July 9, 1997

Mr. Lew W. Myers
Vice President Nuclear - Perry
Centerior Service Company
P.O. Box 97, A200
Perry, OH 44081

SUBJECT: EMERGENCY CORE COOLING SYSTEM SUCTION STRAINER PROGRAM IN RESPONSE TO NRC BULLETIN 96-03, PERRY NUCLEAR POWER PLANT, UNIT 1 (TAC NO. M96162)

Dear Mr. Myers:

On May 6, 1996, the NRC staff issued NRC Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling-Water Reactors" (NRCB 96-03). On March 24, 1997, NRC staff members met with representatives from the Perry and the Grand Gulf plants. A summary of the meeting was issued on April 23, 1997. In the meeting, and in the summary, the NRC staff stated that they would inform you of any significant concerns regarding your proposed use of a new hydrodynamic load calculational methodology. These concerns are included in the enclosure for your consideration. The staff is not requesting additional information by this letter; however, the staff is available to discuss its concerns. The staff may inspect your activities concerning this issue in the future.

Contact me at (301) 415-3027 if you have any questions.

Sincerely,

Original signed by:

Jon B. Hopkins, Senior Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

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Docket No. 50-440

Enclosure: As stated

cc w/encl: See next page

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Staff Concerns Regarding the 10 CFR 50.59 Evaluation Conducted in Support of the NRCB 96-03 Resolution for the Perry and Grand Gulf Nuclear Power Plants

In a meeting on March 24, 1997, between the NRC staff and representatives of The Cleveland Electric Illuminating Company, the licensee for the Perry Nuclear Power Plant, the staff identified some concerns relative to Perry's proposed resolution of NRC Bulletin 96-03. The staff's concerns relate to some of the activities which the licensee believes can be conducted under 10 CFR 50.59 and are described below. The same concerns apply to the Grand Gulf Nuclear Power Plant because they propose to implement the same resolution as Perry. Representatives of the Grand Gulf plant were present at the March 24, 1997, meeting. The staff's specific concerns are as follows:

1. In its meeting with the staff on March 24, 1997, Perry provided a handout entitled, "ECCS Suction Strainer Program and Design Review." The handout discusses one of the advantages of the new Perry/Grand Gulf strainer design that it is "not conducive to air ingestion" assuming actuation of one or more SRV's. The staff is concerned about this statement because the new strainer design proposed by Perry and Grand Gulf would apparently infringe on an area commonly called the "exclusion zone." The exclusion zone is a cylindrical zone drawn around and above every quencher. The zone is a design requirement imposed by GE in the GESSAR II, the GE standard FSAR for Mark III, and BWR 6 designs. All Mark III's referenced the GESSAR II for the hydrodynamic loads portions of their plant FSAR during plant licensing. In Appendix 3b of the GESSAR II, GE provided guidance for the design engineer stating that the ECCS suction piping in the vicinity of the SRV quenchers should not penetrate the exclusion area. The exclusion area was defined in Section 3BA.7 as a clearance zone around each quencher maintaining a minimum clearance of 117 inches from any ECCS suction inlet. The purpose of this clearance is not expressly discussed in the text of the GESSAR; however, the staff believes its purpose is to prevent impingement of the jet emanating at the quencher holes on piping or structures.

   If a structure is now placed in that jet path within the exclusion zone, the effects of the jet impingement acting upon the strainer surface should be evaluated for local effects such as deformation. The jet effect acting upon the near field strainer surface may exert sufficient force to damage the strainer perforated surface. An additional staff concern is related to the air plume discharge of the SRV becoming ingested into the ECCS suction piping. The plume is created from the initial air clearing of the SRV tailpipe when the valve opens.

   Perry stated during the March 24, 1997, meeting that their existing strainers violate this exclusion zone in one location. This particular strainer, therefore, does not meet that design basis requirement imposed by GE. The new proposed toroidal shaped strainer will not meet that design requirement in many locations around the strainer. The licensee

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stated that while they were aware of the exclusion zone, they did not believe there was an analysis to support the exclusion zone requirement, and have concluded that infringing on the zone with the new strainer design is acceptable. The staff believes that infringing upon the exclusion zone as described in the GESSAR II should be supported by analysis or test. If analysis is provided, they should address jet load and the potential for air ingestion into the ECCS systems.

The staff is concerned that the engineering assessment described by Perry during the March 24, 1997, meeting with the staff does not address these issues. The 117-inch minimum clearance as specified in the GESSAR II is not met for the recently modified strainer design that is currently in place, and would not be met for the new strainer design. This means that they would be infringing on many more quencher exclusion zones then their current design and, therefore, they may have a higher likelihood of subjecting the strainer to local jet loads not previously evaluated and also ingesting noncondensables into the strainer.

2. Also within the same handout, the Perry licensee discusses the use of acoustic wave methodology as a suitable method for calculating submerged structure loads. If reviewed, this method may be found suitable by the staff; however, both licensees believe this calculational change can be made under 10 CFR 50.59. The staff notes that the GESSAR II specifically discusses the calculation of submerged structure loads which are based on the Pressure Suppression Test Facility (PSTF) tests run 17 years ago. The GESSAR II also discusses the margin which exists in the current method. For example, GESSAR II states in Section 3BB.5 that expected loads from bulk pool swell (the air bubble phase of LOCA) are at most 60 percent of the design loads with 10-inch pipes never exceeding 30 percent of design value for drag loads.

   With the proposed method of acoustics, the licensees stated that an order of magnitude reduction in the calculated loads on a submerged structure may be obtained. The staff believes that use of this alternative methodology appears to be reducing the safety margin and was not supported or compared with existing test data to determine the available margin that would exist using the proposed methodology. In addition, the staff is concerned that the use of acoustic wave methodology may not be an appropriate method when the originating event causes bulk fluid displacement. Under a postulated LOCA or SRV discharge, the initial air bubble generation causes large fluid displacement, and that subsequent motion generates drag forces on bodies restrained within the fluid. The licensee's approach does not appear to model the water acceleration drag forces.

   It is not clear to the staff how the licensees concluded in their 10 CFR 50.59 evaluation that they are not reducing the margin to safety. Their discussion on March 24, 1997, did not address the subject of inherent

margin in their method and what they believe is adequate margin between calculated loads versus design capability of the strainer device and its mounting.

3. Use of the new methodology for calculating air clearing loads has led both licensees to conclude that uplift loads would be insufficient to lift the strainer, and, therefore, no attachment to the floor or other vertical bracing is needed. The staff believes that a new event may need to be considered because of the proposed design of the strainer. Their proposed strainer is designed to have three hydraulically distinct regions within the toroid; however, because of the physical arrangement, the strainer has all ECCS suction piping mechanically tied together at the strainer.

   The asymmetric load condition is an assumption used currently by the Mark III plants in the LOCA air bubble event. If the proposed Perry method for calculating air bubble/air clearing loads should underestimate the forces or an asymmetric force be generated, then the possibility exists that the strainer could rotate or move. This could lead to the possibility of disabling or reducing the performance of all of the ECCS systems if a hinge is formed in the ECCS piping. The reduction in ECCS performance may occur if the strainer rotates and partially collapses the ECCS suction piping. There was insufficient detail available at the meeting in order to address this potential issue in sufficient depth.

4. From a technical standpoint, the staff noted during the March 24, 1997, meeting that the method which the licensees propose, which is described in NEDE-24822 entitled, "Mark II Improved Chugging Methodology," and approved by the staff in NUREG-0808, does not currently address the use of the acoustic wave methodology for the air clearing portion of the event. That method was intended for the analysis of chugging and condensation oscillations induced loads as described in the NEDE and NUREG. In addition, since staff approval was based in large part on a comparison of analysis with test data, the licensees needed to demonstrate that their "new method" of using acoustic wave methodology for calculating LOCA air bubble and quencher air bubble loads will achieve a 95%-95% confidence level as was done for the original licensing submittal.