

PMHarrisCOL PEmails

From: Angelo Stubbs
Sent: Friday, September 05, 2008 8:51 AM
To: HarrisCOL Resource
Cc: John Segala; Samuel Lee
Subject: FW: HARRIS S-COL PHASE I REVIEW, Delivery of DRAFT Phase I Review TER of Task Order 21, S-COL Sections 10.4.5 and 9.2.12, to Contract NRC-42-07-036
Attachments: DRAFT_HARRIS_TER_Phase I Review_Section_10.4.5_Circ Water System.doc;
DRAFT_HARRIS_TER_Phase I Review_Section_9.2.12_Harris Lake Makeup System.doc

-----Original Message-----

From: Steve Pope [mailto:spope@isilinc.com]
Sent: Friday, July 25, 2008 12:36 PM
To: Angelo Stubbs
Cc: John Segala; Peter Wilson; Samuel Lee; Christopher Chwasz; Devender Reddy
Subject: HARRIS S-COL PHASE I REVIEW, Delivery of DRAFT Phase I Review TER of Task Order 21, S-COL Sections 10.4.5 and 9.2.12, to Contract NRC-42-07-036

Angelo:

In accordance with Contract NRC-42-07-036, Task Order 21, Subtask 4, JCN Q-4014, attached are the results for DRAFT Phase I Review TERs for HARRIS Station S-COL Sections 10.4.5, Circulating Water System and 9.2.12, Harris Lake Makeup System.

ISL Reviewer insertions are indicated by turquoise highlight - there were no RAIs against these reviews. The remaining Phase I Review TER, Section 9.2.11, Raw Water System, will be delivered next week.

Let me know if you have any questions or comments.

Thank you,

Steve

Hearing Identifier: ShearonHarris_COL_Public
Email Number: 73

Mail Envelope Properties (C4A4C9A16294FB4CBA5A36312D05FFAC0ABBFA84CA)

Subject: FW: HARRIS S-COL PHASE I REVIEW, Delivery of DRAFT Phase I Review
TER of Task Order 21, S-COL Sections 10.4.5 and 9.2.12, to Contract NRC-42-07-036
Sent Date: 9/5/2008 8:50:51 AM
Received Date: 9/5/2008 8:50:52 AM
From: Angelo Stubbs

Created By: Angelo.Stubbs@nrc.gov

Recipients:
"John Segala" <John.Segala@nrc.gov>
Tracking Status: None
"Samuel Lee" <Samuel.Lee@nrc.gov>
Tracking Status: None
"HarrisCOL Resource" <HarrisCOL.Resource@nrc.gov>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

Files	Size	Date & Time
MESSAGE	905	9/5/2008 8:50:52 AM
DRAFT_HARRIS_TER_Phase I Review_Section_10.4.5_Circ Water System.doc 90178		
DRAFT_HARRIS_TER_Phase I Review_Section 9.2.12_Harris Lake Makeup System.doc 43586		

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

**DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 10.4.5**

10.4.5 CIRCULATING WATER SYSTEM

10.4.5.1 Introduction

The circulating water system (CWS) removes waste heat from the main condenser. This waste heat is subsequently transferred to the power cycle heat sink. The CWS provides a continuous supply of cooling water to the main condenser to remove the heat rejected by the turbine cycle and auxiliary systems.

10.4.5.2 Summary of Application

In the Harris S-COL FSAR Section 10.4, "Other Features of Steam and Power Conversion System," the applicant incorporated by reference Section 10.4 of the AP1000 DCD, Revision 16, without any departures.

In addition, in FSAR section 10.4.5, the applicant provided the following:

COL information items

- HAR COL 10.4-1 to resolve the COL information item in Section 10.4.12.1, "Circulating Water System," of the AP1000 DCD, Revision 16 [COL Action Item 10.5-3]
- HAR COL 10.4-3 to resolve the COL Information item in Section 10.4.12.3, "Potable Water," of the AP 1000 DCD, Revision 16

Conceptual design information (CDI)

- HAR CDI within FSAR Section 10.4.5, describes the following various aspects of the circulating water system
 - Power generation design basis;
 - General description;
 - Component description;
 - System operation;
 - Tests and inspections; and
 - Instrumentation applications.

10.4.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," September 2004. Regulatory basis of the subsequent change is documented in NUREG-1793, Supplement 2.

In addition, the regulatory basis for acceptance of COL Information Item 10.4-1 (COL Action Item 10.5-3) is established in:

**DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 10.4.5**

Requirements

General Design Criterion (GDC) 4, “Environmental and Dynamic Effects Design Bases,” as it relates to design provisions provided to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS.

Acceptance Criteria

The requirements of GDC 4 are met when the circulating water system design includes provisions to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS. Means should be provided to prevent or detect and control flooding of safety-related areas so that the intended safety function of a system or component will not be precluded due to leakage from the CWS. Malfunction or a failure of a component or piping of the CWS, including an expansion joint, should not have unacceptable adverse effects on the functional performance capabilities of safety-related systems or components.

10.4.5.4 Technical Evaluation

The staff reviewed conformance of Section 10.4.5 of the Harris COL FSAR to the guidance in RG 1.206, Section C.III.1, Chapter 10, C.I.10.4.5 “Circulating Water System.” The staff’s review finds that the applicant appropriately incorporates by reference Section 10.4.5 of the AP1000 DCD, Rev. 16.

Section 10.4.5 of the AP1000 DCD was revised in Revision 16 and is being reviewed by the staff under docket number 52-006. The staff’s technical evaluation of the information incorporated by reference related to the circulating water system will be documented in a supplement to NUREG-1793.

The staff review of this application is limited to the following COL information items and conceptual design information:

HAR COL 10.4-1

In FSAR Section 10.4.5, the applicant provided additional information related to STD COL 10.4-1 to resolve the COL information item in Section 10.4.12.1, “Circulating Water System,” of the AP1000 DCD, Revision 16, which states:

“The Combined License applicant will address the final configuration of the plant circulating water system including piping design pressure, the cooling tower or other site-specific heat sink.

As applicable, the Combined License applicant will address the acceptable Langelier or Stability Index range, the specific chemical selected for use in the CWS water chemistry control, pH adjuster, corrosion inhibitor, scale inhibitor, dispersant, algacide and biocide applications reflecting potential variations in site water chemistry and in micro macro biological life forms. A biocide such as sodium hypochlorite is recommended. Toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room compatibility is addressed in Section 6.4.”

**DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 10.4.5**

The commitment was also captured as COL Action Item 10.5-3 in Appendix F of the staff's FSER for the AP1000 DCD (NUREG-1793):

The COL applicant is responsible for the site-specific configuration of the plant circulating water system (including piping design pressure), the cooling tower, or other site-specific heat sink.

The applicant provided additional text as part of the FSAR to address COL Information Item 10.4.12.1 regarding chemistry control of the condensate, feedwater, and auxiliary steam system. The applicant added text to Sections 10.4.5.1.1, "Safety Design Basis," 10.4.5.1.2, "Power Generation Design Basis," 10.4.5.2.1, "General Description," 10.4.5.2.2, "Component Description," and 10.4.5.5, "Instrumentation Applications," of the AP1000 DCD, Revision 16 to provide added detail concerning circulating water chemistry control.

The staff reviewed the resolution to STD COL 10.4-1 regarding the text added to Sections 10.4.5.2.1, 10.4.5.2.2, and 10.4.5.5 related to circulating water chemistry included under Section 10.4 of the Harris COL.

In FSAR Section 10.4.5.2.1, the applicant described the Harris site-specific circulating water system (CWS), as specified in STD COL 10.4-1. The CWS and the cooling towers provide a heat sink for waste heat exhausted from the main steam turbine. The CWS design parameters are provided in FSAR Table 10.4-201, "Design Parameters for Major Circulating Water System Components."

In FSAR Section 10.4.5.2.2, the applicant stated that the piping design pressure from the circulating water pump discharge to the pump discharge isolation valves is 100 psig, and from the isolation valves, including the condenser and waterboxes, to the cooling tower is 75 psig.

Also, in FSAR Section 10.4.5.2.2, the applicant provided information on the chemical treatment program for the CWS. The applicant stated that sodium hypochloride would be used as a biocide. Chemical solutions of phosphoric acid, zinc chloride, and Azole would be injected into the circulating water to control corrosion. A dispersant chemical would be injected to retain iron and solids in suspension. A Langelier Saturation Index of -2.1 to -0.74 would be expected when operating at concentration ratios of 2.0 to 5.0, respectively. A solution of ammonium bisulfate would be injected into the blowdown as required to reduce the oxidant level in the blowdown before discharge. The applicant also stated that specific chemicals used within the system are determined by the site water conditions.

In FSAR Section 10.4.5.5, the applicant identified that circulating water chemistry is controlled by cooling tower blowdown via regulating the blowdown valve.

The staff reviewed the information provided in the above FSAR sections of the application and finds that the applicant addressed the final configuration of the CWS as specified in the STD COL 10.4-1. The staff finds that the CWS design parameters of temperature and flow rates in FSAR Table 10.4-201 are consistent with the design parameters contained in DCD Revision 16 Tier 2 Table 10.4.5-1. The staff also finds that the design piping pressures of the Harris CWS are consistent with the design pressures of the conceptual (non site-specific) design of the AP-1000 CWS. The staff's evaluation of the CWS final configuration is addressed below under the CDI discussions.

**DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 10.4.5**

The staff finds that the applicant addressed the site-specific chemicals and control and maintenance of CWS chemistry in order to be consistent with DCD Revision 16 Tier 2 Sections 10.4.5.2.2 and 10.4.5.5, and as specified in STD COL 10.4-1. **[This area review is the responsibility of DE/CIB and is not included in the scope of this evaluation. The SBPA staff coordinated with CIB, in this regard.]**

HAR COL 10.4-3

In FSAR Section 10.4.5, the applicant provided additional information related to STD COL 10.4-3 to resolve the COL information item in Section 10.4.12.3, "Potable Water," of the AP1000 DCD, Revision 16, which states:

"The Combined License applicant will address the chemistry requirements for the source of potable water. A biocide such as sodium hypochlorite is recommended. For addition, if a municipal site-specific source is not utilized, toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room compatibility is addressed in Section 6.4."

The commitment was also captured as COL Action Item 10.5-5 in Appendix F of the staff's FSER for the AP1000 DCD (NUREG-1793):

The COL applicant is responsible for the site-specific biocide for use in the potable water system.

In FSAR Section 10.4.5.2.2, the applicant stated that sodium hypochlorite would be used as a biocide for the potable water system.

The staff reviewed the information provided in FSAR section 10.4.5.2.2 of the application and finds that the applicant addressed the requirements specified in the STD COL 10.4-3.

[This area review is the responsibility of DE/CIB and is not included in the scope of this evaluation. The SBPA staff coordinated with CIB, in this regard.]

HAR CDI

The applicant provided conceptual design information as part of the FSAR regarding the CWS. The applicant replaced bracketed text throughout Section 10.4.5 of the AP1000 DCD, Revision 16, to provide Harris-specific CWS power design generation basis component information, general CWS description, component description, system operation, tests and inspections, and instrumentation applications.

The staff reviewed the conceptual design information provided in HAR CDI regarding the text added throughout Section 10.4.5 related to the CWS system.

The CWS supplies cooling water to remove heat from the main condensers, the turbine building closed cooling water system (TCS) heat exchangers and the condenser vacuum pump seal water heat exchangers under varying conditions of power plant loading and design weather conditions. The Harris CWS consists of three 33-1/3 percent capacity circulating water pumps, a hyperbolic natural draft cooling tower, and associated piping, valves, and instrumentation for each unit.

**DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 10.4.5**

In FSAR Section 10.4.5.2.2, the applicant provided conceptual design information regarding the CWS major components, such as; circulating water pumps, cooling tower, cooling tower makeup and blowdown, and piping and valves, which addresses the final configuration of the Harris CWS and as specified in STD COL 10.4-1.

The three circulating water pumps are vertical, wet pit, single-stage, mixed-flow pumps driven by electric motors. The pumps are mounted in an intake structure, which is connected to the cooling tower basin. Each pump discharge line has a motor operated butterfly valve located between the pump discharge and the main header. This permits isolation of one pump for maintenance and allows two-pump operation.

The cooling tower is designed to cool the water to 90.7 °F with a hot water inlet temperature of 119.6 °F. The cooling tower basins serve as storage for the circulating water inventory and allow bypassing of the cooling tower during cold weather operations. The staff finds that the above temperature values are acceptable as they demonstrate an equally effective cooling tower design as listed in DCD, Revision 16, Tier 2, Table 10.4.5-1.

The circulating water system makeup is provided by the Raw Water System, described in Section 9.2.11 of the Harris S-COL. Makeup to and blowdown from the circulating water system is controlled by the makeup and blowdown control valves. The makeup water system for the cooling tower also provides makeup for the service water cooling tower, potable water system, fire protection system, and cycle makeup. Three 50% capacity makeup water pumps are provided and two 100% capacity ancillary pumps are provided when the circulating water system is not in operation.

The underground portions of the CWS piping are constructed of prestressed concrete pressure piping. The remainder of the piping is carbon steel and is coated internally with a corrosion-resistant compound. Control valves provide regulation of cooling tower blowdown and makeup. Piping includes the expansion joints, butterfly valves, condenser water boxes, and tube bundles.

The staff finds that the effects of flooding due to a CWS failure, such as a rupture of an expansion joint, will not result in detrimental effects on safety-related equipment, because the turbine building does not house safety-related equipment and the base slab of the turbine building is located at grade elevation. Water from a system rupture will run out of the building through a relief panel in the turbine building west wall before the level could rise high enough to cause damage. Small circulating water system leaks in the turbine building will drain into the waste water system. Large circulating water system leaks due to pipe failures will be indicated in the control room by a loss of vacuum in the condenser shell. The staff also finds that the closest edge of the natural draft cooling tower is sufficiently far (700 ft) from safety-related structures so that interactions with safety-related structures, systems and components are avoided.

The staff finds that these provisions of the Harris CWS design meet the requirements of GDC 4, as described in SRP Section 10.4.5, Section II Acceptance Criteria.

In FSAR Section 10.4.5.2.3, the applicant states that provision is made during cold weather to direct some of the circulating water flow into freeze prevention spray headers on the periphery of the cooling tower, which heats air flowing through the peripheral spray and allows de-icing in

**DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 10.4.5**

the central cooling tower baffles. Further, the applicant states that the cooling tower is positioned so that its collapse would have no potential to damage structures, systems, or components required for safe shutdown of the plant.

The staff finds that these provisions of the Harris CWS design meet the requirements of GDC 4, as described in SRP Section 10.4.5, Section II Acceptance Criteria.

In FSAR Section 10.4.5.2.5, the applicant identifies the configuration and function of the CWS pressure, temperature and level instrumentation at the Harris site. Also, the motor-operated valve at each pump discharge is interlocked with the pump, so that the pump trips if the discharge valve fails to reach the full-open position shortly after starting the pump.

The staff finds that CDI information provided by the applicant adequately addressed the final configuration of the Harris CWS system as specified in STD COL 10.4-1.

Based on its review, the staff concludes that the site-specific design of the Harris CWS meets the requirements of GDC 4, with respect to the effects of discharging water that may result from a failure of component or piping in the CWS. Further, the staff finds that the Harris CWS meets the design recommendations provided in AP1000 DCD. Therefore, the staff finds that the conceptual design information of the Harris CWS meets the requirements of STD COL 10.4-1, pending the staff's review of the DE/CIB evaluation as related to CWS and potable water chemistry.

10.4.5.5 Post Combined License Activities

None

10.4.5.6 Conclusion

The staff concludes that the information pertaining to the Harris COL FSAR Section 10.4.5 is within the scope of the design certification and adequately incorporates by reference Section 10.4.5 of the AP1000 DCD, and is thus acceptable.

In addition, the staff has compared the additional COL information within the application to the relevant NRC regulations, acceptance criteria defined in NUREG-0800, Section 10.4.5, and other NRC regulatory guides and concludes that the applicant is in compliance with the NRC regulations. In addition, the conceptual design information items, HAR CDI, involving the CWS are adequately addressed by the applicant and can be considered closed. In conclusion, the applicant has provided sufficient information for satisfying GDC 4.

[STD COL 10.4-1 involving circulating water chemistry and STD COL 10.4-3 involving potable water chemistry need to be evaluated by DE/CIB].

DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 9.2.12

9.2.12 HARRIS LAKE MAKEUP WATER SYSTEM

9.2.12.1 Introduction

The Harris Lake Makeup Water System (HLMWS) provides the ability to maintain the required lake level for normal operation at the Harris Nuclear Power Plant Units 1 and 2 and to aid in maintaining the tritium concentrations in the Harris Reservoir below the Environmental Protection Agency (EPA) limits for drinking water. The lake water is used by Harris Nuclear Power Plant Units 1, 2, and 3 for drinking water.

9.2.12.2 Summary of Application

This section of the COL FSAR addresses Harris DCD supplemental information not specifically addressed in Revision 16 to the DCD of the application to amend the AP1000 design certification rule which is being reviewed under docket number 52-006. The primary attributes are HLMWS design basis, system description, component description, system operation, safety evaluation, tests and inspections, and instrumentation applications. The HLMWS does not contain any combined license items or inspections, tests, analysis, and acceptance criteria (ITAAC).

9.2.12.3 Regulatory Basis

Section 9.2.12 of the Harris S-COL FSAR should conform to the guidance in RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.1, "Station Service Water System (Open, Raw Water Cooling System)," regarding format, content, and level of detail.

In addition, the regulatory basis for acceptance of the Harris Lake makeup water System (HLMWS) is established in:

Requirements

General Design Criterion (GDC) 4, "Environmental and Dynamic Effects Design Bases," as it relates to design provisions provided to accommodate the effects of discharging water that may result from a failure of a component or piping in the system.

Acceptance Criteria

The requirements of GDC 4 are met when the system design includes provisions to accommodate the effects of discharging water that may result from a failure of a component or piping. Means should be provided to prevent or detect and control flooding of safety-related areas so that the intended safety function of a system or component will not be precluded due to leakage from the HLMWS. Malfunction or a failure of a component or piping of the HLMWS, including an expansion joint, should not have unacceptable adverse effects on the functional performance capabilities of safety-related systems or components.

DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 9.2.12

9.2.12.4 Technical Evaluation

The staff reviewed conformance of Section 9.2.12 of the Harris S-COL FSAR to the guidance in RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.1, “Station Service Water System (Open, Raw Water Cooling System).” The staff’s review of the HLMWS was limited to the supplemental information provided in the Harris S-COL FSAR Section 9.2.12.

In FSAR Section 9.2.12.1, the applicant provided the design basis for the system. The HLMWS does not serve a safety-related function and does not have a nuclear safety design basis. Failure of the HLMWS does not affect the ability of safety-related systems to perform their intended functions. No interconnections exist between the HLMWS and any potentially radioactive system.

In FSAR Section 9.2.12.2, “System Description,” the applicant provided supplemental information regarding the general description of the HLMWS and its major components. The HLMWS draws water from the Cape Fear River to the Harris Reservoir. The HLMWS pump-house and intake structure are located on a cove of the Cape Fear River. The system consists of three pumps, piping to transport the water from the Cape Fear River to the Harris Reservoir, a discharge structure on the Harris Reservoir, trash racks, traveling water screens, and spray wash pumps. The system includes no piping or component in the proximity of plant safety-related systems or components.

In FSAR Section 9.2.12.3, “System Operation,” the applicant states that the only HLMWS operational mode is to maintain the level of the Harris Reservoir.

In FSAR Section 9.2.12.6, “Instrumentation Applications,” the applicant provided supplemental information regarding instrumentation and controls provided for the system. Flow metering instrumentation is provided to measure lake make-up water to the Harris Lake. Supervisory controls are included at the HLMWS pump house to provide main control room (MCR) control and monitoring capabilities for the HLMWS pumps, valves, and traveling screens.

The staff’s review finds that the applicant included the appropriate level of detail for the RWS in FSAR Section 9.2.12 commensurate with the guidance in RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.1.

In addition, the staff finds that the supplemental information provided by the applicant adequately addressed the requirements of GDC 2 in that the system design includes no piping or component, the failure of which could have unacceptable adverse effects on the functional performance capabilities of safety-related systems or components.

9.2.12.5 Post Combined License Activities

None

9.2.12.6 Conclusion

The staff finds that the applicant has provided sufficient information pertaining to the Harris COL FSAR Section 9.2.12 in accordance with the format and content guidance in

**DRAFT PHASE I
HARRIS PRELIMINARY SAFETY EVALUATION REPORT
Section 9.2.12**

RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.1, "Station Service Water System (Open, Raw Water Cooling Systems)." Additionally, the staff compared the supplemental information in FSAR Section 9.2.12 to the acceptance criteria of GDC 4, as it applies to the HLMWS, and concludes that the applicant is in compliance with the NRC regulations.

In conclusion, the staff finds that the applicant has provided sufficient information to satisfy GDC 4, with respect to the capability of the HLMWS to accommodate the effects of discharging water that may result from a failure of a component or piping in the system. The staff finds, therefore, that the HLMWS is acceptable.