Station Support Department

NRCB No. 96-03
10CFR50.54(f)

PECO NUCLEAR
A Unit of PECO Energy

PECO Energy Company
965 Chesterbrook Boulevard
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November 1, 1996

Docket Nos. 50-277
50-278
50-352
50-353

License Nos. DPR-44
DPR-56
NPF-39
NPF-85

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: Peach Bottom Atomic Power Station, Units 2 and 3
Limerick Generating Station, Units 1 and 2
Response to NRC Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors"

Gentlemen:

Attached is PECO Energy Company's response to NRC Bulletin (NRCB) No. 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors," for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, and Limerick Generating Station (LGS), Units 1 and 2, which was issued on May 6, 1996.

This Bulletin requests that licensees implement appropriate procedural measures and plant modifications to minimize the potential for clogging of Emergency Core Cooling Systems (ECCS) suppression pool pump suction strainers by debris generated during a Loss-of-Coolant-Accident (LOCA). The NRC considers these actions necessary in order to ensure the capability of the ECCS to perform its intended safety function. The NRC identified three (3) potential resolution options in this Bulletin; however, licensees may propose other methods which provide an equivalent level of assurance that the ECCS will respond and provide adequate reactor core cooling capability following a LOCA. The NRC requested that licensees implement the actions identified in this Bulletin by the end of the first refueling outage starting after January 1, 1997. In addition, NRCB 96-03 requires that all BWR licensees provide a written response within 180 days of the date of this Bulletin indicating whether the licensee intends to comply with the "Requested Actions" stipulated in the Bulletin. This response should include a description of the planned actions and mitigative strategies to be used, the schedule for implementation, and proposed Technical Specifications changes, if appropriate.

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The attachment to this letter provides PECO Energy's response to NRCB 96-03. The reporting requirements identified in the Bulletin are restated in the attachment followed by our response for PBAPS, Units 2 and 3, and LGS, Units 1 and 2. This response is being submitted under affirmation in accordance with 10CFR50.54(f), and the required affidavit is enclosed.

If you have any questions or require additional information, please do not hesitate to contact us.

Very truly yours,

D. B. Helker /FOR

G. A. Hunger, Jr.
Director - Licensing

Attachment
Enclosure

cc: H. J. Miller, Administrator, USNRC, Region I (w/ attachment & enclosure)
N. S. Perry, USNRC Senior Resident Inspector, LGS (w/ attachment & enclosure)
W. L. Schmidt, USNRC Senior Resident Inspector, PBAPS (w/ attachment & enclosure)

COMMONWEALTH OF PENNSYLVANIA :

: ss.

COUNTY OF CHESTER :

D. B. Fetters, being first duly sworn, deposes and says:

That he is Vice President of PECO Energy Company; that he has read the foregoing response to NRC Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling-Water Reactors," for Peach Bottom Atomic Power Station, Units 2 and 3, and Limerick Generating Station, Units 1 and 2, and knows the contents thereof; and that the statements and matters set forth therein are true and correct to the best of his knowledge, information, and belief.

Vice President

Subscribed and sworn to
before me this 1ST day
of November 1996.

Notary Public

Notarial Seal
Mary Lou Skrocki, Notary Public
Tredyffrin Twp., Chester County
My Commission Expires Mar 17, 1998

ATTACHMENT

Peach Bottom Atomic Power Station, Units 2 and 3
Limerick Generating Station, Units 1 and 2

Response to NRC Bulletin 96-03, "Potential Plugging
of Emergency Core Cooling Suction Strainers
by Debris in Boiling Water Reactors"

Peach Bottom Atomic Power Station, Units 2 and 3
Limerick Generating Station, Units 1 and 2
Response to NRC Bulletin 96-03

On May 6, 1996, the NRC issued NRCB No. 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors," requesting that Boiling Water Reactor (BWR) licensees implement appropriate procedural measures and plant modifications to minimize the potential for clogging of Emergency Core Cooling System (ECCS) suppression pool pump suction strainers by debris generated during a Loss-of-Coolant-Accident (LOCA). The NRC indicated that these actions were necessary to ensure that the ECCS can perform its intended safety function and minimize the need for operator action to mitigate a LOCA. The NRC requested that the actions specified in NRCB 96-03 be implemented by the end of the first refueling outage starting after January 1, 1997.

In NRCB 96-03 the NRC identified three (3) potential options for addressing the long term resolution of the ECCS pump suction strainer clogging industry issue. In addition, the NRC also indicated that licensees may propose other alternatives which provide an equivalent level of assurance that the ECCS will be able to perform its intended safety function following a LOCA. The three (3) potential resolution options identified in the Bulletin are discussed briefly below.

Option 1: Installation of a Large Capacity Passive Strainer Design

This option utilizes a strainer design of sufficient capacity to ensure that debris loading effects following a LOCA, and as calculated in accordance with the guidance specified in Regulatory Guide (RG) 1.82, Revision 2, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant-Accident," do not cause a loss of Net Positive Suction Head (NPSH) for the ECCS pumps. This design is completely passive and requires no operator intervention, nor does it require an interruption of ECCS flow. Licensees choosing this option should establish new or modify existing programs, as necessary, to ensure that the potential for debris to be generated and transported to the ECCS pump suction strainers' surface following a LOCA does not at any time exceed the assumptions used in estimating the amounts of debris for sizing of the strainers in accordance with RG 1.82, Revision 2.

Option 2: Installation of a Self-Cleaning Strainer

This option introduces a strainer design that prevents clogging by providing continuous cleaning of the strainer surface by use of a blade or brush device. Like Option 1 above, this design does not require any operator action or interrupt ECCS flow. However, this option does rely on an active component which is fully exposed to the LOCA effects in the suppression pool to keep the ECCS pump suction strainers' surface clean. As a result, appropriate measures should be taken to ensure operability of the strainer. Installation of this type of strainer should be combined with 1) implementation of reasonable measures to eliminate debris sources that could potentially damage or overload the strainer following a LOCA (this includes removal of all debris from the suppression pool every refueling outage), and 2) implementation of surveillances to ensure adequate cleaning of the suppression pool and the operability of the strainers.

Option 3: Installation of a Backflush System

This option employs a backflush system which is a reactive system that relies on operator action to remove accumulated debris from the surface of the ECCS pump suction strainers to prevent clogging. In order to ensure that an operator can adequately respond to a suction strainer clogging event, installation of a backflush system should be combined with the following measures: 1) reasonable efforts to maximize the amount of time before clogging could occur; 2) instrumentation and alarms to indicate when strainer differential pressure (ΔP) increases; 3) operator training on recognition and mitigation of a strainer clogging event; and 4) implementation of surveillances to ensure operability of the strainer instrumentation and backflush system. In addition, a supporting analysis for the installation of a backflush system that is consistent with the guidance specified in RG 1.82, Revision 2, should be performed to demonstrate that operators have sufficient time to recognize the onset of strainer clogging and to take appropriate action.

The NRC considers that Technical Specifications (TS) should be proposed to support surveillances for components and systems installed in response to this Bulletin and should include, where appropriate, for the resolution option selected, surveillance testing of active features (i.e., Options 2 and 3), and visual inspections where they provide reasonable assurance that the component is operable.

In addition, NRCB 96-03 requires that all BWR licensees provide a written response within 180 days of the date of this Bulletin as stipulated in the "Required Response" section of NRCB 96-03. The Reporting Requirements specified in this Bulletin are restated below followed by PECO Energy's response for PBAPS, Units 2 and 3, and LGS, Units 1 and 2.

Reporting Requirement 1

Within 180 days of the date of this bulletin, a report indicating to what extent the licensee intends to comply with the requested actions, including a description of planned actions and mitigative strategies to be used, the schedule for implementation, and proposed TS, if appropriate; or, if the licensee does not intend to comply with these actions, a detailed description of the safety basis for the decision. The report must contain a detailed description of any proposed alternative course of action, the schedule for completing this alternative course of action, the safety basis for determining the acceptability of the planned alternative course of action, and proposed TS, if appropriate, that support the proposed alternative course of action and that are consistent with 10CFR50.36. The NRC considers the 180-day response period appropriate, given the amount of engineering that licensees may wish to perform before they provide their formal response to the NRC.

Response

PECO Energy has evaluated the various options identified in NRCB 96-03 and determined that the installation of large-capacity, passive, pump suction strainers (i.e., Option 1 in NRCB 96-03) is the most viable option for implementation at Peach Bottom Atomic Power Station (PBAPS), Unit 2 and 3, and Limerick Generating Station (LGS), Units 1 and 2, in order to achieve a long term resolution for addressing the ECCS pump suction strainer clogging issue.

PECO Energy will install large-capacity, passive, strainers on the Residual Heat Removal (RHR) and Core Spray (CS) system pump suction lines at PBAPS, Units 2 and 3, and LGS, Units 1 and 2. The assumptions used in sizing these new strainers for the PBAPS and LGS ECCS are described below, and are consistent with the guidance specified in Regulatory Guide (RG) 1.82, Revision 2, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant-Accident," and NUREG/CR-6224, "Parametric Study of the Potential for BWR ECCS Strainer Blockage Due to LOCA Generated Debris."

Zone of Destruction

The zone of destruction to be used at PBAPS and LGS for sizing the strainers will be conservatively estimated, as a minimum, to be based on the volume associated with a fully expanding jet at a distance corresponding to a stagnation pressure of 4 psig. This volume will then be converted to a spherical volume based on the data contained in Volume II, "Zone of Influence as Defined by Computational Fluid Dynamics," of the Technical Support Documentation to the Utility Resolution Guideline (URG). This spherical volume, which will be centered at the worst break location, will be used to define the zone of influence. All insulation material contained in this zone will be considered destroyed. The transportable fraction of the destroyed insulation will be conservatively defined to bound any possible accident scenarios and afford substantial design margin and conservatism.

Pipe Break Location

The location of the center of the spherical volume for the zone of influence to be used at PBAPS and LGS will be chosen so that the volume of debris generated will be the most conservative value. The location will be selected by determining the area within the drywell containing the highest density of NUKON insulation material. Since this volume will be bounding, no specific pipe break analysis will be performed.

Insulation Type

Both PBAPS and LGS drywells contain substantial amounts of NUKON (fiberglass) insulation, primarily with protective stainless steel jacketing. Our preliminary calculations indicate that the corresponding loss in Net Positive Suction Head (NPSH) associated with NUKON insulation material bounds the head-loss for Reflective Metallic Insulation (RMI) at both PBAPS and LGS. In addition, Boiling Water Reactor Owners' Group (BWROG) testing has shown that a combined bed of RMI and NUKON insulation along with the deposition of corrosion product debris does not increase the head-loss for the combined bed. Therefore, only a combined bed of NUKON insulation and corrosion product debris will be considered in sizing the new strainers at PBAPS and LGS.

Transport Factor

A transport factor of 100% will be used at PBAPS and LGS for sizing the strainers.

Debris Settling

There will be no credit taken for debris settling in the torus/suppression pool at PBAPS and LGS.

Corrosion Product Inventory

The corrosion product inventory value used for sizing the new strainers at PBAPS and LGS will be based on an accumulation rate of 100 pounds of corrosion product debris per year. This value is based on specific plant data obtained during the last two (2) refueling outages at PBAPS. Actual measurements estimated the accumulation rate at 45 pounds per year. Therefore, using a debris generation rate of 100 pounds per year is considered conservative and provides adequate design margin. Similar practices are being used at PBAPS and LGS to control torus/suppression pool water conductivity, and therefore, this value is considered acceptable for use at PBAPS and LGS. However, this value will be verified for LGS prior to completing the final strainer design. The desludging interval will be chosen to coincide with other periodic inspections of the suppression chambers and to bound the accumulation of other operating debris which may be generated (e.g., paint chips, dust, etc.).

Operational Debris

No loading for operational debris will be explicitly calculated. PECO Energy considers that the insulation and corrosion product loading assumed for sizing the strainers is sufficiently conservative to bound all accident debris loading scenarios.

The new strainers will have more than adequate surface area to ensure operability of the ECCS pumps, and thereby, maintain long-term recirculation cooling capability during post LOCA conditions. After installing the new strainers, it will not be necessary to routinely inspect and clean the suppression pools at PBAPS and LGS. Therefore, suppression pool inspections, and any cleaning that may be necessary, can be coordinated with other periodic inspection activities (e.g., Inservice Inspection (ISI) Program inspections and coating inspections).

The size and shape of the strainers will be such to avoid a loss of NPSH for ECCS pumps as a result of debris deposition on the strainers during the period that the ECCS is required to operate to ensure long-term cooling capability. The strainers currently being considered are a stacked disk configuration. However, PECO Energy will be reviewing other strainer designs as they become available. The sizing of the final strainer design selected for use will be based on the methodology contained in the BWROG Alternate Strainer Test Report. If the final strainer design is not sufficiently similar to the strainers tested by the BWROG to allow the use of this test data, the final design will be tested at the EPRI test facility under conditions identical to the original test plan. The strainers will be designed and structurally supported in order to withstand the expected forces resulting from missiles, debris accumulation, LOCA-induced hydrodynamic loads, and design basis seismic events. The design of the new strainers will require a reanalysis of the hydrodynamic loads at LGS, and could include a reanalysis of the loads for PBAPS should the available design margins be insufficient to support the installation of structural support components for the new strainer structures. This reanalysis could result in an unreviewed safety question that requires prior NRC approval before the strainers can be installed.

PECO Energy is not committing to fabricating the new strainers in accordance with the applicable requirements of the American Society of Mechanical Engineers (ASME) Codes, as requested in NRCB 96-03, since these strainers are not pressure retaining components. However, the strainers will be fabricated of material that is not susceptible to corrosion and degradation during periods of inactivity and normal operations. In addition, since this design relies solely on passive structures and components, PECO Energy does not plan on implementing any new Technical Specifications surveillance requirements for the strainers as requested in this Bulletin. The new strainers will be included in the Inservice Inspection (ISI) Programs at PBAPS, Units 2 and 3, and LGS, Units 1 and 2.

PECO Energy is planning to install the new strainers on the low pressure ECCS (i.e., RHR and CS) pump suction piping during future refueling outages at PBAPS, Units 2 and 3, and LGS, Unit 1 and 2. We are not currently planning to install new strainers on the High Pressure Coolant Injection (HPCI) system pump suction piping at PBAPS and LGS, since the primary suction supply for the HPCI system pumps at PBAPS and LGS is the Condensate Storage Tank (CST), and not the torus/suppression pool. In addition, the HPCI system does not function to provide long-term cooling capability following a LOCA. The schedules for implementing these plant modifications are provided below.

ECCS Suction Strainer Implementation Schedule

PBAPS	LGS
Unit 2 - 2RO12 (September 1998)	Unit 1 - 1RO7 (April 1998)
Unit 3 - 3RO11 (September 1997)	Unit 2 - 2RO5 (April 1999)

These schedules were developed based on the recommendations provided in NRCB 96-03, which requests that licensees implement the appropriate plant modifications by the end of the first refueling outage starting after January 1, 1997. However, by letter dated September 6, 1996, PECO Energy requested that the installation of the modification for LGS, Unit 2, be deferred until the fifth refueling outage (2RO5). There is not adequate time to complete the necessary engineering, procurement, and fabrication activities to support installation of the modification during the fourth refueling outage (2RO4) which is scheduled to begin in January, 1997. The justification and compensatory actions that will be taken to support this deferral were provided in our September 6, 1996 letter. This request is currently pending NRC approval. If the NRC does not approve our request to defer the implementation of the modification work for LGS, Unit 2, until 2RO5, as requested, it will be necessary for PECO Energy to reevalute its options.

In the interim, PECO Energy will continue to monitor ECCS pump differential pressure (dP) data (with the exception of the HPCI system) for any indication of pump performance degradation. We will also continue to analyze the torus and suppression pool water samples that are routinely taken at PBAPS and LGS for evidence of visible fibrous material. These activities will continue until the new strainers are installed at PBAPS and LGS. In addition, Foreign Material Exclusion (FME) controls will be implemented and monitored in accordance with PBAPS and LGS existing plant administrative procedural controls to ensure plant cleanliness, especially in the areas of the drywell and torus/suppression pool.

Reporting Requirement 2

Within 30 days of completion of all requested actions, submit a report confirming completion and summarizing any actions taken.

Response

PECO Energy will submit a report within 30 days after completing the installation of the ECCS pump suction strainer modifications at PBAPS, Units 2 and 3, which summarizes the actions taken. A similar report will be submitted for LGS, Units 1 and 2, within 30 days after completing the modifications at LGS.
