UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION REQUEST FOR RELIEF

LICENSE NOS. DPR-44 AND DPR-56

PECO ENERGY COMPANY

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

DOCKET NOS. 50-277 AND 50-278

1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice testing (IST) of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda, except where relief has been requested and granted or proposed alternatives have been authorized by the Commission pursuant to 10 CFR 50.55a(f)(6)(i), (a)(3)(i), or (a)(3)(ii). In order to obtain authorization or relief, the licensee must demonstrate that: (1) conformance is impractical for its facility; (2) the proposed alternative provides an acceptable level of quality and safety; or (3) compliance would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Section 50.55a(f)(4)(iv) provides that inservice tests of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed, and subject to Commission approval. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provided alternatives to the Code requirements determined to be acceptable to the staff and authorized the use of the alternatives in Positions 1, 2, 6, 7, 9, and 10 provided the licensee follows the guidance delineated in the applicable position. When an alternative is proposed which is in accordance with GL 89-04 guidance and is documented in the IST program, no further evaluation is required; however, implementation of the alternative is subject to NRC inspection.

Section 50.55a authorizes the Commission to grant relief from ASME Code requirements or to approve proposed alternatives upon making the necessary findings. The NRC staff's findings with respect to granting or not granting the relief requested or authorizing the proposed alternative as part of the licensee's IST program are contained in this Safety Evaluation (SE).

The second ten-year interval for Peach Bottom Units 2 and 3 began on September 19, 1986, and ends on September 18, 1996. The current IST program is based on the requirements of the 1980 Edition through the winter 1981 addenda of the ASME Code.

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2.0 BACKGROUND

The licensee submitted the original GVRR-2, Revision 2, relief request in a letter dated February 15, 1995. Revision 2 of GVRR-2 requested relief from the exercise procedure requirements for all excess flow check valves (EFCVs) in the Peach Bottom IST program. The proposed alternative was to test a majority of the EFCVs during system outages while the reactor was at power. The staff requested additional information in a letter dated March 13, 1995, to provide specific justification on a system basis to defer testing. The staff had a phone conversation with the licensee on March 27, 1995, to discuss the relief request. The licensee submitted a revised relief request dated April 17, 1995. The staff denied GVRR-2, Revision 2 in an SE dated July 7, 1995. The SE concluded that scope and programmatic issues had not been addressed by the licensee in their relief request submittals. In addition, a unique burden had not been identified by the licensee that would justify testing of the EFCVs in modes of operation other than refueling outages as previously granted.

In a letter dated July 14, 1995, the licensee submitted another revision to Relief Request GVRR-2, Revision 2. The letter contained information which attempted to address the concerns that the staff had identified in their July 7, 1995 SE. Additional information was provided by the licensee in a letter dated August 9, 1995, to respond to questions raised by the staff in a phone conversation on August 3, 1995. An evaluation of revised Relief Request GVRR-2, Revision 2, follows.

3.0 RELIEF REQUEST GVRR-2, REVISION 2

The licensee has requested relief from the exercise procedure requirements of ASME Section XI, Paragraph IWV-3521, for all the EFCVs contained at Peach Bottom. The licensee has proposed to test a majority of the EFCVs during system outages when the associated unit is at power. The remaining EFCVs would be tested during refueling outages. The EFCVs tested during system outages would be tested at a frequency which would be equivalent to a refueling cycle interval.

Reactor & Recirculation System:

XFC-2(3)-02-007A(B)	XFC-2(3)-02-008A(B)
XFC-2(3)-02-011	XFC-2(3)-02-015A(B)
XFC-2(3)-02-017A(B)	XFC-2(3)-02-019A(B)
XFC-2(3)-02-021A(B,C,D)	XFC-2(3)-02-023A(B,C,D)
XFC-2(3)-02-025	XFC-2(3)-02-027
XFC-2(3)-02-305A(B)	XFC-2(3)-02-033
XFC-2(3)-02-062A(B,C,D)	XFC-2(3)-02-064A(B,C,D)
XFC-2(3)-02-037A(B)	
XFC-2(3)-02-073A(B,C,D,E,F,G,H)	
XFC-2(3)-02-031B(C,D,E,G,H,J,K,M,N,P,R,T,U,V,W)	

Reactor Water Cleanup System:	XFC-2(3)-12-066A(B)	XFC-2(3)-12-80457L(H)*
Reactor Core Isolation Cooling System:	XFC-2(3)-13-055A(B)	
Core Spray System:	XFC-2(3)-14-031A(B)	
High Pressure Coolant Injection System:	XFC-2(3)-23-037A(B)	

*Unit 3 valves will be installed during refueling outage 3R10

3.1 Licensee's Basis for Requesting Relief

In the July 14, 1995 relief request, the licensee states:

"Excess flow check valves (EFCVs) are installed on instrument lines penetrating containment to minimize leakage in the event of an instrument line failure outside the containment in accordance with Regulatory Guide 1.11. The EFCV is a spring loaded ball check valve. Since the system is normally in a static condition, the valve ball is held open by the spring. Any sudden increase in flow thru the valve (i.e. line break) will result in a differential pressure across the valve which will overcome the spring and close the valve. Functional testing of valve closure is accomplished by venting the instrument side of the valve while the process side is under pressure and verifying the absence of leakage through the vent.

The testing described above would require the removal of the associated instrument or instruments from service on a quarterly basis. Removal of any of these instruments from service outside of a scheduled refueling outage or a controlled system outage may cause a spurious signal which could result in a plant trip, an inadvertent initiation of a safety system, loss of decay heat removal and/or the defeating of safety interlocks.

Testing of the EFCVs can be performed during a scheduled system outage when appropriate plant administrative procedures and controls are utilized to ensure plant safety. System outages are performed in order to enhance system performance and maximize system availability. They are scheduled on a less than quarterly frequency (typically once an operating cycle). Taking system outages quarterly solely for the purpose of EFCV testing would result in reduced system availability. NUREG[-]1482, Section 3.1.2 recommends minimizing equipment out of service time. The additional assurance of operational readiness afforded through surveillance testing must outweigh the impact on plant safety incurred when removing equipment from service.

In Section 4.1.4 of NUREG[-]1482, the USNRC approves the deferral of backflow testing of check valves to refueling outages when the testing requires the installation of test equipment. The intent of this request is the same in that EFCV testing requires a plant evolution which should be avoided unless appropriate plant administrative controls are in place.

As discussed in NUREG[-]1482, the staff recommends that the basis for relief address whether: (1) the proposed alternative gives an acceptable level of quality and safety, (2) compliance would result in a hardship without a compensating increase in the level of safety, or (3) complying with Code requirements is impractical. Two of these criteria, and the basis for meeting the criteria are provided below.

<u>The proposed alternative gives an acceptable level of quality and safety.</u>

A review of NPRDS [nuclear power reliability data system] industry failure data for the Dragon excess flow check valves, which is the manufacturer of the valves used at PBAPS [Peach Bottom Atomic Power Station], reveals only 7 failures. The 7 failures break down as follows; 2 were the result of an IST surveillance which failed to met the acceptance criteria for leakage, 1 was an indication (limit switch) problem, and 4 were leakage caused by a bad gasket. Both IST failures occurred at Peach Bottom. A thorough review of Peach Bottom excess flow check valve test history has shown that the 2 NPRDS failures above are the only 2 out of 888 valve tests since 1980. One of the failures, 1.1 gpm measured leakage, was due to dirt on the seating surface of the valve; the other, 4.0 gpm measured leakage, was due to a defective seating surface in the manual bypass portion of the EFCV. These are 2 independent failures which have not been repeated. Only 2 failures out of 888 valve tests indicates that the valves are highly reliable. Further, this review of surveillance test history shows evidence of no time based failure mechanisms or chronic failures associated with the excess flow check valves. Although testing of the EFCVs was performed on the previous refueling cycle frequency (approximately 18 months), testing of the EFCVs has been performed since 1993 on a 24 month refueling outage frequency. Therefore, performing the testing of the EFCVs on a 24 month frequency is appropriate.

<u>Compliance would result in a hardship without a compensating increase in safety.</u>

Personal safety would decrease if EFCV testing would be performed on a quarterly basis during plant operation without an appropriate

system outage. During power operation, the process side of these valves is normally high pressure (>500 psig) and/or high temperature (>200°F) and highly contaminated reactor coolant. Testing EFCVs during system outage windows with the appropriate administrative procedures and controls applied will ensure personnel safety. Additionally, testing at a frequency greater than once per operating cycle would also result in increased radiation dosage and reduced system availability without any compensating increase in safety.

Improvements in work planning and scheduling have resulted in a significant reduction in outage duration at Peach Bottom. As a result of these improvements, EFCV testing has become an outage critical path activity. Due to the large number of EFCVs and the plant conditions required to perform the testing (reactor pressure > 500 psig), testing all the valves during refueling results in an outage duration increase of approximately 2 days. Based on current replacement power costs, this equates to an expenditure of $900,000 per year for the life of the plant. In order to reduce this level of burden, extensive programmatic and procedural controls are used during system outages to ensure that the impact on plant safety is understood prior to removing equipment from service. This process is consistent with industry practice and NRC guidance, and has been recognized as an effective method of controlling the impact of plant activities on safety. During a refueling outage, the constraints on resources are at a premium, and the elimination of work which can be safely performed independent of these constraints is both practical and prudent.

In summary, considering the extremely low failure rate, personnel and plant safety concerns, and the high monetary cost of testing during refueling outages, EFCV testing at a frequency greater than once per operating cycle and exclusively during refueling outages is impracticable and results in a hardship without a compensating increase in the level of safety."

3.1.1 Additional Basis for Testing Certain Valves During System Outages

The licensee provided the following information in their letter dated August 9, 1995, to support their claim of hardship if all the EFCVs were tested during refueling outages:

"The Peach Bottom Atomic Power Station, Units 2 and 3 system design does not include test taps upstream of the Excess Flow Check Valves (EFCVs). For this reason, the EFCVs cannot be isolated and tested using another pressure source; reactor pressure is required to perform the testing. During refueling outages, the duration of time in which adequate reactor pressure is available is much shorter than the time it takes to test

all of the EFCVs. This is based on past experience which has shown that the approximate duration for EFCV testing is 2 days.

A small number of tests (4 valves scheduled for 3R10) can be performed at the beginning of the outage just after shutdown during depressurization. This depressurization time is approximately 4 hours. The remainder of the tests must be performed at the end of the refueling outage when the reactor is again pressurized. This corresponds to the time when the vessel hydrostatic test is being performed. The scheduled hydrostatic test duration is driven by EFCV testing; EFCV testing is the critical path activity during the hydrostatic test. Based on past history and including contingencies for the complexity of test coordination activities, limit switch adjustments, and vessel depressurizations (see next paragraph), testing the remaining EFCVs during the hydrostatic test would add approximately 2 days to the refueling outage. This represents a significant financial hardship. Additionally, minimizing the hydrostatic test duration reduces the challenges to the reactor operator caused by manually controlling reactor pressure at near solid conditions for extended periods of time.

As a result of more efficient outage planning (i.e., shorter outages), decay heat levels during the hydrostatic test are higher than in the past. If the hydrostatic test was extended to test all remaining EFCVs, the vessel could require depressurization as many as 4 times to avoid exceeding the refuel mode bulk coolant temperature limit of 212 degrees F. This is an evolution which challenges the reactor operators and thermally cycles the reactor vessel and should be avoided if possible."

3.2 Alternate Testing

The licensee proposes:

"Functional testing will be performed once per operating cycle during a refueling outage or system outages when appropriate plant administrative controls are in place."

3.3 Evaluation

The licensee's IST program is based on the requirements of the 1980 Edition through the winter 1981 addenda of the ASME Section XI Code. The check valve test frequency requirements of Section XI, Paragraph IWV-3521, state that check valves shall be exercised every three months. Paragraph IWV-3522 further states that these valves shall be exercised to the position required to fulfill their function unless such operation is not practical during plant

operation. Paragraph IWV-3522 allows for testing to be deferred to cold shutdowns if testing is not practicable. There is no provision in Section XI to defer testing to a refueling outage frequency.

Paragraph 4.3.2.2(e) of ASME/ANSI Operations and Maintenance (OM) Standards, Part 10, "Inservice Testing of Valves in Light-Water Reactor Power Plants," (OM-10) allows the deferral of check valve exercise testing that is not practical during plant operation or cold shutdowns to refueling outages. The 1988 edition of ASME Section XI adopts OM-10 for testing of valves. Relief Request GVRR-2, Revision 1, meets the requirements of OM-10, Paragraph 4.3.2.2(e).

Relief Request GVRR-2, Revision 2, requests that the testing frequency of a select number of EFCVs be dependent on system outages while the reactor is at power instead of plant cold shutdowns or refueling outages. The remaining EFCVs would continue to be tested on a refueling outage frequency. There are two parts to this relief request: 1) the testing of a selected group of EFCVs during system outages while the reactor is at power, and 2) the test deferral of the remaining EFCVs to refueling outages. Therefore, each proposed alternate testing will be evaluated separately.

To obtain relief from the Code requirements, the licensee must support one of the following requirements: 1) the proposed alternative provides an acceptable level of quality and safety; 2) compliance with the specified requirements would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety; and 3) the Code requirements are impractical. Although the licensee presented a discussion regarding the reliability of these valves, this information was not reviewed in detail or evaluated, and therefore, was not directly used for approving the alternative.

3.3.1 Valves Tested During Refueling Outages

The following valves will be tested during reactor refueling outages:

XFC-2(3)-02-008A(B)	XFC-2(3)-02-011
XFC-2(3)-02-015A(B)	XFC-2(3)-02-017A(B)
XFC-2(3)-02-019A(B)	XFC-2(3)-02-021A(B,C,D)
XFC-2(3)-02-027	XFC-2(3)-02-033
XFC-2(3)-02-037A(B)	XFC-2(3)-02-064A(B,C,D)
XFC-2(3)-02-073A(B,C,D,E,F,G,H)	

The EFCVs listed above have a safety function in the closed direction to isolate the associated instrument line in the event of a line failure outside of containment. Relief was granted to defer testing of all EFCVs to refueling outages in GVRR-2, Revision 1, which was evaluated in an SE dated January 17, 1991. As stated in that SE, it is impractical to exercise the EFCVs quarterly during power operation because various instrument sensing lines must be vented thus removing from service reactor instrumentation that provides reactor protection and control signals. In addition, it is impractical to exercise these valves during cold shutdowns because removal of the associated

instruments from service could prevent operation of systems required for decay heat removal. It would be a burden for the licensee to test these valves at the Code frequency because of the potential of a reactor scram during power operation and loss of decay heat removal during cold shutdowns. NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," Section 4.1.4, states that the need to set up test equipment is adequate justification to defer check valve backflow (closure) testing to a refueling outage frequency.

These valves have not been listed by the licensee to be tested during system outages while the reactor is at power because either there are no system outages that would allow testing of these valves while the reactor is at power or the risk of an inadvertent reactor scram cannot be mitigated sufficiently during the system outage. Therefore, the only frequency available for the licensee to test these valves is a refueling outage frequency.

Subsequent to the granting of the relief as requested in GVRR-2, Revision 1, 10 CFR 50.55a endorsed the 1989 edition of ASME Section XI. The 1989 edition of the Code provides that the rules for IST of valves may meet the requirements set forth in OM-10. Pursuant to 10 CFR 50.55a(f)(4)(iv), portions of editions or addenda may be used provided that all related requirements of the respective editions or addenda are met, and subject to Commission approval. Approval to use the portion of the 1989 edition of the Code that provides for the use of OM-10 is hereby granted. Paragraph 4.3.2.2(e) of OM-10 states that if valve exercising is not practicable during plant operation or cold shutdowns, it may be limited to a full-stroke exercise during refueling outages. In addition, paragraph 6.2(d) of OM-10 requires that the justification for deferral of valve exercising be documented in the inservice test plan. The licensee's proposed alternative is in accordance with paragraph 4.3.2.2(e) of OM-10. The submission of this relief request meets the documentation requirements of paragraph 6.2(d).

When the licensee's IST program is updated to the third ten-year interval, this portion of GVRR-2, Revision 2, should be included as a refueling outage justification. In addition, if the licensee determines that additional valves from the above list can be tested in systems out of service while the reactor is at power, the licensee should revise all portions of the IST program effected by the changes in EFCV testing.

3.3.2 Valves Tested During System Outages

The licensee has identified the following valves to be tested during system outages when the reactor is at power:

XFC-2(3)-02-007A(B)	XFC-2(3)-02-023A(B,C,D)
XFC-2(3)-02-025	XFC-2(3)-02-305A(B)
XFC-2(3)-02-062A(B,C,D)	
XFC-2(3)-02-031B(C,D,E,G,H,J,K,M,N,P,R,T,U,V,W)	
XFC-2(3)-12-066A(B)	XFC-2(3)-12-80457L(H)*
XFC-2(3)-13-055A(B)	XFC-2(3)-14-031A(B)
XFC-2(3)-23-037A(B)	

*Unit 3 valves will be installed during refueling outage 3R10

These EFCVs have a safety function in the closed direction to isolate the associated instrument line in the event of a line failure outside of containment. As stated previously in Section 3.3.1 of this SE, it is impractical to exercise the EFCVs quarterly during power operation or during cold shutdowns because of the loss of reactor protection and control signals and the potential for inadvertent reactor scrams. The licensee has identified above the valves that can be tested at power when their associated system is out of service for a scheduled maintenance outage.

The licensee stated that current methods employed for testing these valves would increase the length of their refueling outage by approximately 1½ - 2 days. This is because the instrument lines at Peach Bottom do not have test taps upstream of the EFCVs which would allow the attachment of an alternate pressure source to conduct closure testing throughout the entire refueling outage. Without this configuration, the EFCVs can only be tested during refueling outages when the reactor vessel is adequately pressurized. This occurs immediately after shutdown when the reactor is being depressurized and during the reactor vessel hydrostatic test. The licensee stated that testing conducted during the hydrostatic test is on the critical path to the refueling outage schedule. Therefore, testing all EFCVs during the refueling outage at Peach Bottom directly effects the length of the refueling outage.

The licensee has proposed to test the valves listed above during scheduled system outages while the reactor is at power. The frequency of testing for these valves would be similar to the refueling cycle length of twenty four months currently at Peach Bottom. This alternate testing would be consistent with Technical Specification (TS) Section 4.7.D.3 which requires that the operability of the EFCVs be verified at least once per operating cycle (PECO's proposed revision to the Peach Bottom TS, TSCR 93-16, dated September 29, 1994, contains language similar to the current TS regarding EFCV testing). Both the TS and the IST program allow one-time 25 percent extensions of testing intervals. However, if a particular testing interval had the potential to exceed the extended frequency, the licensee would be required to request an extension to the TS and IST frequencies and provide adequate basis for the extension.

Testing these valves during refueling outages is not impractical, however, Peach Bottom appears to have a unique burden because the capability does not exist to test these valves throughout the refueling outage. It is a hardship for the licensee to test the EFCVs listed above during reactor vessel hydrostatic testing, thereby extending the refueling outage, when there exists alternate means to test these valves. The licensee's proposed testing provides a reasonable assurance of operational readiness because the EFCVs will be tested at a frequency similar to the refueling outage frequency.

When the licensee's IST program is updated to the third ten-year interval, GVRR-2, Revision 2, should be updated to included only the valves listed in this section of the SE. In addition, if the licensee determines that additional valves can be tested in systems out of service while the reactor is at power, or performs modifications to test some or all of the valves in this list during refueling outages, the licensee should submit a relief request for approval.

3.4 Conclusion

Use of OM-10 to defer closure testing of the EFCVs listed in Section 3.3.1 at a refueling outage frequency is approved pursuant to 10 CFR 50.55a(f)(4)(iv).

The proposed alternative to the Code exercise procedure requirements is authorized for the EFCVs that can be tested at power in systems that are out of service (listed in Section 3.3.2) pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety. The licensee is authorized to implement the alternate testing in their relief request on the date of issuance of this SE.

When the licensee's IST program is updated to the third ten-year interval, the EFCVs listed in Section 3.3.1 of this SE should be included in a refueling outage justification. GVRR-2, Revision 2, should be updated to include only the valves listed in Section 3.3.2 of this SE. In addition, if the licensee determines that additional EFCVs from the valves listed in Section 3.3.1 can be tested in systems out of service while the reactor is at power, the licensee should submit a relief request for approval.

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