PHILADELPHIA ELECTRIC COMPANY
2301 MARKET STREET
P.O. BOX 8699
PHILADELPHIA, PA 19101
(215) 841-5001

JOSEPH W. GALLAGHER
VICE PRESIDENT
NUCLEAR SERVICES

September 16, 1988

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

Mr. C. E. Rossi, Director
U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: NRC Bulletin No. 88-08, dated June 22, 1988, "Thermal Stresses in Piping Connected to Reactor Coolant Systems", Peach Bottom Atomic Power Station Units 2 and 3 and Limerick Generating Station Units 1 and 2

Dear Mr. Rossi:

Philadelphia Electric Company's response to Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems" is provided in the Attachment. This response is for Peach Bottom Atomic Power Station, Units 2 and 3, and Limerick Generating Station Units 1 and 2.

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

Very truly yours,

J. W. Gallagher

Attachment

cc: Addressee
W. T. Russell, Administrator, Region I, USNRC
T. P. Johnson, USNRC Senior Resident Inspector
T. E. Magette, State of Maryland
T. J. Kenny, Limerick NRC Senior Resident Inspector
J. Urban, Delmarva Power
J. T. Boettger, Public Service Electric & Gas
H. C. Schwemm, Atlantic Electric

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COMMONWEALTH OF PENNSYLVANIA :

: ss.

COUNTY OF PHILADELPHIA :

J. W. Gallagher, being first duly sworn, deposes and says:

That he is Vice President of Philadelphia Electric Company, the Licensee herein; that he has read the foregoing response to NRC Bulletin 88-08 relative to 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.

J W Gallagher

Vice President

Subscribed and sworn to
before me this 16th day
of September, 1988.

Melanie R. Campanella

Notary Public

MELANIE R. CAMPANELLA
Notary Public, Philadelphia, Philadelphia Co.
My Commission Expires February 12, 1990

THERMAL STRESSES IN PIPING CONNECTED TO REACTOR COOLANT SYSTEMS

INTRODUCTION:

Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems", describes the propogation of a circumferential crack through the wall of an unisolable section of emergency core cooling system piping due to high-cycle thermal fatigue.

NRC Bulletin 88-08 directs licensees to review systems connected to the RCS to determine whether unisolable sections of piping could be subjected to stresses from temperature stratification or temperature oscillations. These conditions could be induced by cold water leaking into the RCS via leaking isolation valves. Additionally, such a condition may not have been evaluated in the design analysis of the piping.

The appropriate system piping reviews have been conducted for both Peach Bottom Atomic Power Station (PBAPS), and Limerick Generating Station (LGS). It has been determined that neither plant contains unisolable sections of RCS piping that can be subjected to stresses of the type defined in the Bulletin.

A restatement of the required action and our response is stated below.

Required Action:

The Bulletin includes the following action that must be taken:

> "Review systems connected to the Reactor Coolant Systems (RCS) to determine whether unisolable sections of piping connected to the RCS can be subjected to stresses from temperature stratification or temperature oscillations that could be induced by leaking valves and that were not evaluated in the design analysis of the piping. For those addressees who determine that there are no unisolable sections of piping that can be subjected to such stresses, no additional actions are requested except for the report required below."

RESPONSE:

PEACH BOTTOM AND LIMERICK

Philadelphia Electric Company (PECo) has reviewed the potential for cold water to leak into the Reactor Coolant System (RCS) via the isolation valves at LGS and PBAPS, and has determined that the BWR designs of these stations do not contain any unisolable

sections of piping that are potentially subject to thermal cycling fatigue from cold water leaks into the RCS during normal operation.

With the exception of the difference identified in the High Pressure Coolant Injection (HPCI) section of this response, the following discussions are applicable to both PBAPS and LGS.

During normal operation, the following systems contain relatively colder water than the reactor coolant and are connected to, but isolated from, the reactor coolant system via isolation valves:

High Pressure Coolant Injection

The HPCI system is capable of injecting cold water into the RCS while it is at normal operating pressure, via the feedwater system at Peach Bottom, or the feedwater and core spray systems at Limerick; however, this can only occur when the HPCI system is operating, such as during system surveillance testing. Normally, the HPCI pump is not operating and the system is below RCS operating pressure. Even if the isolation valves were to leak during high pressure surveillance testing, the duration and frequency of the testing is insufficient to be a cause of thermal cycling fatigue stress to the RCS piping.

HPCI water leaking into the RCS via core spray at LGS would require leakage past multiple isolation valves and at a sufficient rate so that the relatively colder fluid would not be heated via heat conduction in the pipe. Leakage from HPCI into the RCS via the feedwater system at PBAPS or LGS would not result in any thermal stresses in the unisolable portion of feedwater piping, as there would be considerable mixing with the feedwater.

Reactor Core Isolation Cooling

Like HPCI, Reactor Core Isolation Cooling (RCIC) at PBAPS and LGS is capable of injecting cold water into the RCS through leaking valves while it is at normal operating pressure via the feedwater system, but only when the RCIC system is in operation. The system is normally below RCS operating pressure, and it operates only during high pressure surveillance testing. As discussed for HPCI, any leakage into the feedwater system is not expected to result in thermal stresses due to the mixing effect with the feedwater.

Standby Liquid Control System

While in operation during surveillance testing, the Standby Liquid Control System (SLCS) at PBAPS and LGS would have the capability to inject cold water into the RCS through the core spray injection line except for the squib valves that isolate the system and prevent leakage to the RCS. These are explosive-actuated valves and no leakage past them is possible. Inadvertent actuation of the SLCS and firing of the squib valves resulting in SLCS injection to the reactor would not contribute to thermal cycling fatigue.

Residual Heat Removal

Leakage past the Residual Heat Removal (RHR) system injection valves into the RCS system could only occur when reactor pressure is below the shutoff head of the RHR pumps for PBAPS and LGS, and then only when the pumps are operating. Normally, the RHR pumps are not in operation while the Reactor is at operating pressure except for testing or when auxiliary cooling is required for the suppression pool. The Low Pressure Coolant Injection (LPCI) portion of the RCS piping is designed for the injection temperature transient that occurs when the RHR system is actuated and the injection valves open, with the reactor at low pressure.

Core Spray

Like RHR, leakage past the Core Spray (CS) injection valves at PBAPS and LGS could only occur when the system is in operation and when reactor pressure is below the CS pump shutoff head. Normally, the CS system is only in operation for testing purposes and otherwise is at a lower pressure than that of the RCS. The CS injection portion of the RCS piping is also designed for the injection temperature transient that occurs when the CS system is actuated and the injection valves open with the reactor at low pressure.

Feedwater

The Feedwater (FW) system is normally in operation and continuously injects relatively cold water into the RCS system. The RCS piping is designed for this, and no abnormal temperature transients or stratification that could contribute to thermal cycling fatigue have been observed during normal FW operation.

Stayfill System

The PBAPS and LGS stayfill system employs condensate jockey pumps to keep the ECCS systems filled with relatively cold water to alleviate the effects of water hammer upon ECCS actuation. However, the jockey pumps' shutoff head is considerably below normal operating RCS pressure and is insufficient to cause water to be injected into the RCS through any leaking isolation valves.

Since the BWR designs of LGS and PB do not contain any normally isolated cold water systems connected to the RCS that are continuously pressurized to a level above the RCS normal operating pressure, it is not possible for any potentially leaking isolation valves to allow cold water to be injected into the RCS and cause thermal cycling fatigue in unisolable RCS piping.

CONCLUSION:

As explained in the analyses presented above, neither LGS nor PB contain unisolable sections of RCS piping that can be subjected to stresses of the type defined in the Bulletin. Therefore, in accordance with action #1 of Bulletin No. 88-08, no further actions are necessary except for the required report. The transmittal of this report fulfills the requirements of this Bulletin.