level (as corrected to account for actual temperature and atmospheric pressure conditions). The maximum ESWS flow rate and minimum allowable cooling tower basin water level, along with the corresponding design basis water temperature and atmospheric pressure that apply need to be listed to assure that test conditions are properly established. The acceptance criteria for an acceptable test need to be specified.

Based on the staff's review of response to RAI 119, Question 9.2.1-22 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

The applicant's response to part 3 of RAI 9.2.1-22 stated that ITAAC Item 7.2 would be revised to specify that ESWS pump testing to demonstrate adequate net positive suction head—net positive suction head actual (NPSHA) must be greater than net positive suction head required (NPSHR). The testing will be completed at the maximum ESWS flow rate conditions, with consideration for the inventory in the cooling tower basin at the lowest allowable level (as corrected to account for actual temperature and atmospheric pressure conditions).The applicant did not identify the ESWS pump NPSH design conditions as requested for this ITAAC. These parameters are necessary to enable comparison with test data obtained at actual conditions. These parameters include maximum ESWS pump flow rate and minimum cooling tower basin water level, along with the corresponding design basis water temperature and atmospheric pressure.

09.02.01-48

Follow-up to RAI 119, Question 9.2.1-22

Applications for standard plant design approval must contain proposed ITAAC in accordance with 10 CFR 52.47(b)(1) requirements. Proposed ITAAC for the ESWS are provided in Tier 1 FSAR Section 2.7.11. The staff reviewed the information provided in Table 2.7.11-3, "Essential Service Water System Inspections, Tests, Analyses, and Acceptance Criteria," to confirm that the proposed ITAAC are adequate for EPR design certification. In addition to the items referred to in RAI 9.2.1-1 through -9 and RAI 9.2.1-21, some of which involve ITAAC considerations, the staff found that the proposed ITAAC are incomplete, inconsistent, inaccurate, or that clarification is needed and the applicant needs to revise the Tier 1 information to address the following considerations in this regard:

Part 4: Quantitative acceptance criteria needed to be established for all ITAAC as applicable (flow rates, heat transfer rates, completion times, etc.).

Based on the staff's review of response to RAI 119, Question 9.2.1-22 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description

provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

1. The applicant's response to Question 4 of RAI 9.2.1-22 states that FSAR Tier 1, Section 2.7.11 and Table 2.7.11-3 would be revised to list quantitative acceptance criteria for applicable ESWS ultimate heat sink (UHS) ITAAC. This information was missing from the FSAR markup.
2. The acceptance column of ITAAC 7.6 Part b, which requires confirmation of "the following" ESWS response time, however, no response time requirement is identified.
3. The acceptance column of ITAAC 7.6 Part b states "a report exists and concludes that the ESWS starts within the following required time in reponsed to a simulated actuation signal". The applicant should consider adding the response time to Tier 1.

09.02.01-49

Follow-up to RAI 119, Question 9.2.1-25

Flooding isolation of the Essential Service Water System (ESWS) pumps is discussed in two sections of the Final Safety Analysis Report (FSAR) (see below); however, Tier 2, Section 9.2.1 makes no mention of this important feature to mitigate a flood in the Safeguard Building (SB) or Fuel Building (FB). Provide a detailed discussion in the appropriate sections of 9.2.1 related to the flood signals and ESWS isolation. Clarify how the logic will isolate each division of ESWS pumps (or all ESWS pumps) and clarify if any pump receives a lockout from starting. Provide schematic diagrams showing all inputs (i.e., logic inputs , sensor inputs, all variables, actuation logic, binary limitation signals), with input types (i.e., hardwired, fiber, type of isolation used), ESWS circuit components, and all ESWS control signal outputs of the ESWS control system. The schematic provided should be of the type provided by Figure RAI 19-1, page 5, and Figure RAI 19-2, page 6, in "Response to Second Request for Additional information", Attachment A, ANP-10284Q2P, dated June 13, 2008. In addition, describe operator actions that are required and justify the non-safety-related classification for the ESWS flooding isolation logic.

From Tier 2 FSAR 19.1.5.2.2.5

"Floods caused by a break in a system with very large flooding potential (ESWS or DWS) are assumed to be contained below ground level of the affected buildings (SB or FB). This is a reasonable assumption since those systems are automatically isolated if the building sump detects a large flooding event. Moreover, expansive time is needed to flood a building up to ground level, so operator isolation is likely to succeed if automatic isolation failed."

From Tier 2 FSAR 3.4.3.4.

"Relevant component and system piping failures considered in the analysis for this elevation include failures in the essential service water system (ESWS) and component cooling water system (CCWS) heat exchangers, leaks in the emergency feed water system, leaks in the CCWS, and pipe failure in the fire water distribution system.

A postulated pipe break or erroneous valve alignment in the ESWS has the potential to impact more than one division. The ESWS piping penetrates the SBs at elevation -14 feet, 9-1/4 inches and is routed to the CCWS heat exchangers at elevation +0 feet. The worst case scenario assumed in the analysis is an erroneous valve alignment where the CCW heat exchanger is left open after plant maintenance, resulting in the entire cross section of the associated ESW line releasing water at elevation +0 feet. To cope with non-closure of the heat exchanger or a large break in the ESWS piping, the pump must be stopped and the isolation valve in the discharge line of the affected ESWS train must be closed to limit the flooding volume in the affected SB.

Non safety-related detection and isolation signals are provided in the nuclear island drain and vent system in each SB to isolate the ESWS. The alarm that actuates the isolation is above the floor level so only large flooding events can activate the alarm. Two level sensors in a one-of- two logic activate the alarm. If a level instrument fails, that sensor is not considered for the voting, and the signal is activated when one sensor alarms.

Based on the staff's review of response to RAI 119, Question 9.2.1-25 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

a. The corresponding markup of FSAR Tier 2 Section 3.4.3.4 should recognize that a control room alarm is provided (removed in the markup) and that no operator actions are required for this scenario to trip the associated ESWS pump and isolate the pump discharge.
b. The end of the last sentence in the FSAR markup appears to be incomplete, Tier 2 FSAR Revision 1, page 3.4-9 (i.e. when one sensor detects). The sentence should be revised for Tier 2, Section 3.4.3.4.
c. The applicant should provide a markup of FSAR Tier 2 Section 9.3.3 "Equipment and Floor Drains" to recognize that safety-related controls are provided in the SB non-controlled area sumps to support the flood protection design features for the scenario described above. The applicant should consider for Section 9.2.1.7.2, "System Alarms", a discussion related to this feature, namely the ESWS pump discharge valve isolation and pump trip due to flooding.
d. The applicant stated that the control details requested by the staff will not be available until later in the design process. The applicant should provide a date when this material will be available for the staff to review.

09.02.01-50

Follow-up to RAI 119, Question 9.2.1-21

Applications for standard plant design approval must contain proposed ITAAC in accordance with 10 CFR 52.47(b)(1) requirements. Proposed ITAAC for the ESWS are provided in Tier 1 FSAR Section 2.7.11. The staff reviewed the descriptive information, arrangement, design features, environmental qualification, performance requirements,

and interface information provided in Tier 1 FSAR Section 2.7.11 to confirm completeness and consistency with the plant design basis as described in Tier 2 Section 9.2.1. The staff found that the Tier 1 information is incomplete, inconsistent, inaccurate, or that clarification is needed and the applicant needs to revise the Tier 1 information to address the following considerations in this regard:

> Part 13 question: Figure 2.7.11-1, "Essential Service Water System Functional Arrangement," does not show nominal pipe sizes, which are necessary for design certification.

Based on the staff's review of response to RAI 119, Question 9.2.1-21**,** the following related item was identified.

Tier 1 Figure 2.7.11-1 does not clearly show ASME Code Classifications, for example, ASME Class 2 or 3, reference Appendix A to RG 1.206, Page C.II.1-A-1, item 4. The applicant should consider adding this information to Tier 1 Figure 2.7.11-1.