UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 12, 2010

Mr. George H. Gellrich, Vice President
Calvert Cliffs Nuclear Power Plant, LLC
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: GENERIC LETTER 2004-02 CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 - (TAC NOS. MC4672 AND MC4673)

Dear Mr. Gellrich:

Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," was issued on September 13, 2004. The GL addressed the potential susceptibility of pressurized-water reactor recirculation sump screens to debris blockage during design-basis accidents requiring recirculation operation of emergency core cooling systems (ECCS) or containment spray systems (CSS) and on the potential for additional adverse effects due to debris blockage of flowpaths necessary for ECCS and CSS recirculation and containment drainage.

The Nuclear Regulatory Commission (NRC) staff has reviewed previous submittals from your facility regarding the GL and has determined that additional information is needed to complete its review. Enclosed is the staff's request for additional information (RAI). As discussed with your staff, we understand that you will be prepared to discuss your proposed responses in detail with the NRC staff in mid-May 2010. We request that you provide draft RAI responses to the staff approximately one week in advance of this discussion. Final submittal of the RAI responses will be scheduled at a later date.

Please contact me at 301-415-1364 if you have any questions.

Sincerely,

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:
Request for Additional Information

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION (RAI)

GENERIC LETTER 2004-02

POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN-BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-317 AND 50-318

Debris Generation/Zone of Influence (ZOI)

In item 1 of its request for additional information (RAI) dated December 8, 2008, the Nuclear Regulatory Commission (NRC) staff requested that the licensee state whether the testing identified in the Westinghouse WCAP-16710-P and WCAP-16720-P test reports was specific to the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (CCNPP) insulation systems (NUKON™, Transco Thermal-wrap®, calcium silicate, generic fiberglass and Temp Mat). The licensee stated in its response that the insulation systems installed in CCNPP are representative of the systems tested in the WCAP-16710 and 16720 tests. The licensee noted that the Transco reflective metallic insulation (RMI), generic fiberglass and Temp Mat insulation systems were assigned ZOIs consistent with the Nuclear Energy Institute (NEI) 04-07 guidance. Subsequent to the licensee's response, the staff has learned of issues with the Westinghouse testing. The staff has provided more detailed questions to the Pressurized Water Reactor Owners Group (PWROG) and affected licensees regarding this testing. These questions (RAIs 1-9) follow, as applicable to CCNPP, and they replace the previous RAI 1. In addressing these questions, the licensee should confirm that debris generation analyses from steam space break was conducted using appropriate ZOIs, and not ZOIs based on saturated or sub-cooled water tests except as previously approved by the staff. The licensee should provide the requested information for Nukon jacket with standard bands, Transco Thermal Wrap, Calcium Silicate, and Marinite® board. Comparisons with tested components should include evaluations of both metal jacketing and cloth covers as applicable.

1. Although the American National Standards Institute/American Nuclear Society (ANSI/ANS) standard referenced in WCAP-16710-P and WCAP-16720-P predicts higher jet centerline stagnation pressures associated with higher levels of subcooling, it is not intuitive that this would necessarily correspond to a generally conservative debris generation result. Please justify the initial debris generation test temperature and pressure with respect to the plant-specific reactor coolant system (RCS) conditions, specifically the plant hot and cold leg operating conditions. If ZOI reductions are also being applied to lines connecting to the pressurizer, then please also discuss the temperature and pressure conditions in these lines. Please explain whether any tests were conducted at alternate temperatures and pressures to assess the variance in the destructiveness of the test jet to the initial test condition specifications. If so, please provide that assessment.

2. Please describe the jacketing/insulation systems used at CCNPP and compare those systems to the jacketing/insulation systems tested. Please demonstrate that the tested jacketing/insulation system adequately represented the plant jacketing/insulation system. The description should include differences in the jacketing and banding systems used for piping and other components for which the test results are applied, potentially including steam generators, pressurizers, reactor coolant pumps, etc. At a minimum, the following areas should be addressed:

    a. Please explain how the characteristic failure dimensions of the tested jacketing/insulation compare with the effective diameter of the jet at the axial placement of the target. The characteristic failure dimensions are based on the primary failure mechanisms of the jacketing system, e.g., for a stainless steel jacket held in place by three latches where all three latches must fail for the jacket to fail, then all three latches must be effectively impacted by the pressure for which the ZOI is calculated. Applying test results to a ZOI based on a centerline pressure for relatively low L/D nozzle to target spacing would be non-conservative with respect to impacting the entire target with the calculated pressure.

    b. Please explain whether the insulation and jacketing system used in the testing was of the same general manufacture and manufacturing process as the insulation used in the plant. If not, please explain what steps were taken to ensure that the general strength of the insulation system tested was conservative with respect to the plant insulation. For example, it is known that there were generally two very different processes used to manufacture calcium silicate whereby one type readily dissolved in water but the other type dissolves much more slowly. Such manufacturing differences could also become apparent in debris generation testing, as well.

    c. The information provided should also include an evaluation of scaling the strength of the jacketing or encapsulation systems to the tests. For example, a latching system on a 30-inch pipe within a ZOI could be stressed much more than a latching system on a 10-inch pipe in a scaled ZOI test. If the latches used in the testing and the plants are the same, the latches in the testing could be significantly under-stressed. If a prototypically sized target were impacted by an undersized jet it would similarly be under-stressed. Evaluations of banding, jacketing, rivets, screws, etc., should be made. For example, scaling the strength of the jacketing was discussed in the Ontario Power Generation (OPG) report on calcium silicate debris generation testing.

3. There are relatively large uncertainties associated with calculating jet stagnation pressures and ZOIs for both the test and the plant conditions based on the models used in the WCAP reports. Please explain what steps were taken to ensure that the calculations resulted in conservative estimates of these values. Please provide the inputs for these calculations and the sources of the inputs.

4. Please describe the procedure and assumptions for using the ANSI/ANS-58-2-1988 standard to calculate the test jet stagnation pressures at specific locations downrange from the test nozzle. In your description, please address the following points.

    a. Please evaluate any difference in the analysis initial temperature condition and the initial test temperature.

b. Please explain whether the water subcooling used in the analysis was that of the initial tank temperature or was it the temperature of the water in the pipe next to the rupture disk. Test data indicated that the water in the piping had cooled below that of the test tank.

c. The break mass flow rate is a key input to the ANSI/ANS-58-2-1988 standard. Please explain how the associated debris generation test mass flow rate was determined. If the experimental volumetric flow was used, please explain how the mass flow was calculated from the volumetric flow given the considerations of potential two-phase flow and temperature dependent water and vapor densities. If the mass flow was analytically determined, please describe the analytical method used to calculate the mass flow rate.

d. Noting the extremely rapid decrease in nozzle pressure and flow rate illustrated in the test plots in the first tenths of a second, please explain how the transient behavior was considered in the application of the ANSI/ANS-58-2-1988 standard. Specifically, please explain whether the inputs to the standard represent the initial conditions or the conditions after the first extremely rapid transient, e.g., say at one tenth of a second.

e. Given the extreme initial transient behavior of the jet, please justify the use of the steady state ANSI/ANS-58-2-1988 standard jet expansion model to determine the jet centerline stagnation pressures rather than experimentally measuring the pressures.

5. Please describe the procedure used to calculate the isobar volumes used in determining the equivalent spherical ZOI radii using the ANSI/ANS-58-2-1988 standard.

   a. Please describe the assumed plant-specific RCS temperatures and pressures and break sizes used in the calculation. Note that the isobar volumes would be different for a hot leg break than for a cold leg break since the degrees of subcooling is a direct input to the ANSI/ANS-58-2-1988 standard and which affects the diameter of the jet. Note that an under-calculated isobar volume would result in an under-calculated ZOI radius.

   b. Please discuss the calculational method used to estimate the plant-specific and break-specific mass flow rate for the postulated plant loss-of-coolant accident (LOCA) which was used as input to the standard for calculating isobar volumes.

   c. Given that the degree of subcooling is an input parameter to the ANSI/ANS-58-2-1988 standard and that this parameter affects the pressure isobar volumes, please explain what steps were taken to ensure that the isobar volumes conservatively match the plant-specific postulated LOCA degree of subcooling for the plant debris generation break selections. Please explain whether multiple break conditions were calculated to ensure a conservative specification of the ZOI radii.

6. Please provide a detailed description of the test apparatus, specifically including the piping from the pressurized test tank to the exit nozzle including the rupture disk system.

   a. Based on the temperature traces in the test reports it is apparent that the fluid near the nozzle was colder than the bulk test temperature. Please explain how the fluid near the nozzle, which was colder than the bulk fluid, was accounted for in the evaluations.

b. Please explain how the hydraulic resistance of the test piping, which affected the test flow characteristics, was evaluated with respect to a postulated plant-specific LOCA break flow where such piping flow resistance would not be present.

c. Please provide the specified rupture differential pressure of the rupture disks.

7. Please discuss the potential for a shock wave resulting from the instantaneous rupture of piping, considering in particular the following points.

   a. Please explain whether any analysis or parametric testing was conducted to get an idea of the sensitivity of the potential to form a shock wave at different thermal-hydraulic conditions. Please explain whether temperatures and pressures prototypical of pressurized-water reactor (PWR) hot legs were considered in this analysis or testing.

   b. Please explain whether the initial lower temperature of the fluid near the test nozzle was taken into consideration in the evaluation. Specifically, please explain whether the damage potential was assessed as a function of the degree of subcooling in the test initial conditions.

   c. Please explain the basis for scaling a shock wave from the reduced-scale nozzle opening area tested to the break opening area for a limiting rupture in the actual plant piping.

   d. Please explain how the effect of a shock wave was scaled with distance for both the test nozzle and plant condition.

8. Please provide the basis for concluding that a jet impact on piping insulation with a 45° seam orientation is a limiting condition for the destruction of insulation installed on steam generators, pressurizers, reactor coolant pumps, and other non-piping components in the containment for which the testing is credited. For instance, considering a break near the steam generator nozzle, once insulation panels on the steam generator directly adjacent to the break are destroyed, the LOCA jet could impact additional insulation panels on the generator from an exposed end, potentially causing damage at significantly larger distances than for the insulation configuration on piping that was tested. Furthermore, it is not clear that the banding and latching mechanisms of the insulation panels on a steam generator or other RCS components provide the same measure of protection against a LOCA jet as those of the piping insulation that was tested. Please provide a technical basis to demonstrate that the test results for piping insulation are prototypical or conservative of the degree of damage that would occur to insulation on steam generators and other non-piping components in the containment if the testing is credited for these components.

   Some piping oriented axially with respect to the break location (including the ruptured pipe itself) could have insulation stripped off near the break. Once this insulation is stripped away, succeeding segments of insulation will have one open end exposed directly to the LOCA jet, which appears to be a more vulnerable configuration than the configuration tested by Westinghouse. As a result, damage would seemingly be capable of propagating along an axially oriented pipe significantly beyond the distances calculated by Westinghouse. Please provide a technical basis to demonstrate that the reduced ZOIs calculated for the piping configuration tested are prototypical or conservative of the degree of damage that would occur to insulation on piping lines oriented axially with respect to the break location.

9. The licensee's response stated that it revised the ZOI for Temp-Mat from 17D (pipe diameters) to 11.7D. The 17D ZOI had originally been assigned because the Temp-Mat installed at CCNPP did not have the wire retainer installed and the 11.7D ZOI was determined from testing conducted on Temp-Mat with the wire retainer installed. The NRC staff had considered the 17D ZOI to be appropriate. The licensee should provide justification that the Temp-Mat installed at CCNPP can be considered to have the same ZOI as the Temp-Mat with the wire retainer that was evaluated during ZOI testing.

Debris Characteristics

10. The assumed debris size distribution of 60 percent small fines and 40 percent large pieces for Nukon and Thermal Wrap low-density fiberglass within a 7D ZOI is inconsistent with Figure 11-2 of the NRC staff's safety evaluation (SE) (ADAMS Accession No. ML043280641), on NEI 04-07, which considers past air jet testing and indicates that the fraction of small fines should be assumed to reach 100 percent at jet pressures greater than or equal to about 18-19 pounds per square inch (psi). Based on the predictions of the ANSI model, jet pressures equal to or exceeding that necessary to generate essentially 100 percent small fines would exist within a 7D ZOI. In light of the discussion above concerning previous testing experience, please provide a basis for considering the assumed debris size distribution of 60 percent small fines and 40 percent large pieces within a 7D ZOI to be conservative or prototypical for Nukon and Thermal Wrap.

11. Table 3.c.1-1 in the licensee's response dated October 23, 2009, indicates that only a relatively small quantity of Marinite fragments is assumed to become debris when subjected to LOCA blowdown. Based on the licensee's response to item 3.b.3 in the same document, it appeared that this size distribution was based on destruction testing performed at Wyle Laboratories. The NRC staff understands that the minimum distance from the Wyle test nozzle at which the Marinite board was positioned was equivalent to a 3.4D ZOI. As such, it appeared to the staff that application of the debris characterization results from this testing to Marinite located within 3.4D of postulated pipe ruptures would be non-conservative. Please clarify the distance of the installed Marinite from potential break locations that could result in the need for sump recirculation and provide justification regarding application (if any) of the Wyle test results to Marinite within 3.4D of potential break locations.

Latent Debris

12. The licensee's supplemental response dated October 23, 2009, included the following statement regarding the samples taken as part of the latent debris survey: "The latent debris was described as dust with no fiber in any sample." Given the quantity and multiple types of debris insulation present in the CCNPP containment, it seems highly unlikely that latent debris found in containment would be composed of all particulate and no fiber. In addition, an all-particulate assumption for latent debris is inconsistent with the 2004 NRC SE on NEI 04-07 and with data from other PWRs. The SE recommends using an 85 percent particulate/15 percent fiber latent debris composition. The composition was determined by sampling performed, via sweeping with a Masolin cloth and vacuuming using high efficiency

particulate absorbing filters, in a number of volunteer plants. Please justify no consideration of fibers for latent debris as applied to strainer performance testing.

Debris Transport

13. The NRC staff considers the single failure of a low-pressure safety injection (LPSI) pump to trip at the time of switchover to recirculation to not be fully addressed in the licensee's October 23, 2009, supplemental response. Therefore, please address the following items related to the potential operation (including failure to trip) of a LPSI pump during recirculation:

    a. Please identify how much time operators would need to terminate the additional flow associated with a LPSI pump that failed to automatically trip and the means by which the flow would be terminated. Please provide a basis for the assumed time period of operation that considers whether the operator actions to address this potential failure are proceduralized and can be accomplished from the control room.

    b. Please state whether conditions exist for which emergency operating procedures would either direct or allow plant operators to operate a LPSI pump in recirculation mode under design basis conditions (e.g., during hot leg recirculation). If such conditions exist, please identify their impact on the strainer performance analysis.

    c. Increased sump flow from an operating LPSI pump could lead to increased debris transport (e.g., transport of coating chips or large pieces of debris) that was not considered in the debris transport calculation or flume testing. Please provide a basis for concluding that the increased flows associated with LPSI pump operation would not lead to additional transport beyond that considered in the existing analysis.

    d. Please explain how the failure of the LPSI pump to trip was considered in the head loss testing.

    e. Please provide the details of the evaluation of net positive suction head (NPSH) margin associated with the failure of the LPSI pump to trip. Provide the effects on the high-pressure safety injection (HPSI) pumps and the containment spray pumps to the extent they are required to operate during the recirculation phase of the event.

14. The licensee's October 23, 2009, supplemental response reached the conclusion that transport of coating chips would not be expected during post-LOCA recirculation. A conclusion also appears to have been made that large debris pieces will not transport to the strainers. To fully support these conclusions, please provide the following additional information:

    a. Please identify the average flume velocity for the testing described in response to item 3.h.3, during which coating chips were observed to sink directly to the bottom of the flume, even when dropped in front of the strainer. Please further identify whether the testing performed considered whether the coating chips were able to transport by tumbling or sliding along the flume floor and onto the strainer surface after falling out of suspension settling onto the floor.

b. Please provide a conservative estimate of the velocities in the containment pool along flowpaths by which sump fluid would reach the strainer. The NRC staff understands that a computational fluid dynamics analysis was not performed for the post-LOCA containment pool and does not consider it necessary given other conservatisms in the transport analysis. However, the clean strainer flow calculation in response to item 3.e.1 is not sufficient to analyze debris transport to the strainer because it does not consider external flow features upstream of the strainer that could have a significant influence on pool flow. Please include an estimate of the limiting pool velocities for the case of a LPSI pump single failure to trip as well as the limiting flow case without consideration of a LPSI pump failure to trip.

Head Loss and Vortexing

15. Please evaluate the potential for deaeration across the debris bed. If deaeration is predicted to occur, please determine and describe the effect on NPSH required for the required pumps according to the guidance in Regulatory Guide 1.83, Rev. 3, Appendix A.

16. The licensee provided information on the calculation of clean strainer head loss (CSHL) in section 3f9 of the final supplemental response. The information provided was found to be acceptable since the calculation used industry standard practices to determine the CSHL. However, the response did not state whether the CSHL calculation assumed equal flow through all strainer modules as could occur for a debris laden strainer, or if the calculation assumed higher flow for the modules nearer the pump suction. The NRC staff expects CSHL calculations to assume flow distributed evenly among all strainer perforated surfaces in order to determine a realistic CSHL portion for a debris laden strainer. Please provide the assumptions that were made for flow through the strainer during the evaluation of CSHL.

17. In RAI 14 of the NRC staff's letter of December 8, 2008, the staff requested a vortexing evaluation. Based on the licensee's response, the staff believes that it is likely that the evaluation bounded the design conditions. However, the response was not clear on all aspects of the evaluation. Please provide the additional information regarding the vortex evaluation:

    a. The licensee's response to section 3f4 indicated that testing was conducted at about 4 inches submergence and that flow rates during clean strainer testing ranged from 80 percent to 500 percent of the nominal design flow rate. Section 3f3 and the response to RAI 14 stated that testing was conducted at 1 inch and about 6 inches. Please explain whether observation for vortex formation was conducted at the minimum submergence of 1 inch. If so, please state what flow rates were used during this testing.

    b. Please provide the maximum flow rate attained at each submergence level during testing.

    c. Please state the maximum postulated flow rate through the strainer nearest the pump suction, and explain whether the maximum flow rate during testing bounds this value.

    d. If testing was not conducted at the minimum submergence and maximum flow rate, please provide additional details on how it was concluded that vortex formation would not occur.

18. RAI 15 of the NRC staff's letter of December 8, 2008, requested the licensee to discuss whether any significant sources of water drainage could enter the containment pool directly above, or in the immediate vicinity of the strainer, and whether this drainage could result in significant splashing and/or disturbances at the containment pool surface and, therefore, lead to unacceptable air entrainment through the strainer surface. In addition, it asked the licensee to clarify whether the top surface of the strainer modules (i.e., the upper face of the cartridges) is perforated or solid plate. The licensee provided additional information on the installation of the strainer and how water drainage might fall into the containment pool near the strainer. The response stated that the top of the strainer is solid (not perforated). The licensee also stated that a majority of the strainer is covered so that break or spray flow could not impact the pool near those sections. However, the response indicated that portions of the strainer are not covered, and drainage from collected spray flow could fall directly onto these parts of the strainer. Because of the low submergence, please provide additional technical basis for the assertion that the drain flow could not result in unacceptable air entrainment into the strainer.

19. In RAI 16, the NRC staff requested the licensee to provide the results and methodology for the final strainer qualification testing for head loss and vortexing with a level of detail consistent with the information requested in the staff's content guide for supplemental responses. The licensee provided additional information regarding the test methodology and results for the final strainer qualification testing. In general, the information provided indicates that the testing was conducted in accordance with staff guidance. However, Figure 3f4-2 of the supplemental response appeared to show that the testing was conducted with a two-sided strainer. This figure does not correspond to Figure 17-1 provided in the RAI response, which shows a single-sided strainer. In addition, the flow rate was reduced during the testing. It appeared that flow was reduced following the addition of non-chemical debris and before the addition of chemical debris. There were several changes in head loss as observed on the head loss plots provided with the RAI response (Figure 16-1) and the final supplemental response (Figures 3o2.26-1, 2, and 3). No explanations for the changes in head loss were provided. In addition, the staff could not determine what condition each of the three tests presented in section 3o represented. Please provide the following information regarding the testing:

    a. Please explain whether the test was conducted with a 2-sided strainer (i.e. with pockets facing away from each other discharging into a central plenum with the pump taking suction from that plenum). If the testing was conducted with a single-sided strainer, questions 19.b through 19.d below do not require a response.

    b. Please explain how the debris amount that transports to each side of the strainer was determined.

    c. Please provide the debris split between the two sides of the strainer and explain how debris was added to the test for each side.

    d. Please provide photographs of the debris deposition on the rear strainer pockets and front strainer pockets and evaluate any differences in the amounts of debris deposited in the front and rear pockets.

e. Please provide the flow rates used during the testing and the basis for any changes in flow rates during testing. (e.g. why was flow rate reduced after non-chemical debris addition and before chemical precipitate addition?)

f. Please provide the maximum head loss attained with each debris load at each flow rate. Head losses during the final flow sweeps need not be provided.

g. Please provide the purpose for each of the tests presented, including differences in how the tests were performed to meet the expected plant conditions that the tests represented.

h. Please provide an explanation for significant head loss changes that occurred during the tests where it is not evident from the test plot that a debris addition was initiated, flow change was made, etc.

i. Please provide an evaluation of the sharp increase followed by a relatively rapid decrease in head loss following the initiation of sodium aluminum silicate addition.

20. RAI 22 asked the licensee to identify the debris loading conditions for which the final strainer maximum head loss occurs and confirm that testing has been performed to verify that the strainer, when laden with a thin bed or maximum debris loading, would not result in unacceptable head losses. The licensee's response stated that the loading included theoretical fibrous debris loads from 0.10 inches to 1 inch. 50 percent of the particulate debris was added at the theoretical thickness of 0.10 inches and the remaining 50 percent of the particulate was added at the theoretical thickness of 0.15 inches. This is reasonable. However, the licensee did not provide all of the requested information for this issue, sufficient to confirm that head loss had been determined prototypically or conservatively. Please provide the following:

a. The results of thin bed test showing the head loss at the various debris loads from 0.10 to 1.0 inch theoretical bed thicknesses.

b. The masses for each type of debris added during the thin bed test, broken down into the amount included in each separate debris addition.

c. The mass of each debris type added to the maximum load tests.

d. The mass of chemical debris added during each chemical precipitate addition and the time at which the debris was added, or the window in which the precipitates were added if it was a continuous addition.

e. The scaling factor(s) used during the testing.

f. The test strainer area.

The NRC staff considers that much of this information would be most easily presented on an annotated plot of head loss and flow during the testing in conjunction with a debris addition schedule for each test.

Net Positive Suction Head

21. Please provide an evaluation of how the following phenomenon could affect the containment sump water level or state how they are accounted for in the current sump level calculation:

    a. water droplets in transit from the spray nozzles to the containment pool

    b. holdups on vertical surfaces due to condensation and filming

    c. holdups on horizontal surfaces

    d. shrinkage of water volume due to cooling of RCS inventory

22. Please provide a summary of emergency core cooling system (ECCS) and containment spray pump NPSH margins at additional sump fluid temperatures. In particular, an evaluation of NPSH margins at elevated sump temperatures should be included. Please provide an explanation for the reason that the NPSH margins provided in the final supplemental response included margins for the LPSI pumps when the LPSI pump suction source is not generally considered to be the containment sump. Additional information regarding the margin for the containment spray pumps should be provided since these pumps are generally considered to take suction from the ECCS sump. The NRC staff also noted an apparent typographical or calculation error in the table on page 28 of the updated supplemental response. That is, the margin for the LPSI pump at 120 °F was listed as 8.9 ft while the difference between the $NPSH_A$ and $NPSH_R$ columns was 9.9 ft. Please include in the information provided an evaluation for all pumps taking suction from the ECCS sump. The information should include the full range of sump conditions and the limiting flow rates evaluated (including LPSI flow if applicable). If a time- or temperature-dependent head loss evaluation (e.g. delayed onset of chemical effects) was used for CCNPP, this effect should be evident in the information provided. (See RAI 23 below.)

Chemical Effects

23. The licensee's submittal of October 23, 2009, (Attachment 1, page 48) states that CCNPP conservatively assumes that aluminum will precipitate out as sodium aluminum silicate and will begin to affect head loss at sump pool temperatures between 140 °F and 110 °F. Please confirm whether all chemical precipitate was assumed to form at 140 °F. If all precipitate was not assumed to form at 140 °F, please provide a detailed discussion and justification regarding the amount of precipitate assumed to form as a function of temperature.

April 12, 2010

Mr. George H. Gellrich, Vice President
Calvert Cliffs Nuclear Power Plant, LLC
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: GENERIC LETTER 2004-02 CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 - (TAC NOS. MC4672 AND MC4673)

Dear Mr. Gellrich:

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The Nuclear Regulatory Commission (NRC) staff has reviewed previous submittals from your facility regarding the GL and has determined that additional information is needed to complete its review. Enclosed is the staff's request for additional information (RAI). As discussed with your staff, we understand that you will be prepared to discuss your proposed responses in detail with the NRC staff in mid-May 2010. We request that you provide draft RAI responses to the staff approximately one week in advance of this discussion. Final submittal of the RAI responses will be scheduled at a later date.

Please contact me at 301-415-1364 if you have any questions.

Sincerely,
/RA/
Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:
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