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NUCLEAR ENERGY

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February 4, 2010

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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 No. 127, Circulating Water System

References:
1) John Rycyna (NRC) to Robert Poche (UniStar Nuclear Energy), "RAI No 127 SBPA 2600.doc" email dated July 28, 2009

2) UniStar Nuclear Energy Letter UN#09-521, from Greg Gibson to Document Control Desk, U.S. NRC, Submittal of Response to RAI No. 127, Circulating Water System, dated December 17, 2009

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 July 28, 2009 (Reference 1). This RAI addresses Circulating Water System, as discussed in Section 10.4.5 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 6.

Reference 2 indicated that the response would be provided by February 5, 2010. The enclosure provides our response to RAI No. 127, Questions 10.04.05-1A and 10.04.05-2B, 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 to RAI No. 127, Questions 10.04.05-1A and 10.04.05-2B 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. Michael J. Yox at (410) 470-6317.

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

Executed on February 4, 2010

for Greg Gibson

Enclosure: Response to NRC Request for Additional Information RAI No. 127, Questions 10.04.05-1A and 10.04.05-2B, Circulating Water System, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR COL Application
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, 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 No. 127, Questions 10.04.05-1A and 10.04.05-2B, Circulating Water System, Calvert Cliffs Nuclear Power Plant, Unit 3

RAI No. 127

Question 10.04.05-1A

General Design Criteria (GDC) 4, as it relates to flooding, requires that design provisions be provided to accommodate the effects of discharging water that may result from a failure of a component or piping in the circulating water system (CWS). In Section 10.4.5.3, "Safety Evaluation," of the Final Safety Analysis Report for the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined Operating License (COL) application, the applicant stated that internal flooding of the Turbine Building due to an un-isolatable break or crack in a CWS pipe or failure of a CWS component, including expansion joints, does not result in damage to safety-related structures, systems, and components (SSCs). However, the applicant did not provide a description of the potential flooding hazard caused by collapse of the cooling tower, or failure of CWS yard piping. Therefore, the staff requests the applicant to provide additional information regarding the turbine building water level control and cooling tower and yard piping failure effects as related to the CWS flood control.

Response

The following provides a description of flood flow behavior due to a postulated cooling tower basin wall collapse and a postulated CWS pipe failure, and a description of the turbine building water level control. The response is grouped in three subparts as follows:

a. Potential flooding due to cooling tower basin wall collapse
b. Potential flooding due to CWS pipe failure in the yard
c. Turbine building water level control

Subpart (a): Potential Flooding due to Cooling Tower Basin Wall Collapse

The yard area surrounding the cooling tower basin slopes downward from east to west. The eastern boundary is at Elevation 100 ft NGVD29 and the western boundary is at Elevation 94 ft NGVD29 (FSAR Figures 2.4-7 and 2.5-129). The power block, where the safety-related structures, systems, and components (SSCs) are located, is approximately 1,800 feet northeast of the cooling tower basin. A drainage ditch is located on the west side of the cooling tower with a ditch bank at Elevation 92 ft. The ditch overflow is to Johns Creek. The maximum water level in the cooling tower basin is at Elevation 100 ft. Based on the yard topography and maximum basin water level, a breach in the cooling tower basin would result in flood discharge flow west toward the western perimeter road and drainage ditch, away from the power block and safety-related SSCs. Consequently, there is no flooding potential to safety-related SSCs as a result of a postulated breach or collapse of the cooling tower basin walls.

Subpart (b): Potential Flooding due to CWS Pipe Failure in the Yard

The CWS supply and return lines between the cooling tower and condenser consist of two independent CWS pipelines. Two vertical pumps discharge into a single CWS supply pipe. The supply and return CWS pipes are buried between the cooling tower and the turbine building. The pipes near the turbine building are approximately 30 feet below the grade. The internal water pressure of the CWS pipe segment on the supply side is higher than the return pipe from the condenser due to the condenser pressure losses.

A postulated break in the segment of CWS piping located between the CW pump house at the cooling tower basin up to the vicinity of the power block area perimeter road would result in flood water flowing toward the surrounding drainage ditches and away from the power block, as a result of designed yard grade topography (FSAR Revision 6 Figure 2.5-129). Consequently, a CWS pipe failure in this area is not considered to be a flood hazard to the power block area.

A postulated pipe break in the yard area located south of the non-safety related switchgear building would result in the release of flood water in that yard area. The CWS piping in this area is at the closest point to the power block and a potential flood hazard from a pipe failure in this area was evaluated. The yard area adjacent to the switchgear building is enclosed by perimeter roads on the west, south, and east sides and by the switchgear building on the north side. The finish grade elevations in this area are established by the eastern road (power block side) and the western road (transformer side) crown elevations at or above Elevation 84.5 feet NGVD29, to prevent flood flows from overtopping these roads. Drainage is based on conveying runoff and postulated flood flow south toward the southern perimeter road which has a lower crown at Elevation 82.0 feet NGVD29 (FSAR Figures 2.4-9 and 2.5-159).

A flood analysis was performed to assess the effect of a flood flow resulting from a postulated CWS pipe failure in the yard area next to the non-safety related switchgear building. The methodology used was based on open channel, gradually varied flow formulation.

For the purpose of analysis, a maximum potential flow from one CWS supply pipe was conservatively assumed. The design flow for each CW pump is approximately 200,000 gpm with a maximum pump run-out flow of 250,000 gpm. Because each CWS pipe receives flow from two pumps, the maximum flow in a pipe can amount to 500,000 gpm for a postulated CWS pipe failure. It was conservatively assumed that the two CW pumps continue to operate, supplying water to one CWS pipe during the postulated failure. However, because the water available in the cooling tower basin is finite, the CWS pumps can deliver water only for a limited time (approximately 10 to 15 minutes depending on the final cooling tower design). To maximize the flood level in the area, it was also assumed that the flood will spread only 120 feet laterally at origination location.

From the gradually varied flow water surface computation, the calculated maximum localized flood water level at the non-safety related switchgear building (flood origination location) is at Elevation 84.1 feet NGVD29. The flood spreads and the flood level decreases as it flows downward toward the southern drainage. The respective flood level over the road is at Elevation 83.1 ft NGVD29, and the direction of the flow is away from the power block area. The safety-related SSC buildings are located a few hundred feet away from this area and protected by the east side road and by having a design floor elevation of 84.6 feet NGVD29. Consequently, the flood water from a postulated break of a CWS pipe in the yard area will not reach the power block area and will not create a flood hazard to safety-related SSCs.

Subpart (c): Turbine Building Water Level Control

Turbine Building sumps are provided with sump pumps to remove water collected from miscellaneous drains. Level instrumentation is provided to control the pumps and to alert the operators of a high level condition on increasing sump level. However, this equipment is not required or credited to terminate a flooding event in the Turbine Building to protect safety-related SSCs.

COLA Impact

FSAR Section 10.4.5.3 will be supplemented as follows in a future COLA revision:

10.4.5.3 Safety Evaluation

{Internal flooding of the Turbine Building due to an un-isolatable break or crack in a circulating water system pipe or failure of a CWS component, including expansion joints, does not result in damage to safety-related SSCs. Below the main steam piping penetrations, no direct pathway through which flooding could spread exists between the Turbine Building and adjacent structures that house safety-related SSCs. No safety-related SSCs reside in the Turbine Building. Flooding exiting the Turbine Building at grade is directed away from structures that house safety-related SSCs by site grading, so external flooding resulting from a failure in the CWS does not adversely affect safety related SSCs.}

Considering the cooling tower yard topography and cooling tower basin elevation (see FSAR Figures 2.4-7 and 2.5-129), a collapse in a cooling tower basin wall would result in flood water flowing toward the cooling tower area western boundary to design drainage ditches and away from the power block area; consequently, there is no impact to safety-related SSCs in the power block area due to a postulated collapse of a cooling tower basin wall.

Flooding resulting from a postulated CWS pipe failure in the yard area adjacent to the Switchgear Building will not result in a flood hazard to safety-related SSCs. The finish grade topography along the CWS pipe route is designed such that surface runoff is directed to the south away from the power block and toward drainage ditches (FSAR Figures 2.4-9 and 2.5-129). To assess the effect of a flood resulting from a postulated CWS pipe failure in the yard area next to the non-safety related Switchgear Building (the closest CW pipe point to the power block area), a flood analysis was performed to determine the flood level. From the results of this analysis, the calculated maximum localized flood level at the non-safety related Switchgear Building (flood origination location) is Elevation 84.1 feet NGVD29. The flood water both spreads and deceases in level as it flows downward and toward the southern drainage path. The respective flood level over the southern perimeter road is at Elevation 83.1 ft NGVD29 and the direction of the flow is away from the power block area. Safety-related structures are located a few hundred feet away from this area and are protected by the high crown of the east side perimeter road and by having a design floor elevation of 84.6 feet NGVD29, which is above the maximum calculated flood elevation. Consequently, the flood water from a postulated break of a CWS pipe in the yard area will not reach the power block area and will not create a flood hazard to safety-related SSCs.}

Question 10.04.05-2B

COL Information Item 10.4-6 for the CCNPP CWS states, "if a vacuum priming system is required, a COL applicant that references the U.S. EPR design certification will provide the site specific design information." In CCNPP Unit 3 FSAR Section 10.4.5.2.2, under "Vacuum Priming System," the applicant stated that a vacuum priming system is not required at CCNPP Unit 3; however, the applicant did not provide any justification for its statement. Therefore, the staff requests the applicant to provide additional information and/or clarification in this regard.

Response

For the CCNPP Unit 3 Circulating Water System (CWS), a vacuum priming system is not required either for initial priming of the CWS in preparation for system startup or in maintaining system operation.

The CWS is filled and vented using gravity fill from the circulating water pump forebay and using the pressure fill line with the CWS makeup water system pumps (see Figure 1 below). First, the gravity fill line will be used to prime the Closed Cooling Water System (CLCWS) heat exchangers and fill a substantial portion of the condenser. During this operation, the circulating water makeup pumps provide water from the Chesapeake Bay directly to the cooling tower basin. Next, the pressure fill-line from the CWS makeup system will fill the remainder of the condenser and the rest of the CWS piping. The system is fully primed when fill water exits the condenser waterbox and CLCWS heat exchanger vent valves, and the cooling tower spray nozzles.

FSAR Figure 10.4-3 will be revised to show the pressure fill line from the CWS makeup water system to the CWS.

During normal system operation, either through the tower spray headers or the tower bypass line, the condenser and heat exchangers are under positive pressure. Therefore no vacuum priming system is required.

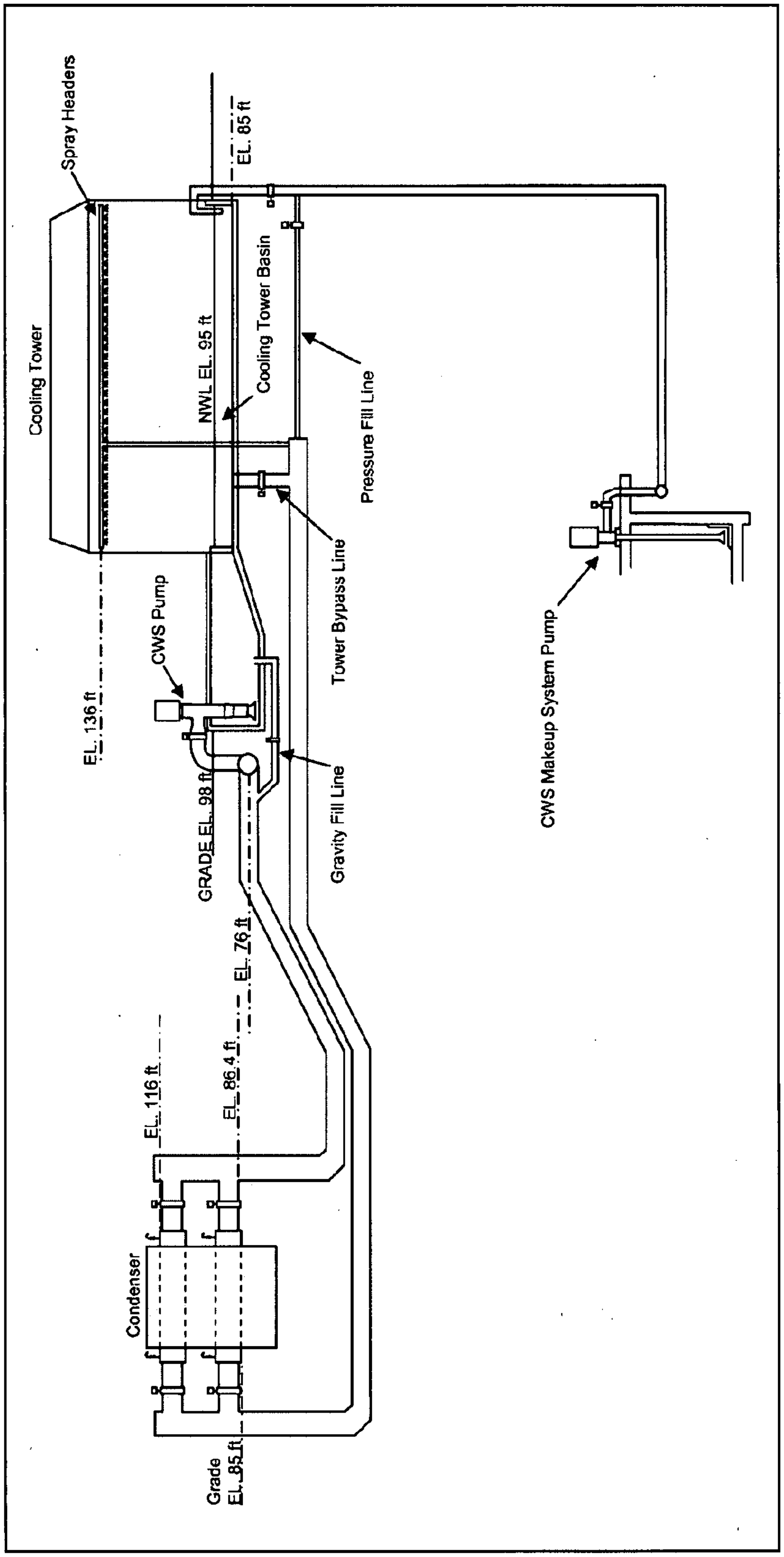

Figure 1 – Sketch of the CWS Section View (Not to Scale)

COLA Impact

FSAR Section 10.4.5.2.2 will be updated as follows in a future COLA revision:

10.4.5.2.2 Component Description

Vacuum Priming System

The U.S. EPR FSAR includes the following COL Item in Section 10.4.5.2.2 for the Vacuum Priming System:

> If a vacuum priming system is required, a COL applicant that references the U.S. EPR design certification will provide the site-specific information.

This COL Item is addressed as follows:

~~{A vacuum priming system is not required at CCNPP Unit 3.}~~

{A vacuum priming system is not required for filling and venting of the CWS in preparation for system startup, or during normal system operation. The CWS is filled and vented using gravity fill from the circulating water pump forebay and using the pressure fill line with the CWS makeup water system pumps. The system is fully primed when fill water exits the condenser waterbox vent valves, CLCWS heat exchanger vent valves, and cooling tower spray nozzles.

During normal system operation, either through the tower spray headers or the tower bypass line, the condenser and heat exchangers are under positive pressure. Therefore no vacuum priming system is required.}

FSAR Figure 10.4-3 will be replaced with the following figure in a future COLA revision:

Figure 10.4-3 - {Circulating Water System Makeup System P&ID}