



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM RELIEF REQUEST

FOR EXCESS FLOW CHECK VALVES

PENNSYLVANIA POWER AND LIGHT COMPANY

SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2

DOCKET NOS. 50-387 AND 388

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 components be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code applicable Edition and Addenda, except where alternatives have been authorized or specific written relief has been requested by the licensee and granted by the Commission pursuant to paragraph 10 CFR 50.55a(g)(6)(i), or alternatives approved pursuant to 10 CFR 50.55a(a)(3)(i) or (a)(3)(ii). Under the proposed alternatives, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; or (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. In requesting relief, the licensee must demonstrate that the requirement is impractical for the facility. NRC guidance contained in Generic Letter (GL) 89-04, *Guidance on Developing Acceptable Inservice Testing Programs*, provides alternatives to the Code requirements determined acceptable to the staff. Alternatives that conform with the guidance in GL 89-04 may be implemented without additional NRC approval. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. The NRC staff's findings with respect to authorizing alternatives and granting the relief requested as part of the licensee's IST program are contained in this safety evaluation (SE).

This SE covers a revised relief request for a proposed alternative to the Code requirements with regard to excess flow check valves (EFCVs) as described in Pennsylvania Power and Light Company's (PP&L's) letter dated May 20, 1996.

The relief request evaluated in this SE relates to the second 10-year IST interval for the Susquehanna Steam Electric Station, Units 1 and 2. The interval began June 1, 1994. The second 10-year interval program is based on the requirements of the 1989 Edition of Section XI of the *ASME Boiler and Pressure Vessel Code* (the Code) in accordance with 10 CFR 50.55a.

ENCLOSURE

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## 2.0 RELIEF REQUEST NO. 23, REV. 14 for UNIT 1 AND 11 FOR UNIT 2

The licensee requests relief from the quarterly IST requirements of the ASME B&PV Code, Section XI for certain listed EFCVs. The licensee proposes to perform the testing on an 18-month frequency immediately prior to refueling outages, consistent with Technical Specification 4.6.3.4.

### 2.1 Licensee's Basis for Requested Relief

Excess flow check valves are installed on instrument lines penetrating containment in accordance with Regulatory Guide 1.11. The lines are sized and/or contain an orifice, such that offsite doses will be substantially below 10 CFR 100 limits in the event of a rupture. Therefore, individual leak rate testing of these valves is not required for conformance with 10 CFR Part 50, Appendix J requirements.

Functional testing of these valves to verify closure can be accomplished by venting the instrument side (outlet) of the valve while the process side (inlet) is under pressure. This testing is required by Technical Specifications 4.6.3.4 at least once per 18 months.

Testing on a frequency greater than once per 18 months is a hardship for several reasons. The piping configuration does not include test taps upstream of the EFCVs. Therefore, the valves cannot be isolated and tested using a pressure other than reactor pressure. Testing during plant operation requires removal of the associated instruments from service. These instruments are in use during plant operation and their removal from service may cause a spurious signal which could result in a plant trip or an unnecessary challenge to safety systems. Additionally, process liquid will be contaminated to some degree, requiring special measures to collect flow from the vented instrument side and will also contribute to an increase in personnel radiation exposure. Testing on a quarterly basis is deemed impractical since the risk of performing frequent tests outweighs the benefit achieved with a quarterly test and will also increase personnel exposure.

NUREG-1482 allows test deferrals to refueling outages if it is impractical to test quarterly or during cold shutdowns. Considering the large number of valves to be tested and the need for reactor pressure it is a hardship to test all the valves during a refueling outage. Recent improvements in plant refueling outage schedules minimizes the time that is planned for refueling and testing activities during the outages. In order to perform the EFCV testing using required reactor pressure, the tests would be performed in conjunction with vessel hydrostatic testing. As a result of shorter outages, decay heat levels during hydrostatic tests are higher. If hydrostatic testing was extended to test all EFCVs, the vessel could require depressurization several times to avoid exceeding the maximum bulk coolant temperature limit. These are undesirable evolutions that challenge the reactor operator and thermally cycle the reactor vessel. Further, based on past experience, EFCV testing during hydrostatic testing becomes the outage critical path and could extend the outage 2 days to accommodate the testing of all the EFCVs.

A review of the maintenance history has shown that the EFCVs have been extremely reliable over the life of the plant. Test records show a less than 1 percent EFCV failure rate with many such causes attributed to alarm problems, limit switch adjustments, blown fuses, and dirt in the instrument lines. Only half of the failures required valve replacement. The review shows no evidence of time based failure mechanisms or common mode failures associated with the EFCVs.

A proposed alternative to testing during the refueling outage would be to test certain EFCVs immediately preceding the refueling outage while the reactor is at power, while also instituting the appropriate administrative and schedule controls. This provides the appropriate conditions for testing while maintaining reactor pressure at >500 psig and also providing an acceptable level of quality and safety. Performance of the EFCV testing prior to the outage will be scheduled, such that, in the event of a failure, the resulting action statement and limiting condition of operation will encompass the planned shutdown for the refueling outage. Using this strategy, unplanned, unnecessary plant shutdowns as a result of EFCV testing will be avoided.

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

## 2.2 Alternate Method

The licensee proposes, as an alternative, to perform EFCV functional testing at least once every 18 months per Technical Specification 4.6.3.4, immediately preceding a planned refueling outage with the appropriate administrative controls established.

## 2.3 Evaluation

The EFCV's safety function is to isolate the associated instrument line in the event of a line rupture outside of containment. The EFCV is specifically designed to perform this function. The valve has an internal poppet assembly which closes off valve flow on high flow or a high differential pressure caused by a rupture in the outlet line (instrument line). The licensee reports that the instrument lines penetrating containment also have a restrictive orifice and/or are sized so that any offsite doses will be substantially below the 10 CFR Part 100 limits in the event of a rupture and failure of the EFCV to close.

The licensee finds that testing on a quarterly interval is a hardship for several reasons: 1) the testing requires removal of the instruments from operational service; 2) removal of the instruments during plant operation may cause a spurious signal leading to a plant trip, altered plant operations, or unnecessary challenge to safety systems; 3) effluent from the vented side of the valve will be contaminated to some extent and require special collection provisions; and 4) personnel will be exposed to unnecessary radiation.

The licensee reviewed the performance experience of the EFCVs and concluded that the valves have been highly reliable over the life of the plant. The review of the surveillance test history showed no evidence of time-based failure mechanisms or common mode failures associated with the EFCVs. The licensee's assessments of reliability and failure experience are consistent with other industry EFCV information reviewed by the staff.

Rather than testing the EFCVs quarterly, the licensee proposes to perform the test once a refueling cycle and immediately prior to the refueling outage with appropriate administrative and schedule controls implemented. The licensee will test the EFCV's safety function performance under conditions nearly identical to the expected conditions that the valves would experience when required to mitigate the consequences of ruptured instrument lines during plant operation. The licensee will perform testing to verify valve closure by venting the instrument side of the valve while the inlet side of the valve is subject to reactor pressure. The scheduling of each test immediately prior to the refueling outage ensures that the resulting action statement and limiting condition of operation will encompass the planned shutdown for the refueling outage and preclude unplanned and unnecessary shutdowns.

The Code testing requirements for check valves applicable to the 1989 Edition of Section XI of the ASME B&PV Code, by reference, are contained in ASME/ANSI, OMa-1988, Part 10. Paragraphs 4.3.2.1, 4.3.2.2 (a) and 4.3.2.2 (e) of Part 10 define the major requirements pertaining to the licensee's proposed alternative. In part, the paragraphs respectively require: 1) valves be exercised quarterly; 2) valves be exercised during plant operation; and 3) if valve exercising during plant operation is not practical, it may be limited to full-stroke during refueling outages.

In considering the reliability record of the EFCVs, the flow restrictive outlet instrument lines outside containment, the hardship of testing a large number of EFCVs quarterly during plant operation and potential actuation of safety systems, the specific Code language, and level of quality and safety of the proposed alternative to the Code requirements, the staff has determined that the proposed alternative is acceptable and compliance with the quarterly test provisions of the Code for the licensee's identified EFCVs would result in hardship without a compensating increase in the level of quality and safety.

### 3.0 CONCLUSION

The staff concludes that the licensee's proposed alternative to the Code requirements to perform functional testing of the EFCVs identified in the licensee's May 20, 1996, letter at least once every 18 months immediately preceding a planned refueling outage with appropriate administrative and scheduling controls implemented is authorized by law, pursuant to 10 CFR 50.55a(a)(3)(ii), based on the determination that compliance with the Code requirements results in a hardship without a compensating increase in the level of quality and safety, as compared to testing the valves every 18 months during refueling outages as was previously approved by the staff.

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