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December 3, 2002

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Response to Request for Additional Information, Generic Letter 96-06

Reference (a) required an analysis of the Service Water System to determine the effects of an accident that produced extreme heat in Containment. Calvert Cliffs' initial response is contained in Reference (b). We submitted a license amendment request to modify the Service Water System (Reference d) and subsequently withdrew the request pending further analysis (Reference e).

During a telephone conference (Reference g), the Nuclear Regulatory Commission (NRC) posed the following questions and requests:

1. On July 25, 2002 (Reference f), Calvert Cliffs stated that waterhammer is the only remaining issue and several options to resolve it were being considered. Please provide a description of the option chosen.
2. Please provide a simplified elevation diagram showing the relative position of the service water (SRW) head tanks and the containment air coolers (CAC).
3. Please provide a discussion of the Generic Letter 96-06 worst case scenario as it applies to Calvert Cliffs.
4. Please provide a discussion of minimum margin to boiling in the SRW System with assumptions used in making this determination.
5. Please provide the results of the two-phase flow evaluation for the service water system.

Response to Item 1: (Discussion of option chosen)

We have determined that the best option to prevent waterhammer is to place the SRW pumps on step ' 0 ' in the loading sequence of the emergency diesel generator. This design will start the SRW pump before water in the CAC reaches the bulk boiling temperature, thereby eliminating any significant waterhammer.

Response to Item 2:

The elevation drawing is attached to this letter.

A072

<u>Response to Item 3</u>: (Discussion of worst case scenario)

The worst case scenario is design basis loss-of-coolant accident concurrent with a loss-of-offsite power. The analysis of this scenario uses a bounding approach, incorporating conservative inputs, and assumptions. For example:

- Zero fouling is assumed on the inner and outer surfaces of the CAC tubes, thereby maximizing heat transfer.
- The SRW head tank water level is assumed to be minimum, resulting in the lowest available head pressure from the tank.
- The analysis uses the top tube in the highest elevation CAC. (Taken together with the minimum head pressure provided by the head tank, this provides the lowest saturation temperature for boiling to occur and thus the shortest time to boil).
- Perfect heat transfer is assumed across the tube wall.
- The initial SRW temperature is assumed to be above the maximum for normal operations.
- The condensation heat transfer coefficient is taken as Uchida times 4.

<u>Response to Item 4</u>: (Minimum margin to boiling following modification)

The minimum time margin between SRW pump start and the start of bulk boiling is predicted (conservatively) to be 1.4 seconds.

<u>Response to Item 5</u>: (Results of two phase flow evaluation)

As stated in Reference (c), Calvert Cliffs does not experience conditions in the SRW System that would result in two-phase flow. The analysis is documented in a calculation and includes the transition period where the SRW System is reconfigured into the accident lineup through automatic valve isolation.

At Calvert Cliffs the SRW flow is throttled on the inlet side of the CACs. There are no flow restrictions downstream of the CACs that would act to force the fluid closer to two-phase flow conditions. The piping at the outlet of the CACs drops off significantly in elevation resulting in pressure recovery, moving further from saturation conditions. Therefore, during the worst case loss-of-coolant accident conditions, the location to create two-phase flow conditions is situated at the outlet of the highest CAC.

The analysis uses a bounding approach by incorporating conservative inputs and assumptions that serve to promote saturation conditions. Saturation conditions are dependent upon fluid pressure and temperature. Our analysis evaluated line-ups that create the lowest pressure (closer to saturation) and the highest temperature (closer to saturation) at the CAC outlet.

The lowest saturation pressure at this location was achieved by selecting the highest SRW piping and the lowest level in the SRW head tank. Other assumptions are:

- Valves that open to lower pressure at the CAC outlet (CAC outlet valves) were assumed open at the start of the event, lowering system pressure at the CAC outlet, moving the system closer to saturation conditions.
- Valves that throttle to lower pressure at the CAC outlet (CAC inlet valves) were assumed throttled at the start of the event, lowering system pressure at the CAC outlet, moving the system closer to saturation conditions.

- Zero fouling is assumed on the inner and outer surfaces of the CAC tubes and perfect heat transfer is assumed across the tube wall, maximizing heat input and CAC SRW outlet temperature, moving the system closer to saturation conditions.
- The SRW pumps are modeled to be performing at or below their low inservice testing action limits. This results in a lower total SRW flow, lower CAC flow, and lower pressure at the CAC outlet, moving the system closer to saturation.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

PEK/EMT/bjd

Attachment: Service Water System Simplified Elevation Sketch

REFERENCES:

(a) Letter from Mr. B. K. Grimes (NRC) to Mr. C. H. Cruse (BGE), dated September 30, 1996, NRC Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions"

(b) Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated October 30, 1996, 30-Day Response to Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions"

(c) Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated January 28, 1997, 120-Day Response to Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions"

(d) Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated March 6, 1997, License Amendment Request, Modification to the Service Water Head Tanks

(e) Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated November 30, 1998, Withdrawal of License Amendment Request, Modification to the Service Water Head Tanks.

(f) Letter from Mr. P. E. Katz (CCNPP) to NRC Document Control Desk, dated July 25, 2002, Request to Complete Actions to Address Generic Letter 96-06 Issue (TAC Nos. M96792 and M96793)

(g) Telecon between Mr. P.S. Tam, et. al. (NRC) and Mr. E. M. Tyler, et. al. (CCNPP) on October 4, 2002, Verbal Request for Information Regarding Closure of Generic Letter 96-06 Issues

cc: J. Petro, Esquire
J. E. Silberg, Esquire
Director, Project Directorate I-1, NRC
D. M. Skay, NRC
H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR

ATTACHMENT

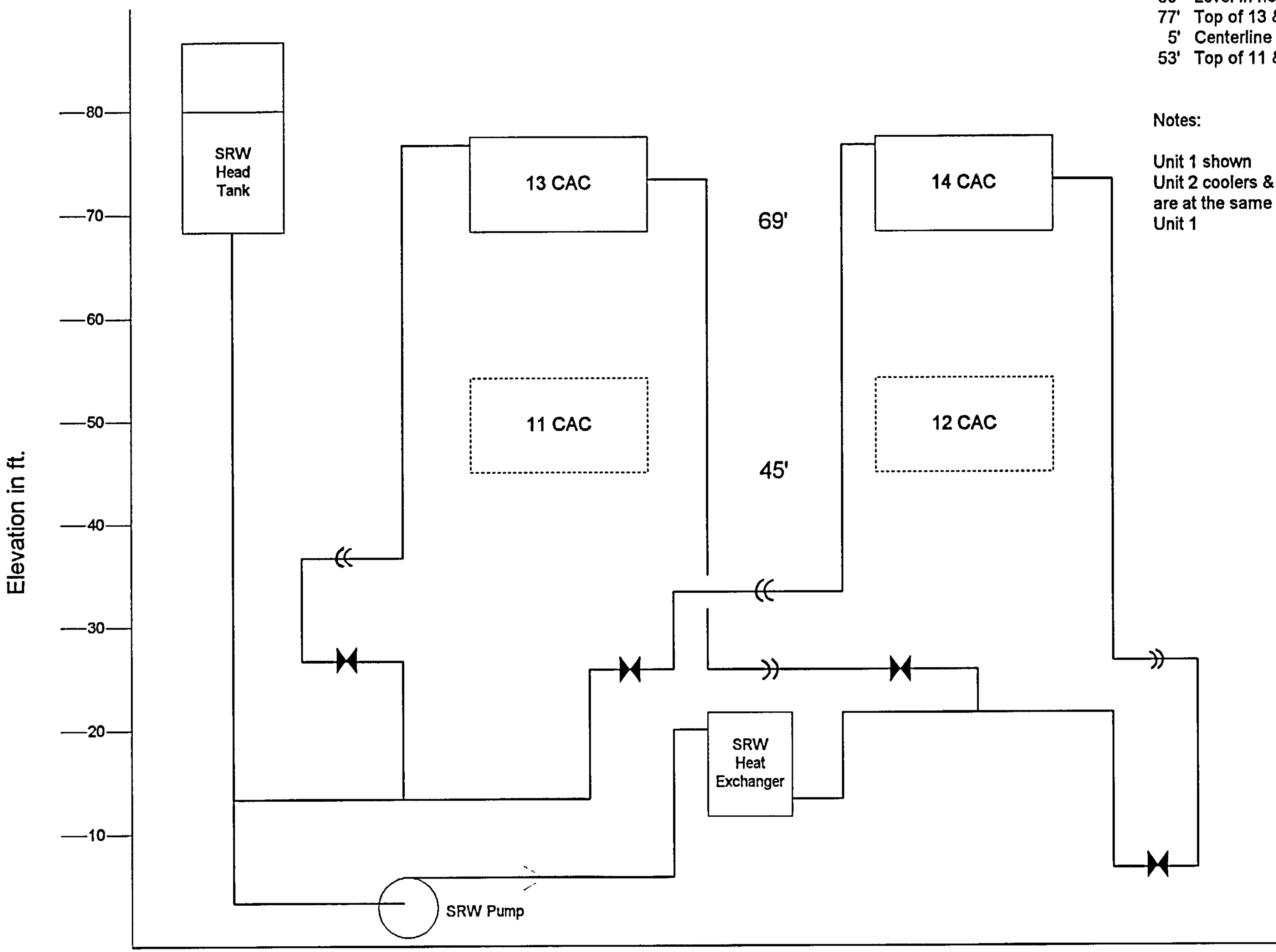
SERVICE WATER SYSTEM SIMPLIFIED ELEVATION SKETCH

Calvert Cliffs Nuclear Power Plant, Inc.
December 3, 2002

80' Level in head tank
77' Top of 13 & 14 CAC
5' Centerline of Pump
53' Top of 11 & 12 CAC

Notes:

Unit 1 shown
Unit 2 coolers & components are at the same elevation as for Unit 1



Service Water System Simplified Elevation Sketch