CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9610160227 DOC.DATE: 96/10/04 NOTARIZED: NO DOCKET #
FACIL:50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylva 05000388
AUTH.NAME AUTHOR AFFILIATION
BYRAM,R.G. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Provides interim response to requested actions of NRC Bulletin 96-03, "Potential Plugging of ECC Suction Strainers by Debris in BWRs."

DISTRIBUTION CODE: IE73D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 10
TITLE: NRC Bulletin 96-03, "Potential Plugging of ECCS Strainers by Debris i

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	NRR/LYNCH,D.	1	1	PD1-2 PD	1	1
	POSLUSNY,C	1	1			
INTERNAL:	FILE CENTER 01	1	1	NRR/DE/ECGB	1	1
	NRR/DE/ECGB/A	1	1	NRR/DSSA/SCSB	4	4
	NRR/DSSA/SRXB	1	1	NRR/DSSA/SRXB/A	1	1
	NRR/PD3-2	1	1	RES/DET/GSIB	2	2
EXTERNAL:	NOAC	1	1	NRC PDR	1	1

CATEGORY 1 DOCUMENT

NOTE TO ALL "RIDS" RECIPIENTS:
PLEASE HELP US TO REDUCE WASTE. TO HAVE YOUR NAME OR ORGANIZATION REMOVED FROM DISTRIBUTION LISTS OR REDUCE THE NUMBER OF COPIES RECEIVED BY YOU OR YOUR ORGANIZATION, CONTACT THE DOCUMENT CONTROL DESK (DCD) ON EXTENSION 415-2083

TOTAL NUMBER OF COPIES REQUIRED: LTTR 17 ENCL 17

PP&L Pennsylvania Power & Light Company
Two North Ninth Street • Allentown, PA 18101-1179 • 610/774-5151

Robert G. Byram
Senior Vice President-Nuclear
610/774-7502
Fax: 610/774-5019

OCT 04 1996

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
INTERIM RESPONSE TO BULLETIN 96-03
REQUEST FOR ONE-CYCLE DEFERRAL FOR UNIT 2
PLA-4512 **FILE R41-2** **Docket No. 50-388**

Reference: *NRC Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors," dated May 6, 1996.*

The purpose of this letter is to provide an interim response to the requested actions of NRC Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors." The Bulletin requests that addressees implement appropriate procedural measures and plan modifications to minimize the potential for clogging of ECCS suction strainers by debris during a loss-of-coolant accident (LOCA). It further requires that addressees report the extent to which the requested actions will be taken and notify the NRC upon completion. This letter represents an interim response only; PP&L will submit a supplemental response to Bulletin 96-03 within 180 days of the date of the Bulletin, as required. Our supplemental response will address both units and will provide the required information delineated in the Bulletin.

Specifically, the Bulletin requires licensees to implement a final resolution to minimize the potential for clogging ECCS suction strainers by the end of the first refueling outage starting after January 1, 1997. This first impacts Susquehanna-Unit 2, which is scheduled to begin its eighth refueling outage in March 1997. This letter requests a one-cycle deferral for implementing a final resolution for Unit 2 to the ninth refueling outage, which is scheduled for March 1999. The detailed basis for this request is provided in the attachment to this letter.

PP&L's evaluation of Bulletin 96-03 revealed that replacement of existing strainers with larger-capacity, alternate-geometry passive strainers appears to be the preferred long term resolution. In preparation for the upcoming Spring '97 Unit 2 outage, PP&L initiated an aggressive strainer replacement project effort, based upon the assumptions that (1) an NRC-approved technical basis for sizing the strainers would be established in time to support a Spring installation; and (2) the

modification could be designed and planned in time for installation in Unit 2's Spring outage. However, as noted below, an NRC-approved technical basis will not be available to support the design and implementation of the strainer modification in the Spring, and critical engineering issues identified during modification scoping remain unresolved.

The absence of an approved technical basis for sizing the passive strainers renders the effectiveness of a replacement strainer indeterminate. The significant uncertainties currently associated with several key technical assumptions make any strainer installed in the Spring '97 outage a compensatory action.

At the present time it appears that the replacement strainer will be limited in size by stresses produced by hydrodynamic loadings in the suppression pool. The existing structural design margins for our existing strainers, piping and penetrations are small, as a result of a conservative design basis hydrodynamic load definition. Thus, a replacement strainer designed for the existing load definition may not be sufficient to mitigate the effects of the post-LOCA strainer plugging scenario when evaluated against the final analytical criteria. In order to maximize the size of the new strainers, we are currently evaluating options (e.g., possible revision of hydrodynamic load definition) to maximize the strainer design envelope. Thus, the possibility exists that strainers installed in the Spring '97 outage could subsequently require replacement with a larger strainer at a subsequent outage to adequately mitigate the event.

In lieu of installing an "interim" strainer in the Spring, PP&L proposes compensatory actions which substantively reduce vulnerability to the suction strainer plugging scenario. These actions focus primarily on minimizing or eliminating individual debris source terms. Key actions in this regard include further minimizing the remaining fibrous insulation source term, minimizing other potential drywell debris sources and desludging the suppression pool. This will include a review of programmatic controls to ensure that any further introductions of potential debris sources are limited and evaluated. Other proposed compensatory actions are confirmatory in nature, such as multiple ECCS pump runs, strainer inspections, water sampling and sludge sampling for the purpose of verifying the absence of fiber accumulation in the suppression pool, as well as containment walkdowns during outages to confirm the absence of foreign material. Our objective is to eliminate to the extent possible, and then to confirm the absence of, the components that must be present for post-LOCA strainer plugging to occur. These source term reductions and confirmatory actions represent definitive commitments, which have significant outage and economic impacts, but which also result in a measurable reduction in SSES's vulnerability to suction strainer plugging, and contribute substantially toward our final resolution.

In summary, given the significant uncertainty in several key technical assumptions, PP&L does not believe that installation of an "interim" strainer in the Spring '97 outage is prudent. More importantly, we believe our proposed set of compensatory actions alone represent a significant

step towards eliminating the likelihood of suction strainer plugging in Unit 2. While these actions are proposed as compensatory actions, they also represent key elements in our final resolution strategy.

Please note that PP&L has been working since 1993 to address this concern in light of industry events, from both the normal operation and design basis accident perspectives. Our efforts to understand and mitigate this potential problem have been a high priority, commensurate with our view of its safety significance. This request for deferral does not in any way change our level of commitment to resolving this issue; rather, it reflects our intent to develop a final solution which is fully understood and technically credible.

The attachment to this letter provides our detailed basis for requesting the one-cycle deferral. Any questions on this interim response should be directed to Ms. K.R. Leone (610) 774-4023.

Very truly yours,

R. G. Byram

Attachment

copy: NRC Region I
Mr. K. Jenison, NRC Sr. Resident Inspector, SSES
Mr. C. Poslusny, NRC Sr. Project Manager, OWFN

PP&L INTERIM RESPONSE TO NRC BULLETIN 96-03:

"POTENTIAL PLUGGING OF EMERGENCY CORE COOLING SUCTION STRAINERS BY DEBRIS IN BOILING-WATER REACTORS"

Basis for Deferral of Final Actions for Unit 2

Unit 2 Conditions

At SSES, the systems of interest include the Residual Heat Removal (RHR) system and the Core Spray system. Following a large high energy line break, these low-pressure systems take suction from the suppression pool as a cooling water source. The teed suction strainer assemblies consist of upper and lower conical strainer baskets and are arranged vertically. The baskets are made from stainless steel perforated plate with 1/8-inch holes on 3/16-inch centers. The dimensions of each strainer assembly are provided below.

System	Basket Type (2 baskets per assembly)
Core Spray	16" truncated cone
RHR	24" truncated cone

PP&L replaced Nukon fibrous insulation within 7 pipe diameters of HELB locations (as postulated in the FSAR) with stainless-steel reflective metallic insulation (RMI) in both units. These modifications followed the guidance of Regulatory Guide 1.82, Revision 1 with respect to determining the break zone of destruction. This action affected insulation on the Reactor Recirculation, Main Steam, Feedwater, Reactor Water Clean-Up, Core Spray, RHR, RCIC and HPCI piping inside the drywell. PP&L also replaced anti-sweat fibrous insulation material on the Reactor Building Chilled Water (RBCW) system with phenolic foam insulation, based upon the same assumed conical zone-of-destruction, in accordance with Regulatory Guide 1.82, Revision 1. Removal of the fiberglass insulation in this zone of influence reduced the remaining fibrous insulation in the drywell to approximately 2-5% of the total insulation inventory; that is, ~95-98% of the total insulation inventory in the drywell is RMI.

Although PP&L has a relatively small fiber source term, our preferred option is replacement of the existing conical strainers with alternate geometry passive strainers (e.g., stacked disc) with more capacity. We believe that this will minimize any "thin-bed" effects associated with the conical strainers, and provide ample margin over actual debris source terms.

PP&L's current "final" resolution plan for Unit 2 is installation of a passive strainer with larger capacity than the currently installed strainers. In preparation, PP&L initiated a strainer replacement project, effort, on the assumption that an approved technical basis would be established. However, as noted below, this approved technical basis will not be available in time to design and implement the strainer modification.

Basis for Deferral

As indicated above, PP&L's preferred option is replacement of the existing conical strainers with alternate geometry passive strainers. In order to size the replacement strainers, technical assumptions regarding key elements of the suction strainer scenario are required. PP&L is looking to the results of BWROG testing and analysis for this information. The BWROG recommended strainer design methodology will be documented in the "Utility Resolution Guidance (URG) for Resolution of ECCS Suction Strainer Blockage." Transmittal of the draft URG to the NRC is currently targeted for October 1996, with submittal of the final version in November 1996. NRC approval of the URG calculational methodology is not expected until 1997, at the earliest. Due to the complexity of the suction strainer plugging analysis, we would also anticipate that time will be required to resolve NRC comments. This provides insufficient time prior to the March 1997 outage in which to design and fabricate the strainers using the approved generic methodology.

Additionally, although PP&L plans to adhere to the recommendations of the URG to the extent possible, the possibility exists that plant-specific conditions could warrant exceptions. In either case, NRC review and approval of the final resolution will be required because this issue involves application of new design criteria which have not been previously reviewed by the NRC.

The capacity of the strainer to combat the plugging scenario is directly related to its surface area, and thus its size. The size is constrained by the resultant structural loads on the piping and penetrations. A detailed structural analysis of the strainer piping penetrations and anchors will require significant engineering effort and time to complete. However, a preliminary "scoping" review of the structural capability of the existing strainers when subjected to hydrodynamic loads shows that the Condensation Oscillation/Chugging submerged structure loads are the primary contributor. For the emergency condition, out of a total combined stress of 33377 psi, CO/CH submerged structure loads contributed 26971 psi (note that the allowable stress for this condition is 33750 psi).

PP&L anticipates that installation of alternate geometry strainers could require a licensing action to revise the current conservative submerged structure load definition to that used by the Mark II Owner's Group. Maximizing the margin in the strainer capacity minimizes the impact of analytical uncertainty, which is unavoidable in resolving the strainer plugging issue. PP&L is convinced that the optimal solution to this problem is a passive strainer with this additional design margin. Receiving NRC approval of such a licensing action by the Spring 1997 appears unlikely.

In summary, the basis for deferral of a final resolution for Unit 2 recognizes the following challenges:

* The generic methodology for sizing passive strainers, the BWROG Utility Resolution Guidance (URG), has not yet been finalized. As a result, an NRC-approved basis for the analytical assumptions has not been established.

* Although PP&L plans to adhere to the recommendations of the URG to the extent possible, plant-specific conditions could warrant exceptions to the URG which could require additional NRC review and approval.

* Application of the Mark II generic hydrodynamic load definition may be desired to maximize strainer capacity and thus design margin. A change to PP&L's current load definition will require a licensing change, and possibly NRC approval.

* Installation of an "interim" strainer, based upon uncertain technical assumptions, is not technically or economically prudent; PP&L intends to develop a final solution which is fully understood and technically credible.

Justification for Continued Operation

The extension in implementation of a final resolution for one cycle of operation for SSES Unit 2 is justified based upon the following: (1) the actions previously implemented in response to NRCB 93-02, NRCB 93-02, Supplement 1; (2) the actions previously implemented in response to NRCB 95-02; (3) previous safety assessments; and (4) the implementation of additional compensatory actions.

(1) Bulletin 93-02 and Supplement

As noted in Bulletin 96-03, licensee responses to Bulletin 93-02 and its supplement demonstrated that appropriate interim measures have been implemented to ensure adequate protection of public health and safety to allow continued operation until the final actions are implemented. This event involved the deposition of fibrous material on an RHR strainer, shortly after the pool had been thoroughly cleaned. The material was traced to temporary drywell cooling filters which had been inadvertently introduced to the suppression pool during outage activities, apparently before the pool cleaning. In response to Bulletin 93-02 and its supplement, PP&L verified that no fibrous air filters or other temporary sources of fiber were installed in either unit's containment, and that controls were sufficient to minimize the possibility of debris intrusion. Additionally, PP&L prepared a briefing package for operations and appropriate emergency response personnel, including internal evaluations of the issue and operator guidance. This was supplemented by a requalification training module presented to operators.

(2) Bulletin 95-02

Although PP&L has not yet received an NRC safety evaluation for its response to Bulletin 95-02, discussions with NRR have indicated the response to be acceptable. In its response, PP&L committed to the following actions:

* Perform water and sludge sampling, and inspect strainers, for the presence of fiber. Conduct desludging as necessary based upon inspection/sampling results. **

* Inspect suppression pool floor for the presence of foreign material. Remove and evaluate material. Evaluate and disposition any discernible remaining material, including corrosion products, for their potential impact on strainer performance.

* Conduct daily walkdowns of the drywell and wetwell during refueling outages for the presence of foreign material.**

* Install temporary covers during refueling outages to provide additional assurance that debris could not be introduced to the pool via downcomers. **

* Install fittings to provide positive protection against introducing foreign material (e.g., hoses) into the pool during draining evolutions. **

* Reinforce containment worker awareness of foreign material exclusion through various communications media, and increased supervisory presence.

* Implement plant-specific training on INPO SOER 95-1, "Reducing Events Resulting from Foreign Material Intrusion."

* Establish a pool cleaning program based upon pool cleanliness assumptions embedded in PP&L's final resolution to the post-LOCA debris clogging concern, once it has been approved by NRC.

* Investigate potential means of taking unfiltered pool water samples while at power.

* Evaluate pump suction pressure indication trended data.

Additionally, PP&L decided to conduct feed-and-bleed operations to reduce corrosion products during operations, and to perform "multiple-pump runs" to confirm the absence of fiber accumulations in the pool. The latter activity entailed extended runs of multiple RHR pumps in order to achieve sufficient agitation, such that any fibers would be

** . This was performed in the 1995 outages of both units and the 1996 outage of Unit 1.

suspended and then drawn to the suction strainer. This was recently performed during the ninth refueling outage of Unit 1, and will be performed during the eight refueling outage of Unit 2. The Unit 1 tests conducted to date revealed no accumulations of fibrous material, thus confirming the absence of fiber in the pool.

(3) BWROG Safety Assessment

The BWROG has completed interim safety assessments regarding the potential blockage of the ECCS suction strainers. This information was published in the "Interim Report of the BWR Owner's Group ECCS Suction Strainer Committee," dated December 1994 and transmitted to the NRC on December 15, 1994, and establishes a low safety significance on the basis of the low probabilistic risk of the event. The rationale is based upon:

* the low probability of the initiating event;

* the fact that only a small fraction of total ECCS flow is required to provide makeup following reflood of the vessel;

* the availability of alternate sources of makeup water should ECCS provide insufficient flow;

* the conservatism of current licensing basis analyses of available ECCS; and

* the fact that realistic analyses of fuel temperature response indicate that significant time is available for operator action to establish alternate water injection, even if ECCS performance is compromised early following a LOCA.

(4) Compensatory Actions

PP&L has been working since 1993 to address this concern in light of industry events, from both the normal operation and design basis accident perspectives. Although PP&L was instrumental in the formation of the BWROG ECCS Suction Strainer Committee, and provides leadership of the Committee, it took aggressive action to resolve the issue at the SSES units prior to the generic BWROG efforts. Some of the major actions that have been taken by PP&L include the following:

* An extensive insulation testing effort was undertaken in 1993 to understand the phenomena of debris generation, transport, backflush and headloss. The results from these tests confirmed that the suction strainer clogging scenario was applicable to PP&L.

* PP&L significantly reduced its fibrous source term in the drywells of both units, by replacing fibrous insulation with RMI in the zone-of-destruction defined by Reg. Guide 1.82, Revision 1. This reduced the amount of fibrous insulation in the drywell to approximately 2% of the total insulation inventory.

* PP&L significantly reduced the amount of unqualified coatings by performing LOCA qualification testing on inorganic zinc coatings inside containment. This in-situ qualification allowed for a reduction of 37,400 sq. ft. of the unqualified coatings in Unit 1 and 26,000 sq. ft of the unqualified coatings in Unit 2.

* PP&L performed testing to quantify the corrosion products on the structural steel in the wetwell airspace. This allowed for definition of the potential post-LOCA contribution of this source term.

In order to further reduce its vulnerability to suction strainer plugging, PP&L intends to take the actions listed below in the Spring '97 Unit 2 outage. The primary focus of these actions is to reduce the potential contributors (i.e., "source terms") to strainer plugging.

* Minimize the potential fibrous insulation source term. Although this could entail replacement of the remaining fibrous insulation, this will also include evaluation of the feasibility of jacketing fibrous insulation and securing with banding determined via BWROG testing to be effective at containing the fibrous debris.

* Minimize the potential debris "source term" from the vapor barrier paper backing on the Koolphen-K foam insulation currently installed on the RBCW chilled water piping.

* Conduct a walkdown of the drywell and remove non-metallic tags, stickers, and other "fixed" debris sources, where possible. Document and technically justify any "fixed" debris sources that remain.

* Desludge and/or filter the Unit 2 suppression pool (only a slight accumulation was observed in 1995), and conduct an FME inspection of the suppression pool by divers.

* Review programmatic controls to ensure any further introductions of potential debris sources are limited and evaluated.

* Inspect all strainers, and collect water and sludge samples to confirm the absence of fiber in the pool, consistent with BWROG guidelines. (Note that this was confirmed during the previous Unit 2 outage in 1995.)

* Conduct multiple ECCS pump runs to verify the absence of fiber accumulation in the suppression pool.

* Continue performance of twice-daily drywell and wetwell walkdowns during outages (i.e., periods of containment access) to confirm the absence of foreign material.

* Continue installation of covers over downcomers during outages to provide additional assurance that debris could not be introduced via this pathway.