

May 2, 2001

Mr. Mike Bellamy
Site Vice President
Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

SUBJECT: PILGRIM NUCLEAR POWER STATION - RELIEF REQUESTS FROM
SECTION XI, THE PUMP AND VALVE INSERVICE TESTING PROGRAM
REGARDING REVISED EXCESS FLOW CHECK VALVE TESTING
FREQUENCY (TAC NO. MB1124)

Dear Mr. Bellamy:

By letter dated February 2, 2001, as supplemented on March 22, 2001, Entergy Nuclear Generation Company (the licensee) submitted two valve relief requests (RV-44 and RV-45) for Pilgrim Nuclear Power Station. The licensee requested relief for excess flow check valves from Section XI of the American Society for Mechanical Engineers Boiler and Pressure Vessel Code (the Code) inservice tests that are required to be performed every refueling outage, and from the biennial requirement to verify that the valve position is accurately indicated.

Based on our review of the information provided in your submittals, the staff finds that your proposed relief requests are an acceptable alternative to the pump and valve inservice testing requirements of Section XI of the Code, and therefore, your request for relief is authorized for the remainder of the term of the current operating license, pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety.

The basis for the staff's conclusion is in the enclosed safety evaluation. This action closes TAC No. MB1124. If you have any questions regarding the relief request, please contact Alan Wang at (301) 415-1445.

Sincerely,

/RA/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure: Safety Evaluation

cc w/encl: See next page

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ACCESSION NUMBER: ML011080497

*SE dated 4/10/01; no major changes made.

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Pilgrim Nuclear Power Station

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST FOR EXCESS FLOW CHECK VALVE TESTING FREQUENCY

PILGRIM NUCLEAR POWER STATION

ENTERGY NUCLEAR GENERATION COMPANY

DOCKET NO. 50-293

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves are performed in accordance with Section XI of the ASME *Boiler and Pressure Vessel Code* (the Code) and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to Sections (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. Guidance related to the development and implementation of IST programs is given in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," issued April 3, 1989, and its Supplement 1 issued April 4, 1995. Also see NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," and NUREG/CR-6396, "Examples, Clarifications, and Guidance on Preparing Requests for Relief from Pump and Valve Inservice Testing Requirements."

The 1989 Edition of the ASME Code is the applicable Code of Record for the third 10-year interval IST program at the Pilgrim Nuclear Power Station (Pilgrim). Subsection IWV of the 1989 Edition, which gives the requirements for IST of valves, references Part 10 of the American National Standards Institute/ASME *Operations and Maintenance Standards* (OM-10) as the rules for IST of valves. OM-10 replaces specific requirements in previous editions of Section XI, Subsection IWV, of the ASME Code. Subsection IWP of the 1989 Edition, which gives the requirements for IST of pumps, references Part 6 of the American National Standards Institute/ASME *Operations and Maintenance Standards* (OM-6) as the rules for IST of pumps. OM-6 replaces specific requirements in previous editions of Section XI, Subsection IWP, of the ASME Code.

By letter dated February 2, 2001, as supplemented on March 22, 2001, Entergy Nuclear Generation Company (Entergy) submitted two valve relief requests (RV-44 and RV-45) for Pilgrim. Entergy requested relief for excess flow check valves (EFCVs) from the ASME Code-required tests every refueling outage, and from the biennial requirements of verifying valve position. The staff has completed its review of the relief requests and is providing the following evaluation.

2.0 RELIEF REQUEST RV-44

Entergy requests relief for the following EFCVs (manufactured by Chemiquip) from the ASME Code inservice tests that are required to be performed every refueling outage as specified in OM-10 Code, Paragraph 4.3.2.2, and from the biennial requirements (Paragraph 4.1 of OM-10 Code) of verifying that the valve position is accurately indicated. The relief request allows that a representative sample (approximately 20 percent) of the affected EFCVs be tested each refueling cycle such that each EFCV will be tested at least once every 10 years (nominal).

Excess Flow Check Valves Included in Relief Request RV-44

1-CK-17A/B/C/D	263-53	263-92
1-CK-18A/B/C/D	263-55	263-215A/B
261-19A/B	263-57	263-217A/B
261-20A/B	263-59	263-219A/B
261-21A/B	263-61	263-220A/B
261-22A/B	263-69	263-223A/B
261-67A/B/C/D/E/F/G/H	263-71	263-225
261-110A/B	263-73	263-227
262-25A/B	263-75	263-231A/B
262-26A/B	263-77	263-233
263-38	263-79	263-237
263-44	263-81	263-242A/B
263-45	263-83	400-31A/B
263-51	263-90	

2.1 Basis for Relief (as stated)

NEDO-32977-A, and the associated NRC safety evaluation, dated March 14, 2000, provides the basis for this relief. NEDO-32977-A justifies relaxing the EFCV testing frequency from the current testing of each valve once/cycle to a ~20% sample once/cycle such that each valve is tested within a 10 year interval.

NEDO-32977-A demonstrates, through operating experience, a high degree of reliability with EFCVs and the low consequences of an EFCV failure. Reliability data in the report (Tables 4-1 and 4.2) documents two EFCV failures (failure to close) at 4 participating plants (Monticello, Dresden, Vermont Yankee and Oyster Creek), for Chemiquip valves similar to those used at Pilgrim. These two failures were observed over a service time of 5426 operating years (4.75E +07 operating hours). This results in a "Best Estimate Failure Rate" of 4.21 E-08 per hour of operating time and an "Upper Limit Failure Rate" of 1.33 E-07 per hour of operating time. A review of historical test surveillance data, and a test failure

component history search at Pilgrim shows zero EFCV failures (failure to close) have been observed (data from 1983 through 1999 RFO #12). In addition, there are no known EFCV failures that occurred earlier than 1983.

The instrument lines at Pilgrim have a flow restricting orifice upstream of the EFCVs to limit reactor water leakage in the event of rupture. Previous evaluations contained in Pilgrim's Updated Final Safety Analysis Report (UFSAR) of such an instrument line rupture do not credit the EFCVs for isolating the rupture. Thus a failure of an EFCV, though not expected as a result of this request, is bounded by the analysis. Based on the NEDO-32977-A and the analysis contained in Pilgrim's UFSAR, the proposed alternative to the required exercise testing frequency for EFCVs prescribed by OM-10 provides a satisfactory level of quality and safety.

2.2 Alternative Testing (as stated)

This relief request proposes to exercise test (FC), by full-stroke to the position required to fulfill its function, a representative sample of EFCVs every refueling outage. During the exercise test, gross valve seat leakage (LX_{EFC}) will be measured. The representative sample is based on approximately 20 percent of the valves each cycle such that each valve is tested every 10 years (nominal). An Administrative Open Normal Position Verification (AP) will be performed on each valve following exercise and leak testing.

EFCV failures will be documented in Pilgrim's Corrective Action Program as a surveillance test failure. The failure will be evaluated and corrected. The Administrative EFCV Sample Test Program procedure will trend EFCV test failures and determine if additional testing is warranted.

The Administrative EFCV Sample Test Program procedure will also establish a minimum acceptance criteria for Chemiquip EFCVs of less than or equal to 1 failure per year (2 failures per 2 years) on a 2 year rolling average. This requirement will ensure EFCV performance remains consistent with the extended test interval. Upon exceeding the criteria an evaluation will be required which will:

- require a root-cause evaluation to determine cause,
- determine the extent of conditions,
- require an evaluation of the testing interval to ensure reliability of the EFCVs, and
- produce a risk analysis of the effects of the failures on cumulative and instantaneous plant safety.

Corrective actions and performance goals will be established based on the results of the root-cause analysis.

2.3 Evaluation

EFCVs are installed on boiling-water reactor (BWR) instrument lines to limit the release of fluid in the event of an instrument line break. Examples of EFCV installations include reactor pressure vessel level and pressure instrumentation, main steamline flow instrumentation, recirculation pump suction pressure, and reactor core isolation cooling steamline flow instrumentation. EFCVs are not required to close in response to a containment isolation signal and are not required to operate under post loss-of-coolant accident (LOCA) conditions.

The Pilgrim Technical Specifications (TS) surveillance requires the EFCVs to be tested for proper operation in accordance with the IST program. The Pilgrim IST program has deferred the quarterly testing of these valves based on the provision of the Code that states "if exercising is not practical during plant operation or cold shutdowns, it may be limited to full-stroke testing during refueling outages." Based on the Code provision above, and the Refueling Outage Justification (ROJ) number ROJ-16, EFCVs at Pilgrim are currently tested once every refueling outage (24 months). The proposed change by Entergy revises the surveillance frequency by allowing a "representative sample" of EFCVs to be tested every 24 months. The "representative sample" is based on approximately 20 percent of the EFCVs being tested each refueling outage such that each valve is tested at least once every 10 years (nominal).

Entergy's justification for the relief request is based on General Electric Nuclear Energy (GE) Topical Report NEDO-32977-A, "Excess Flow Check Valve Testing Relaxation" dated June 2000. The topical report provided: (1) an estimate of steam release frequency (into the reactor building) due to a break in an instrument line concurrent with an EFCV failure to close, and (2) an assessment of the radiological consequences of such a release. The staff reviewed the GE topical report and issued its evaluation on March 14, 2000. In its evaluation, the staff agreed that the test interval could be extended up to a maximum of 10 years. In conjunction with this finding, the staff noted that each licensee that adopts the relaxed test interval program for EFCVs must have a failure feedback mechanism and corrective action program to ensure EFCV performance continues to be bounded by the topical report results. Also, each licensee is required to perform a plant-specific radiological dose assessment, EFCV failure analysis, and release frequency analysis to confirm that they are bounded by the generic analyses of the topical report.

In this safety evaluation, the staff reviewed Entergy's proposal for its applicability to GE Topical Report NEDO-32977-A and conformance with approved staff guidance regarding radiological dose assessment, EFCV failure rate and release frequency, and the proposed failure feedback mechanism and corrective action program. Based on its review, the staff concludes that the radiological consequences of an EFCV failure are sufficiently low, are acceptable, and that the alternative testing in conjunction with the corrective action plan provides a high degree of valve reliability and operability. Additionally, an orifice is installed upstream of the EFCVs to limit reactor water leakage in the event of rupture. The orifice limits leakage to a level where the integrity and functional performance of secondary containment and associated safety systems are maintained. Therefore, the staff finds that Entergy's proposed alternative test provides an acceptable level of quality and safety.

2.4 Conclusion For Relief Request RV-44

Based on the above evaluation, the staff finds the proposed relaxation of the Pilgrim EFCV test frequency, which would allow a representative sample of EFCVs to be tested every 24 months, with all EFCVs being tested at least once every 10 years (nominal), to be acceptable. Therefore, Entergy's proposed alternative to the Code testing requirements is authorized for the remainder of the term of the current operating license pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

3.0 RELIEF REQUEST RV-45

Entergy requests relief for EFCVs 2-CK-125A and 2-CK-125B (manufactured by Dragon) from the ASME Code inservice tests that are required to be performed every refueling outage as specified in OM-10 Code, Paragraph 4.3.2.2, and from the biennial requirements (paragraph 4.1 of OM-10 Code) of verifying that the valve position is accurately indicated. The relief request allows that one of the two EFCVs be tested each refueling cycle.

3.1 Basis for Relief (as stated)

NEDO-32977-A, and the associated NRC Safety Evaluation, dated March 14, 2000, provides the basis for this relief. NEDO-32977-A justifies relaxing the EFCV testing frequency from the current testing of each valve once/cycle to a ~ 20% sample once/cycle such that each valve is tested within a 10 year interval.

NEDO-32977-A demonstrates, through operating experience, a high degree of reliability with EFCVs and the low consequences of an EFCV failure. Reliability data in the report (Tables 4-1 and 4.2) documents two EFCV failures (failure to close) at 3 participating plants (Clinton, Fermi and WNP2), for Dragon valves similar to those used at Pilgrim. These two failures were observed over a service time of 2494 operating years ($2.18\text{E} +07$ operating hours). This results in a "Best Estimate Failure Rate" of $9.2\text{E} -08$ per hour of operating time and an "Upper Limit Failure Rate" of $2.89\text{E} -07$ per hour of operating time. A review of historical test surveillance data, and a test failure component history search at Pilgrim shows zero EFCV failures (failure to close) have been observed from 1989 through 1999 RFO 12 (these valves were initially installed in 1987, but could not undergo meaningful plant testing until 1989 because their initial [sic] design actuation flow rate was greater than available system test flow rate).

The instrument lines at Pilgrim have a flow restricting orifice upstream of the EFCVs to limit reactor water leakage in the event of rupture. Previous evaluations contained in Pilgrim's Updated Final Safety Analysis Report (UFSAR) of such an instrument line rupture do not credit the EFCVs for isolating the rupture. Thus a failure of an EFCV, though not expected as a result of this request, is bounded by the analysis. Based on the NEDO-32977-A and the analysis contained in Pilgrim's UFSAR, the proposed alternative to the required exercise testing frequency for EFCVs prescribed by OM-10 provides a satisfactory level of quality and safety.

3.2 Alternative Testing (as stated)

This relief request proposes to exercise test (FC), by full-stroke to the position required to fulfill its function, a representative sample of EFCVs every refueling outage. During the exercise test, gross valve seat leakage (LX_{EFC}) will be measured. The representative sample is based on approximately 20 percent of the valves (for the case of Dragon EFCVs – one valve) each cycle such that each valve is tested at least once every 10 years. An Administrative Open Normal Position Verification (AP) will be performed on each valve following exercise and leak testing.

EFCV failures will be documented in Pilgrim's Corrective Action Program as a surveillance test failure. The failure will be evaluated and corrected. The Administrative EFCV Sample Test Program Procedure will trend EFCV test failures and determine if additional testing is warranted.

The Administrative EFCV Sample Test Program Procedure will also establish a minimum acceptance criteria for Dragon EFCVs of less than or equal to 1/2 failure per year (1 failure per 2 years) on a 2 year rolling average. This requirement will ensure EFCV performance remains consistent with the extended test interval. Upon exceeding the criteria an evaluation will be required which will:

- require a Root-Cause Evaluation to determine cause,
- determine the extent of conditions,
- require an evaluation of the testing interval to ensure reliability of the EFCVs, and
- produce a risk analysis of the effects of the failures on cumulative and instantaneous plant safety.
- corrective actions and performance goals will be established based on the results of the Root-Cause Analysis.

3.3 Evaluation

Valves 2-CK-125A and 2-CK-125B are EFCVs which are manufactured by Dragon and installed on Nuclear Boiler Instrumentation lines. These EFCVs are not required to close in response to a containment isolation signal and are not required to operate under post-LOCA conditions.

The Pilgrim TS surveillance requires the EFCVs to be tested for proper operation in accordance with the IST program. The Pilgrim IST program has deferred the quarterly testing of these valves based on the provision of the Code that states "if exercising is not practical during plant operation or cold shutdowns, it may be limited to full-stroke testing during refueling outages." Based on the Code provision above, and the Refueling Outage Justification (ROJ) number ROJ-16, EFCVs at Pilgrim are currently tested once every refueling outage (24 months). The proposed change by Entergy would revise the surveillance frequency by allowing one of the two

EFCVs to be tested every 24 months. This is more restrictive than the proposed surveillance in the topical report of approximately 20 percent of the EFCVs being tested each refueling outage such that each EFCV is tested at least once every 10 years (nominal).

Entergy's justification for the relief request is based on General Electric Nuclear Energy (GE) Topical Report NEDO-32977-A, "Excess Flow Check Valve Testing Relaxation" dated June 2000. The topical report provided: (1) an estimate of steam release frequency (into the reactor building) due to a break in an instrument line concurrent with an EFCV failure to close; and (2) an assessment of the radiological consequences of such a release. The staff reviewed the GE topical report and issued its evaluation on March 14, 2000. In its evaluation, the staff agreed that the test interval could be extended up to a maximum of 10 years. In conjunction with this finding, the staff noted that each licensee that adopts the relaxed test interval program for EFCVs must have a failure feedback mechanism and corrective action program to ensure EFCV performance continues to be bounded by the topical report results. Also, each licensee is required to perform a plant-specific radiological dose assessment, EFCV failure analysis, and release frequency analysis to confirm that they are bounded by the generic analyses of the topical report.

In this safety evaluation, the staff reviewed Entergy's proposal for its applicability to GE Topical Report NEDO-32977-A and conformance with approved staff guidance regarding radiological dose assessment, EFCV failure rate and release frequency, and the proposed failure feedback mechanism and corrective action program. Based on its review, the staff concludes that the radiological consequences of an EFCV failure are sufficiently low, are acceptable, and that the alternative testing in conjunction with the corrective action plan provides a high degree of valve reliability and operability. Additionally, an orifice is installed upstream of the EFCVs to limit reactor water leakage in the event of rupture. The orifice limits leakage to a level where the integrity and functional performance of secondary containment and associated safety systems are maintained. Therefore, the staff finds that Entergy's proposed alternative test provides an acceptable level of quality and safety.

3.4 Conclusion For Relief Request RV-44

Based on the preceding evaluation, the staff finds the proposed relaxation of the Pilgrim EFCV test frequency, which would allow one of the two EFCVs to be tested every 24 months to be acceptable. Therefore, Entergy's proposed alternative to the Code testing requirements is authorized for the remainder of the term of the current operating license, pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

Principal Contributor: Y. Huang
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Date: May 2, 2001