10CFR50.12(a)

BOSTON EDISON

Pilgrim Nuclear Power Station
Rocky Hill Road
Plymouth, Massachusetts 02360

Ralph G. Bird
Senior Vice President — Nuclear

BECo 89-094
July 7, 1989

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

License DPR-35
Docket 50-293

REQUEST FOR EXEMPTION FROM PRIMARY CONTAINMENT
LEAKAGE TESTING REQUIREMENTS OF 10CFR50, APPENDIX J

In accordance with 10CFR50.12(a), Boston Edison Company (BECo) requests exemption from the primary containment leakage testing requirements of 10CFR50, Appendix J, Sections III.A.6(b), III.D.2.(a), and III.D.3.

Exemption from Section III.A.6(b) would change the present requirement to conduct a Type A primary containment integrated leak rate test (PCILRT) at each plant shutdown for refueling or approximately every 18 months, whichever occurs first; and allow instead, the resumption of the PCILRT test schedule of Section III.D.1(a) that specifies only three tests be performed at approximately equal intervals during each 10-year service period. Granting this exemption would allow implementation of an alternative Local Leak Rate Testing Corrective Action Plan in lieu of conducting a PCILRT during planned Maintenance Outages that may occur during the operating cycle. The PCILRT instead would be performed during our next refueling outage (RFO #8).

The exemptions from the requirements of Sections III.D.2(a) and III.D.3 are one-time schedule extensions to the extent that the Type B and C local leak rate tests (LLRTs) for the following components would be permitted to exceed the maximum 2-year retest interval by approximately 6 months. These LLRTs would be performed next during Refueling Outage 8.

1. Shutdown Cooling Suction Isolation Valves MO-1001-47 and MO-1001-50 (Penetration X-12, Type C LLRTs)

2. Reactor Building Closed Cooling Water Isolation Valve MO-4002 on the line from the drywell and Check Valve 30-CK-432 on the line to the drywell (Penetrations X-24 and X-23, respectively; Type C LLRTs)

3. Drywell Head (no penetration number, Type B LLRT) and Drywell Head Access Hatch (Penetration X-4, Type B LLRT)

A017
1/1

We have scheduled a maintenance outage for October 1989 and are presently considering the possibility of another maintenance outage for the latter part of 1990. The type of testing for which we are seeking exemption is not practicable for performing during outages such as these and are better accomplished during refueling outages. Attachment A provides justification and details the circumstances associated with the need for these exemptions. Attachment B provides the elements of our Local Leak Rate Testing Corrective Action Plan provided in support of the exemption on PCILRT testing schedule.

K. L. Highfill
for R. G. Bird

DMV/amm/3441

Attachments: A. Justification for Exemption from the Requirements of 10CFR50, Appendix J

B. Local Leak Rate Testing Corrective Action Plan

cc: Mr. D. McDonald, Project Manager
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation
Mail Stop: 14D1
U. S. Nuclear Regulatory Commission
1 White Flint North
11555 Rockville Pike
Rockville, MD 02852

U. S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Senior NRC Resident Inspector
Pilgrim Nuclear Power Station

JUSTIFICATION FOR EXEMPTION FROM THE REQUIREMENTS OF 10CFR50, APPENDIX J

I. Exemption from the PCILRT Retest Requirements of 10CFR50, Appendix J, Section III.A.6(b)

Section III.A.6(b) states:

> "If two consecutive periodic Type A tests fail to meet the applicable acceptance criteria in III.A.5(b), notwithstanding the periodic retest schedule of III.D, a Type A test shall be performed at each plant shutdown for refueling or approximately every 18 months, whichever occurs first, until two consecutive Type A tests meet the acceptance criteria in III.A.5(b), after which time the retest schedule specified in III.D may be resumed."

The Type A PCILRTs performed at Pilgrim Nuclear Power Station (PNPS) during the last three refueling outages (1982, 1984, and 1987) did not meet the acceptance criteria for the "as found" condition as a result of leakage from the pathways of the Type B and C LLRTs. Because the last PCILRT at PNPS was performed in December 1987, the next PCILRT would be required to be performed in approximately 18 months, which would be during the Cycle 8 Maintenance Outage currently scheduled for October 1989.

This exemption is requested so that the Type A test would not have to be performed during the October 1989 Maintenance Outage or other maintenance outages that may occur during the operating cycle and that the normal PCILRT retest schedule specified in Secion III.D.1(a) of Appendix J would be restored. The next PCILRT would be performed during Refueling Outage 8, and the resumption of the normal retest schedule would begin at this time.

10CFR50, Appendix J establishes two types of tests utilizing separate acceptance criteria. The local leak rate tests (LLRTs) (Type B and C) are performed during each refueling outage, while the primary containment integrated leak rate test (PCILRT) (Type A) is performed three times in each 10 year inservice inspection (ISI) interval (approximately every 3 to 4 years). The LLRTs provide periodic surveillance of components such as isolation valves and air lock seals. The PCILRT is a measurement of the overall integrated leakage rate of the containment. It includes testing of passive and structural components and verifies the adequacy of the LLRT program.

Exceeding the allowable leakage rate during the PCILRT indicates that either a passive or structural component is leaking or that there may be an inadequacy in the LLRT program. For leaking passive or structural components, the only test that could determine that the leak exists or had been corrected would be the PCILRT. In the case of LLRT program deficiency, the PCILRT would serve as a means of verification of the LLRT program results.

The failures of the Pilgrim Station 1982, 1984, and 1987 "as-found" PCILRTs were the direct result of Type B and C penalty additions and not the failure of a passive or structural component. The cause of the failure (valve leakage) was repaired and tested prior to the PCILRT. The Type A PCILRT successfully met its leakage criteria.

NRC Information Notice 85-71, "Containment Integrated Leak Rate Tests", dated August 22, 1985, states in part:

> "if Type B and C leakage rates constitute an identified contributor to this failure of the "as found" condition for the PCILRT, the general purpose of maintaining a high degree of containment integrity might be better served through an improved maintenance and testing program for containment penetration boundaries and isolation valves. In this situation, the licensee may submit a Corrective Action Plan with an alternative leakage test program proposal as an exemption request for NRC staff review. If this submittal is approved by the NRC staff, the licensee may implement the corrective action and alternative leakage test program in lieu of the required increase in Type A test frequency incurred after the failure of two successive Type A tests."

As an alternative to performing this PCILRT, BECo proposes that a more effective approach to maintaining a high degree of containment integrity is through implementing an improved maintenance and testing program for containment isolation valves and penetrations. The Local Leak Rate Testing Corrective Action Plan in Attachment B to this letter provides details of the program for implementation at PNPS. This Corrective Action Plan was developed using the guidance of NRC Information Notice 85-71, and is designed to eliminate the root cause of the successive PCILRT failures at PNPS by aggressively addressing leakage observed from the pathways of Type B and C LLRTs.

Prior to the development of our Corrective Action Plan, we established a Local Leak Rate Testing Failure Analysis Team in October 1986 as a "standing entity" to conduct root cause analyses and to recommend and follow up on corrective actions for all local leak rate test failures that occurred during our last refueling outage (RFO #7). By intensifying the level of attention at resolving the actual root causes for Type B and C test failures, the results of the "as left" PCILRT conducted at PNPS in December 1987 were the lowest leakage in the plant history. Enclosure 1 summarizes the root cause analyses and corrective actions taken for the RFO #7 local leak rate test failures. Also, as discussed in more detail in the augmented LLRT Testing Section of the Corrective Action Plan, we have already initiated more frequent LLRTs. Two additional LLRTs have been performed since the December 1987 PCILRT "as found" failure, and more testing is planned for October 1989.

10CFR50.12(a) indicates that the Commission may grant exemptions if special circumstances are present. One of the special circumstances presented in 50.12(a)(2)(ii) is,

> "application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

The underlying purpose of 10CFR50 Appendix J, Section III.6(b) is to ensure the integrity of the primary containment and its penetrations and to ensure that unacceptable containment leakage is identified and corrected. Implementation of the Corrective Action Plan will ensure this underlying purpose is met through an aggressive program to identify and correct containment isolation valve leakage and thereby provide an equivalent level of protection as the increased PCILRT frequency required by Section III.6(b).

The results of the PCILRT tests, neglecting the addition of penalties for the penetration leakages determined from the Type B and C tests, do not indicate any deterioration of containment integrity. Consequently, the probability of accidents would not be increased by this change and the post-accident radiological releases would not be greater than previously determined. Thus the proposed exemption would provide a degree of assurance of containment integrity equivalent to that required by Appendix J and does not present an undue risk to the public health and safety.

II. Exemption from the Type C LLRT Retest Requirement for Shutdown Cooling Suction Isolation Valves MO-1001-47 and MO-1001-50

Section III.D.3 of 10CFR, Appendix J requires a Type C LLRT to be performed on all primary containment isolation valves during each refueling outage, but in no case at intervals greater than 2 years. LLRTs on Shutdown Cooling Suction Isolation Valves MO-1001-47 and MO-1001-50 were last performed on November 28, 1988, near the end of Refueling Outage 7. Accordingly, the next LLRT on these in-series isolation valves for primary containment Penetration X-12 would be required on or before November 28, 1990. However, because Refueling Outage 8 will not occur until at least March 1, 1991, the 2 year interval would be exceeded.

These valves are used to isolate the single suction line from the reactor water recirculation system to the shutdown cooling system pumps. Local leak rate testing of these valves during outages other than refueling outages would have an adverse impact on the control of reactor coolant temperature because the shutdown cooling system is the only normal means of removing decay heat from the reactor vessel during short outages. A more appropriate alternative would be to perform the LLRTs on these two valves during Refueling Outage 8, while the reactor is refueled and shutdown cooling is not required. Accordingly, BECo requests a one-time exemption from the maximum 2-year LLRT retest interval for Shutdown Cooling Suction Isolation Valves MO-1001-47 and MO-1001-50. These valves will be tested during Refueling Outage 8 and the retest interval will not exceed 2 years and approximately 6 months.

Shutdown Cooling Suction Isolation Valves MO-1001-47 and MO-1001-50 have been LLRT tested four times each since May 1987. The only LLRT failure on these valves occurred in May 1987, when leakage of 13.5 slm was observed past Isolation Valve MO-1001-50. The valve was disassembled, reworked, and components were replaced. Since the failure, Isolation Valve MO-1001-50 has successfully passed three LLRTs. The last LLRTs were performed on these valves on November 28, 1988 in anticipation of startup for Cycle 8. The maximum 2-year retest was required. However, because of the length of the PNPS Restart Program, Cycle 8 will exceed this maximum 2-year retest interval.

The requested exemption would provide only temporary relief from the requirements of Section III.D.3 of 10CFR50, Appendix J to the extent that the Type C LLRTs for Shutdown Cooling Suction Isolation Valves MO-1001-47 and MO-1001-50 would be permitted to exceed the maximum 2-year retest interval by approxiamtely 6 months. BECo has made good faith efforts to comply with the regulation based on the increased LLRT retest frequency on these valves since May 1987.

III. <u>Exemption from the Type C LLRT Retest Requirement for Reactor Building Closed Cooling Water (RBCCW) Isolation Valve MO-4002 and Check Valve 30-CK-432</u>

Section III.D.3 of 10CFR50, Appendix J requires a Type C LLRT to be performed on all primary containment isolation valves during each refueling outage, but in no case at intervals greater than 2 years. LLRTs on RBCCW Isolation Valve MO-4002 and Check Valve 30-CK-432 were last performed on December 19, 1988, near the end of Refueling Outage 7. Accordingly, the next LLRT on these valves would be required by December 19, 1990. However, because Refueling Outage 8 is not scheduled to begin until at least March 1, 1991, the 2 year interval would be exceeded.

Train B of the RBCCW is the only closed-water system that penetrates the PNPS drywell. It is used to provide component cooling inside the drywell for the drywell coolers, the oil coolers to both recirculation pumps, and the drywell fans. Outside the drywell, Train B of the RBCCW is used to provide component cooling for both control rod drive (CRD) pumps, both reactor water cleanup (RWCU) pumps, and the heat exchanger on Train B of the fuel pool cooling system. Containment isolation for Train B of the RBCCW is provided by Isolation Valve MO-4002 on the line from the drywell (Penetration X-24) and by Check Valve 30-CK-432 on the line to the drywell (Penetration X-23). Only one isolation valve is provided on each penetration because Train B of the RBCCW is a closed-water system and it does not provide a direct leakage flowpath from the drywell to secondary containment.

LLRT testing of RBCCW Isolation Valve MO-4002 and Check Valve 30-CK-432 requires plant operators to close the valves to each component in the drywell served by Train B of RBCCW. This is done to isolate any leakage that would remain within the drywell and need not be measured. In addition, staging must be built above the torus to provide access to the valves for the LLRTs. After the tests, the staging must be removed. All of this work to manipulate the valves of affected drywell components, build and remove staging, and perform the LLRTs would result in considerable radiation exposure (approximately 1.41 person rem) of plant workers.

RBCCW water contains nitrites for corrosion control and approximately 2,500 gallons of this water must be drained and treated by the radwaste demineralizer during the LLRT tests on these valves. Because nitrites act to break down the demineralizer resins, this water must be carefully collected and treated by the radwaste demineralizer in measured amounts. In any case, the treatment of this high-nitrite water would result in more frequently changed resin and ultimately result in greater production of radwaste. In addition, performance of the LLRT tests on RBCCW Isolation Valve MO-4002 and Check Valve 30-CK-432 would have a large impact on plant operation because all components cooled by Train B of the RBCCW would be inoperable during the tests. The affected systems include the drywell coolers, both recirculation pumps, both CRD pumps, both RWCU pumps, and Train B of the fuel pool cooling system.

LLRTs on RBCCW Isolation Valve MO-4002 and Check Valve 30-CK-432 performed since December 1981 have been successful, with indicated leakage on each valve measuring 0.1 slm. A leakage of 0.1 slm corresponds to the minimum sensitivity of the leakage instrumentation. In addition, LLRTs on these valves have been performed successfully three times each since July 1987.

The requested exemption would provide only temporary relief from the requirements of Section III.D.3 of 10CFR50, Appendix J to the extent that the Type C LLRTs for RBCCW Isolation Valve MO-4002 and Check Valve 30-CK-432 would be permitted to exceed the maximum 2-year retest interval by approximately 6 months. BECo has made good faith efforts to comply with the regulation based on the increased LLRT retest frequency on these valves since July 1987.

IV. Exemption from the Type B LLRT Retest Requirement for the Drywell Head and Drywell Head Access Hatch

Section III.D.2(a) of 10CFR50, Appendix J requires a Type B LLRT to be performed on all primary containment penetrations, whose design incorporates components such as resilient seals and gaskets, during each refueling outage, but in no case at intervals greater than 2 years. The LLRTs on the Drywell Head and Drywell Head Access Hatch were last performed on November 29, 1988, near the end of Refueling Outage 7. Accordingly, the next LLRT on these penetrations would be required by November 29, 1990. However, because Refueling Outage 8 is currently not scheduled to begin until at least March 1, 1991, the 2 year interval would be exceeded.

To perform the LLRT tests on the Drywell Head and Drywell Head Access Hatch, seven of the nine shield blocks that rest above the drywell must be removed. The shield blocks are normally removed only during refueling outages when the Drywell Head must be removed for fuel loading and unloading. In this circumstance, the shield blocks would be moved only to allow the LLRTs. Also, the work to perform these LLRTs would be in a high radiation area and would result in considerable radiation exposure (approximately .6 person rem) of plant personnel.

The Drywell Head and Drywell Head Access Hatch have lifetime histories of successful LLRTs at PNPS, with indicated leakage on each penetration measuring 0.1 slm. A leakage of 0.1 slm corresponds to the minimum sensitivity of the leakage instrumentation.

The requested exemption would provide only temporary relief from the requirements of Section III.D.2(a) of 10CFR50, Appendix J to the extent that the Type B LLRTs for the Drywell Head and Drywell Head Access Hatch would be permitted to exceed the maximum 2-year retest interval by approximately 6 months.

Enclosure 1 to Attachment A

AO 7011A, 2" Drywell Equipment Sump Inboard Isolation Valve

Root Cause:

The LLRT failure of AO 7011A was cause by corrosion of the valve plug (disc) which caused scoring of the Teflon seat over 15 years of service.

Corrective Action:

Short Term

Install new valve with material change on disc to prevent disc corrosion (i.e. stainless steel verses ductile iron).

Long Term

None

Feedwater Check Valves

Root Cause:

1. Soft seat material (by Sargent SR740-70) was found to be suffering from thermal aging and subsequent erosive wear.

2. Bushings were of an older design. Design change recommendations by manufacturer not incorporated.

3. Hinge pins were of an older design. Design change recommendations by manufacturer not incorporated.

Corrective Action:

Short Term:

- Replace old hinge pins with new design hinge pins to restore design clearances.
- Replace old bushings with new shouldered bushings.
- Remove dowel pins and install snap rings over the threaded rod which holds the remaining ring onto the valve disc.
- Replace the old soft seat material (Sargent SR740-70 material) with new material which has passed thermal aging tests simulating 6 years accelerated thermal aging (Parker; E692).

Long Term:

- Test and trend LLRT results utilizing the new (Parker E692) material.

- Open and inspect at least one feedwater check valve each refueling outage to evaluate soft seat material.

MO220-2 Main Steam Drain Outboard Isolation Valve

Root Cause:

Packing leakage

Corrective Action:

Short Term:

Inspect and add or change packing as required.

Long Term:

Valve to be considered for live loaded packing (i.e., Chesterton live loaded packing) or replace packing each refueling outage.

AO 5044A Drywell Purge Exhaust Outboard Isolation Valve

Root Cause:

Jack screw was adjusted to be just barely closing the valve during valve initial installation. During the operating cycle the valve became "worn in", and since full seating was not present on initial testing, the valve came unseated after periodic operation.

Corrective Action:

Short Term:

This valve is the only Clow wafer valve at Pilgrim with a Jack Screw feature. The Jack Screw has been adjusted properly and tested (LLRT) satisfactorily.

Long Term:

None

Personnel Airlock

Root Cause:

The packing on the inner door handwheel shafts were found to be leaking.

Corrective Action:

Short Term:

Tighten packing and/or inspect or replace packing as required.

Long Term:

Trend LLRT results for degradation which would identify frequency of preventive maintenance and subsequent repair prior to exceeding LLRT acceptance.

AO 220-44 Reactor Sample Valve (Inboard)

Root Cause:

The LLRT failure of AO220-44 was caused by a mismatch of the valve actuator with the valve. This has been documented for the Valve Replacement II Program.

Corrective Action:

Short Term:

Replace AO220-44 (valve and actuator).

Long Term:

None

2301-74 HPCI Turbine Exhaust Line Stop Check Valve

Root Cause:

Pilgrim has experienced Turbine exhaust line water hammer. The water hammer occurs after a turbine trip and a subsequent restart caused from water siphoning from the torus to the hot exhaust pipe during steam condensation and pipe cool down. The water will siphon from the torus in 2 to 3 seconds after the turbine is secured or tripped.

The 2301-74 stop check is first in line from the torus and would experience severe hammering which would be transmitted onto the soft seat and valve body seat. Over time this hammering may have caused the soft seat ring to loosen; rotate; and sections to sever.

Corrective Action:

Short Term:

Completion of the HPCI vacuum breaker modification which is installing two vacuum relief check valves, two normally open motor operated containment isolations valves, and two normally open manual isolation valves which adds vacuum relief to the turbine exhaust pipe. This will be operable prior to running of HPCI.

Replacement of soft seat with like kind and verification of a tight fit within the retaining ring.

Long Term:

None. Valve re-test resulted in 0.0 SLM at 45 psig.

<u>SV5065-77; Pass Liquid Return to Torus</u>

<u>Root Cause</u>:

The LLRT failure of SV5065-77 was caused by a metal burr (approximately 3/4" long by 1/8" wide) lodged in the seat of the valve.

<u>Corrective Action</u>:

Short Term:

Remove burr, inspect for damage to seat or disc and LLRT.

Long Term:

None

<u>MO1001-50; RHR Shutdown Cooling Inboard Isolation Valve</u>

<u>Root Cause</u>:

The LLRT failure of MO1001-50 was caused by low areas on the disc and seat probably occurring during the RFO #6 refurbishment of this valve.

<u>Corrective Action</u>:

Short Term:

Perform "Dexter" machine of both disc and seat to restore proper seating.

Long Term:

None

MO 1201-5 Reactor Water Cleanup
<u>Suction Outboard Isolation Valve</u>

<u>Root Cause</u>:

The LLRT failure of MO1201-5 was caused by uneven (not flat) seating surfaces on the valve seat probably occurring during initial installation in 1984 (RFO #6).

<u>Corrective Action</u>:

Short Term:

1. Machine the valve seat to restore a flat surface.

2. Replace the disc with a new disc.

Long Term:

Continue to monitor and trend leakage as part of the LLRT Program.

<u>AO203-1A, 2A, 1B, 1D, 2D; Main Steam Isolation Valves</u>

<u>Root Cause</u>:

Pilot poppet lock nut assembly disassociation from stems caused by rotational and vibrational forces, existing valve design, wearing of poppet guides, and assembly process.

<u>Corrective Action</u>:

Short Term:

1. Valve re-design to provide redundancy of two set screws locking the pilot poppet via counterbored machined land areas on the pilot poppet nut.

2. Revise assembly process to include specific sequenced steps with measurements and torques specified.

3. Repair air leak on actuator, replace the split ring assembly, cleaning the seat, grinding poppet guides, and replacing poppet.

Long Term:

Trend LLRT results for degradation that would identify potential recurrence of symptoms.

<u>AO-5042A & B, Torus Main Exhaust</u>

<u>Root Cause</u>:

The LLRT failure AO-5042A and AO-5042B was caused by resin fouling of the valve seats possibly compounded by misaligned flange couplings between the valves and connecting piping.

(NOTE: The initial "as found" LLRT was successful. The resin fouling occurred during the refueling outage when primary containment was not required. The identification of the valve failure was the result of the additional testing performed approximately 12 months after the initial LLRT.)

Corrective Action:

Short Term:

1. Review the controls and steps taken in procedures for condensate demineralizer/resin transfer operations. Additional steps need to be implemented to prevent or respond to water/resin intrusion to the contaminated exhaust header (prior to ILRT).

2. Inspect TIP room header (to SBGTS) prior to ILRT.

3. Modify existing condensate demineralizer vent tie-in (or other method) to TIP room header to prevent water/resin from reaching AO-5042A&B, e.g., provide a physical barrier between condensate demineralizer vent pipe and TIP room header (deflector plate).

4. Modify the controls on the condensate demineralizer loop seal drain valve to open more often.

Long Term:

Procurement of spare parts such as seats and associated hardware for valves AO-504A&B including bronze bushings in lieu of carbon bushings.

LOCAL LEAK RATE TESTING CORRECTIVE ACTION PLAN

I. Problem

The Type A primary containment integrated leak rate tests (PCILRTs) at the Pilgrim Nuclear Power Station (PNPS) during the last three refueling outages did not meet the acceptance criteria for the "as found" condition as a result of excessive leakage observed from the pathways of the Type B and C local leak rate tests (LLRTs). The actual "as found" condition was not quantified by the PCILRTs conducted during Refueling Outage 5 (February 1982) and Refueling Outage 6 (December 1984). This was because the LLRT testing method at that time did not quantify excessive leakage past some containment isolation valves. An analysis of the containment penetrations that were repaired prior to the PCILRT was performed to assess the "as-found" containment leakage condition. The analysis determined a net equivalent LLRT leakage to be 234.19 slm or 1.112444 percent/day. This indicated that the maximum allowable leakage of 1.0 percent/day was exceeded and the PCILRT failed in the "as found" condition.

II. Root Cause of Problem

A. Containment isolation valve leakage.

Specific valves have a history of repeated LLRT failures. The success of the PCILRTs before the penalty addition from Type B and C LLRT tests indicates, however, that passive and structural components of the PNPS drywell are not contributors to this problem.

B. Inability to trend individual valve and penetration performance.

Past LLRT testing methods did not always quantify excessive valve leakage. LLRT trending is conducted without assistance from computerized methods.

C. Inconsistent testing methodology.

Additional guidance is needed to specify how each system needs to be lined up for testing (i.e., draining, venting, seat flushing). Improper pre-testing conditions can create a failed test or influence the final test result.

III. Objective of Corrective Action Plan

A. Reduce containment isolation valve leakage so that each valve consistently tests below the maximum acceptable leakage for each valve.

B. Implement a computerized LLRT Trending Program to enhance predicted valve leakage and implement repairs or modifications before excessive leakage occurs.

C. Implement a review and upgrade of LLRT test procedures.

IV. Corrective Actions

A. Valve Betterment Program

An evaluation of valve failures at PNPS in 1981 identified the need for a repair and replacement program for valves that present problems due to excessive leakage, operational concerns, ALARA or housekeeping concerns. The Valve Betterment Program was initiated and caused the repair or replacement of valves at PNPS during the last three outages. As a result, 17 valves have been replaced in the following systems: Containment Atmospheric Control, High Pressure Coolant Injection, Main Steam, Reactor Water Cleanup, Instrument Air, Residual Heat Removal, Reactor Sample, and the Containment Sump Systems. In addition, 8 MSIVS and 4 feedwater check valves have been modified to improve leak tightness and integrity.

The Valve Betterment Program includes improvements in the affected vendor manuals and other vendor documents, and will continue to consider the repair or replacement of valves, as recommended by plant personnel and the LLRT Failure Analysis Team.

B. LLRT Failure Analysis Team

During Refueling Outage 7, an LLRT Failure Analysis Team of knowledgeable engineers from both the Nuclear Engineering and Plant Departments was formed to investigate each LLRT failure, determine root cause, and recommend corrective action. This team will continue to perform their charter for any future LLRT failures at PNPS.

C. LLRT Trending Program

By September 1, 1989, BECo will implement an LLRT Trending Program at PNPS on a computerized database. This program will enhance abilities beyond the current manual system for data correlation such as valve histories and valve manufacturers, for all containment penetrations. It will also make penetration configuration and component data more readily available to the LLRT Engineer.

D. LLRT Test Method Improvement

The LLRT Engineer at PNPS is in the process of reviewing all LLRT procedures to ensure proper and standarized testing methodology. Discussions with other utilities and INPO are planned to benefit from their experience. This review will also incorporate lessons learned from past testing experience.

E. Augmented LLRT Testing

1. Since the failure of the December 1987 PCILRT for the "as found" condition, nearly two complete sets of LLRTs were performed on the containment penetrations at PNPS. They were performed in the June and December 1988 timeframes. This increased testing verified the repairs and root cause analyses performed were successful. An additional set of LLRTs is planned to be completed by the October 1989 Maintenance Outage, with the exception of BECo's request for exemption from Type B and C LLRTs for five penetrations (see

Attachment A to this letter). During Refueling Outage 8, a full LLRT will be completed prior to the planned PCILRT. In all, BECo plans to complete approximately five sets of LLRTs on containment penetrations at PNPS during the four-year period from June 1987 to June 1991.

2. During any planned outage at PNPS greater than 30 days, BECo will perform LLRTs on any penetrations which the LLRT Trending Program indicates could exceed penetration leak rate acceptance criteria.

V. <u>Actions Completed</u>

The majority (83%) of the net equivalent LLRT leakage that caused the "as found" failure of the PCILRT in December 1987 was due to excessive leakage past the feedwater check valves. These feedwater check valves had a history of LLRT failures due to worn soft seats, leaking hinge pins, and cracked welds on bushings.

The failure root cause analysis performed by the LLRT Failure Analysis Team determined that the failure was caused by degraded soft seat material (Sargent SR740-70), and bushings and hinge pins from an older design. As short-term corrective action, the old hinge pins and bushings were replaced with new designs and the soft seat material was replaced with a new material (Parker E692) which has passed thermal aging tests simulating 6 years of accelerated thermal aging.

The following long term corrective actions were identified:

- Continue to closely trend the LLRT performance of the refurbished valves.
- BECo will open and inspect at least one feedwater check valve during each refueling outage to evaluate the new soft seat material's performance.

The minimal leakage experienced during these feedwater check valves thus far indicates the repairs have been successful.