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UniStar
NUCLEAR ENERGY

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April 6, 2011

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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI 286, Ultimate Heat Sink

References:

1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI 286 SBPA 5313" email dated January 21, 2011

2) UniStar Nuclear Energy Letter UN#11-089, from Greg Gibson to Document Control Desk, U.S. NRC, Submittal of Response to RAIs 279 and 286, Ultimate Heat Sink, dated February 21, 2011

The purpose of this letter is to respond to the request for additional information (RAI) identified in the NRC e-mail correspondence to UniStar Nuclear Energy, dated January 21, 2011 (Reference 1). This RAI addresses the Ultimate Heat Sink, as discussed in Section 9.2.5 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 7.

Reference 2 provided an April 8, 2011 schedule for the response to RAI 286, Question 09.02.05-18. The enclosure provides our response to RAI 286, Question 09.02.05-18, and includes revised COLA content. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the COLA.

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NRO

Our response does not include any new regulatory commitments. This letter does not contain any sensitive or proprietary information.

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Wayne A. Massie at (410) 470-5503.

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

Executed on April 6, 2011

Greg Gibson

Enclosure: Response to NRC Request for Additional Information RAI 286, Question 09.02.05-18, Ultimate Heat Sink, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Charles Casto, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

GTG/RDS/mdf

Enclosure

Response to NRC Request for Additional Information
RAI 286, Question 09.02.05-18, Ultimate Heat Sink,
Calvert Cliffs Nuclear Power Plant, Unit 3

RAI 286

Question 09.02.05-18

Below are follow up questions for RAI 171, Q9.2.5-2 and RAI 171, Q9.2.5-3.

For RAI 171, Q9.2.5-2, there are 3 follow up questions.

(1) Regarding Bullets 4 and 5:

Applicant's response to the RAI stated that there are two 100% capacity pumps with the following flow rates: desalinated water flow rate of 1225 gpm (4637 lpm), nominal pump flow rate of 790 gpm (2992 lpm) for head determination, and the average flow rate of 807 gpm (3055 lpm), and the maximum flow rate of 2411 gpm (9126 lpm).

The maximum UHS evaporate water loss is indicated in Table 2.0-1, "U.S. ERP Site Design Envelope Comparison," as 1364 gpm (5163 lpm). The U.S.EPR Tier 2 Table 9.2.5-2, "Ultimate Heat Sink Design Parameters," states that the maximum evaporation loss at design conditions (total both cells) is 571 gpm (2161 lpm).

Based on the staff's review of the applicant's response, the desalinated water pump design capacity is not clear for CCNPP Unit 3 and neither is the available margin that would be maintained above its Technical Specification water level in the UHS basin. Therefore, the applicant should provide information that clearly addresses this question.

(2) Regarding Bullet 7:

In response to the RAI, the applicant provided revised FSAR Figure 9.2-7, "Raw Water and Desalinated Water System," which indicates specific location of RWSS equipment and major isolation valves. However, the figure does not show the flow path to the potable water system. This conflicts with CCNPP Unit 3 FSAR Sections 9.2.9.2 and 9.2.9.3 which state that a second pair of 100% capacity pumps is provided for potable water demand. The applicant should provide information that reconciles this apparent conflict.

(3) Regarding Bullet 10:

The revised FSAR Section 14.2.14.1 adequately describes the standby desalinated water transfer pump's automatic start upon sensing a low discharge pressure or upon the trip of the desalinated water transfer pump. The applicant stated in its response that Section 9.2.9.3 would be revised to remove the 'desalinated water transfer pumps - Potable Water.' However, this FSAR markup was not provided as part of the RAI response. Revision 7 of the COL FSAR states that "a second pair of 100% capacity pumps is provided for potable water demand". Therefore, this markup should be provided or provide a clarification to this statement from part 10 of this RAI response.

For RAI 171, Q9.2.5-3, there is 1 follow up question.

The applicant's response to this RAI stated that an "evaluation of impact of a failure of the non-safety-related RWSS piping on the ESWS pumphouse buildings and ESWS cooling towers indicates that the RWSS piping has no impact on the ability of the ESWS pumphouse buildings and ESWS cooling towers to meet their intended safety function." However, the applicant did not justify this conclusion was made.

The applicant's response to Q9.2.5-2 stated that non-safety-related materials for the RWSS underground piping may include materials such as fiberglass reinforced plastic (FRP) or high density polyethylene (HDPE). Assuming a seismic event, the staff considers that all four trains of the non-safety-related pipes could be breached at their interface to the ESW pump house with the desalinated water transfer pumps running at high flow rate, continuing to feed the break. The applicant should describe in the CCNPP Unit 3 FSAR the impact of a seismic event on the ESWS pump house and the means by which the UHS cooling towers and ESWS components would continue to meet their intended safety function. The details of this evaluation should be provided.

Response

(1) Regarding Bullets 4 and 5:

Each of the two 100% capacity desalinated water transfer pumps has been sized based upon a total developed head of a nominal 200 ft (61 m) at nominal 790 gpm (2992 lpm) flow. The desalination plant is designed for an average flow of 1225 gpm (4,637 lpm).

The comparison of maximum Ultimate Heat Sink (UHS) cooling tower evaporative losses in FSAR Table 2.0-1 was removed in Revision 7 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 COLA FSAR.

The evaporation loss at design conditions (total both cells) of 571 gpm (2161 lpm) is the evaporation value that occurs during the design basis accident (DBA), at the design meteorological conditions and heat load. Since this evaporation value occurs during the DBA, the Raw Water Supply System (RWSS) (nonsafety-related system) is not credited for the replenishment of the basin.

During normal operation, only two UHS cooling towers are in operation. Based on the UHS analysis for normal operational heat load and worst case three-day temperature for evaporation, the average total makeup water required is approximately 282 gpm (1068 lpm) for each cooling tower.

The design of desalination capacity is based on the UHS cooling towers evaporation value of 282 gpm (1068 lpm) per tower and other associated losses such as drift, and blowdown. In addition, the design of the desalination plant also considers other user demands such as potable water, fire water, and demineralized water makeup concurrent with the requirements of the operating UHS cooling towers. The cooling tower evaporation value during normal operation used in the sizing of desalination capacity is conservative, since this is based on the worst case meteorological conditions using a 30-year period of meteorological data. As specified in FSAR Section 9.2.5.1, for two cooling towers the Essential Service Water System (ESWS) normal makeup provides 627 gpm (564 gpm for evaporation, 61 gpm for blowdown and 2 gpm for drift).

In response to U.S. EPR RAI 119, Question 09.02.01-17[1], AREVA indicated that the cooling tower basin will be maintained at normal operating level (approximately 6 inches above the low operating level). Each UHS cooling tower basin has a margin of 10 inches below the low operating level to the Technical Specification limit, which provides additional margin for the UHS cooling tower water inventory during normal operation.

(2) Regarding Bullet 7:

FSAR Figure 9.2-7 indicates a flow path to the Potable Water System from the desalination processing of the RWSS. The details of the Potable Water System, including two 100% capacity Potable Water Transfer Pumps, are shown in FSAR Figure 9.2-1.

FSAR Section 9.2.9.3 (under the sub heading Desalinated Water Transfer Pumps), is being revised to remove the potable water transfer pump discussion. The potable water transfer pumps are described in FSAR Section 9.2.4.2.2.

(3) Regarding Bullet 10:

In the response to CCNPP Unit 3 RAI 171, Question 09.02.05-2, bullet 10, the last paragraph is changed to read, "FSAR Figure 9.2-7 has also been revised to remove the 'desalinated water transfer pumps – Potable water', which are part of Potable and Sanitary water system and not part of the RWSS."

RAI 171, Q9.2.5-3, follow up question:

The nonsafety-related RWSS piping supplying makeup water to the UHS cooling tower terminates at the interface with the Essential Service Water (ESW) Building.

In the event of a break of RWSS piping at the interface with the ESW System at the building wall, with the discharge directly against the ESW Building wall, the wall will act as a dissipation baffle, reducing the force of the flow. The interface penetration anchor, designed and constructed in conformance to RG 1.29, Revision 4 regulatory position C.2, does not allow flow through the penetration anchor inside the building.

The buried RWSS pipe enters the ESW Building approximately 6 ft below grade. For a complete RWSS pipe failure outside the building (at the interface), the least resistance flow path will be upward. Therefore, the flow will find its way toward the surface after eroding the top soil cover. In essence, the pipe failure will result in soil erosion of the pipe surrounding area at the break location creating a localized scour hole. The eroded soil will be entrained with water and will move with the flow in the upward direction creating a gully or localized scour hole. The scour hole will function as an energy dissipation pool, dissipating the forces associated with the high pressure flow. The bottom of the ESW structure is approximately 10 ft lower than the buried RWSS pipe. Soil erosion towards the structure bottom is less likely, since the distance upward is shorter. This will result in a dissipation pool surrounding the failed pipe in the ground. The size of the scour holes are substantially less than the footprint of the ESW structure and hazard to the structure associated with the scouring is insignificant.

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[1] R. Pederson (AREVA) to G. Tesfaye (NRC), "Response to U.S. EPR Design Certification Application RAI No. 119, FSAR Ch. 9, Supplement 2," email dated April 27, 2009.

The scope of the interface anchor and the normal makeup piping inside the building is part of the generic ESW design. As specified in the responses to U.S. EPR RAI 119, Question 09.02.01-1[2] and U.S. EPR RAI 175, Question 09.02.05-4[3], nonsafety-related UHS piping, components, and associated pipe supports located near or forming an extension of safety-related system piping and components are classified and designed as Seismic Category II or Non-Seismic, depending on pipe routing. As a minimum, the nonsafety-related system piping is seismically analyzed up to the boundary anchor. A Seismic Category II classification ensures that loss of physical integrity of a nonsafety-related structure, system or component (SSC), as a result of natural phenomena, will not result in an adverse interaction with a safety-related SSC that potentially compromises the capability of the safety-related SSC to perform its safety function. Therefore, the design of the interface anchor to the seismic standards prevents leakage of water inside the ESW Building from a break of the RWSS piping.

In the event of a break of the RWSS piping to the UHS cooling tower during a seismic event, the normal makeup supply to the UHS cooling tower basin will be terminated. Safe shutdown is achieved and maintained with the UHS tower basin 72-hour reserve and with the safety-related UHS makeup supply after 72 hours.

COLA Impact

FSAR Section 2.4.11.6 is being updated as follows (only the impacted portion is shown):

2.4.11.6 Heat Sink Dependability Requirements

The normal non-safety-related water supply to the UHS cooling tower basins is fresh water from a desalination plant (approximately ~~629~~ 627 gpm (~~2,381~~ 2,373 lpm)). The emergency safety-related water supply to the ESWS cooling tower basins is brackish water from the Chesapeake Bay from the emergency makeup water system (approximately 228 gpm (862 lpm) maximum anticipated per train). In the event normal water supply is lost, there is a 72 hour volume of water available at the tower basin to deal with system losses before the emergency UHS makeup water supply is required to be initiated.

. . .

FSAR Section 9.2.5.1 is being updated as follows:

9.2.5.1 Design Basis

A COL Applicant that references the U.S. EPR FSAR design certification will provide site specific design information corresponding to U.S. EPR FSAR Figure 9.2.5-2 [[Conceptual Site Specific UHS Systems]].

The conceptual design information is addressed as follows:

{ESWS support systems are schematically represented in Figure 9.2-3. For the two operational cooling tower basins, ~~N~~normal essential service water makeup provides ~~up to 629 gpm (2,381~~

2 R. Pederson (AREVA) to G. Tesfaye (NRC), "Response to U.S. EPR Design Certification Application RAI No. 119, FSAR Ch. 9, Supplement 2," email dated April 27, 2009.

3 R. Wells (AREVA) to G. Tesfaye (NRC), "Response to U.S. EPR Design Certification Application RAI No. 175, FSAR Ch. 9, Supplement 1," email dated May 22, 2009.

~~lpm)~~ a maximum of 627 gpm (2373 lpm) of desalinated water to replenish ESWS inventory losses due to evaporation, blowdown, and drift~~, and incidental system leakage~~ during normal operations and shutdown/cooldown. ESWS cooling tower blowdown discharges up to 61 gpm (231 lpm) of water to the retention basin to maintain ESWS chemistry. This quantity is based on maintaining ten cycles of concentration in the cooling tower basin.

During the post-72 hour design basis accident condition, the ESWS Cooling Tower for one train has a maximum evaporative loss of 225 gpm (852 lpm), and blowdown is secured.

The ESWS makeup chemical treatment system provides a means for adding chemicals to the UHS makeup water and to the normal ESWS makeup water. This is done to limit corrosion, scaling, and biological contaminants in order to minimize component fouling.}

FSAR Section 9.2.9.3 is being updated as follows (only the impacted portion is shown):

9.2.9.3 Component Descriptions

. . .

Desalinated Water Transfer Pumps

These are horizontal centrifugal pumps that forward water to the supplied systems. Each pump is equipped with a discharge check valve, suction and discharge isolation valves, and a recirculation line for maintaining system pressure while meeting minimum flow requirements. Two 100% capacity transfer pumps supply the demands of essential service water, fire protection and feed to the demineralized water system. ~~A second pair of 100% capacity pumps is provided for potable water demand.~~ Duplicate full capacity transfer pumps makes online inspection and maintenance of these pumps possible without unduly affecting system operation.

. . .

FSAR Section 9.2.9.4 is being updated as follows:

9.2.9.4 Safety Evaluation

Raw water supply and the desalinization plant provide no safety-related function. Therefore, no safety evaluation is required with respect to plant design basis events.

There is no connection between raw water supplied to the desalinization plant, or the desalinization plant itself, and components or other systems that have the potential to carry radiological contamination. This complies with Criterion 60 of Appendix A to 10 CFR 50 (CFR, 2008).

With respect to potential flooding caused by failures of piping or components, the raw water delivery piping and the desalinization plant are located remote from any safety related systems or equipment, except for the lines connecting to the ESWS cooling tower basins. Failures will not adversely impact safety functions because intervening topography and the plant storm water controls are designed to divert surface water flow, including that which would result from catastrophic failure of the desalinated water storage tanks. The system boundary from the nonsafety-related RWSS to the safety-related ESWS occurs at the ESWS isolation valve located in the pumphouse buildings.

~~Evaluation of the impact of a failure of the nonsafety-related RWSS piping on the ESWS pumphouse buildings and ESWS cooling towers indicates that the RWSS piping has no impact on the ability of the ESWS pumphouse buildings and ESWS cooling towers to meet their intended safety function.~~

The nonsafety-related RWSS piping supplying makeup water to the UHS cooling tower terminates at the interface with the ESW Building.

In the event of a break of the RWSS piping at the interface with the ESW system at the building wall, with the discharge directly against the ESW Building wall, the wall will act as a dissipation baffle, reducing the force of the flow. The interface penetration anchor, designed and constructed in conformance to RG 1.29, Revision 4 regulatory position C.2, does not allow flow through the penetration anchor inside the building.

The buried RWSS pipe enters the ESW Building approximately 6 ft below grade. For a complete RWSS pipe failure outside the building (at the interface), the least resistance flow path will be upward. Therefore, the flow will find its way toward the surface after eroding the top soil cover. In essence, the pipe failure will result in soil erosion of the pipe surrounding area at the break location creating a localized scour hole. The eroded soil will be entrained with water and will move with the flow in the upward direction creating a gully or localized scour hole. The scour hole will function as an energy dissipation pool, dissipating the forces associated with the high pressure flow. The bottom of the ESW structure is approximately 10 ft lower than the buried RWSS pipe. Soil erosion towards the structure bottom is less likely, since the distance upward is shorter. This will result in a dissipation pool surrounding the failed pipe in the ground. The size of the scour holes are substantially less than the footprint of the ESW structure and hazard to the structure associated with the scouring is insignificant.

FSAR Figure 9.2-7 is being replaced with the following:

Figure 9.2-7 - {Raw Water and Desalinated Water Supply}