Entergy

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March 5, 2014

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Entergy Nuclear Operations, Inc
Pilgrim Nuclear Power Station
Docket 50-293
License No. DPR-35

SUBJECT: Pilgrim Relief Request PRR-25, Proposed Alternative, Request for Relief for Temporary Acceptance of a Flaw in Salt Service Water (SSW) System Pipe Spool JF29-8-4.

LETTER NUMBER: 2.14.023

Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(a)(3)(ii), Entergy Nuclear Operations, Inc. (ENO) hereby requests NRC approval of the Request for Relief for a Proposed Alternative for the Pilgrim Nuclear Power Station (PNPS). This alternative is for the current fourth 10-year inservice inspection interval.

This Request for Relief is submitted because a through-wall flaw was discovered in a safety class 3 Salt Service Water System 18-inch rubber-lined carbon steel elbow. PNPS has performed an operability evaluation of the through-wall flaw and determined that the spool and associated piping system continues to be capable of performing its required safety function and is not susceptible to sudden or catastrophic failure. Immediate repair or replacement of the piping spool piece would require a plant shutdown and result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The requested Relief Request maintains the quality and safety considerations of structures, systems, and components required for safe operation of Pilgrim Nuclear Power Station.

Attachments 1 through 5 provide the description of Relief Request and Regulatory Commitments, including supporting documentation, as follows:

Attachment 1 - Describes the proposed Relief Request.
Attachment 2 - Provides a list of Regulatory Commitments
Attachment 3 - Provides Pilgrim Salt Service Water Discharge Piping Elbow (JF29-8-4) Wall Thinning Stress Analysis (Structural Integrity Associates Calculation No. 1400287.301, Rev. 0)
Attachment 4 - Provides Flaw Evaluation of SSW Discharge Piping Leaking Elbow (Structural Integrity Associates Calculation No. 1400287.302, Rev. 0)
Attachment 5 - Provides SSW Spool JF29-8-4 NDE Data Sheet

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If you have any questions concerning this relief request, please contact Mr. Joseph Lynch, Nuclear Assurance Manager at 508-830-8403.

Sincerely,

John A. Dent, Jr.
Site Vice President

Attachment 1 - Pilgrim Relief Request PRR-25, Proposed Alternative (6 pages)
Attachment 2 - List of Regulatory Commitments (1 page)
Attachment 3 - Pilgrim Salt Service Water Discharge Piping Elbow (JF29-8-4) Wall Thinning Stress Analysis, Structural Integrity Associates Calculation No. 1400287.301, Rev. 0 (22 Pages)
Attachment 4 - Flaw Evaluation of SSW Discharge Piping Leaking Elbow, Structural Integrity Associates Calculation No. 1400287.302, Rev. 0 (20 pages)
Attachment 5 - SSW Spool JF29-8-4 NDE Data Sheet (4 pages)

cc: Mr. William M. Dean
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Pilgrim Nuclear Power Station

ATTACHMENT 1

TO ENTERGY LETTER 2.14.023

PILGRIM RELIEF REQUEST PRR-25

Relief Request Number PRR-25 Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(ii), Hardship or Unusual Difficulty Without Compensating Increase in Level of Quality and Safety Discussion

(6 Pages)

Relief Request Number PRR-25 Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(ii), Hardship or Unusual Difficulty Without Compensating Increase in Level of Quality and Safety Discussion

1. ASME Code Component(s) Affected / Applicable Code Edition

Components/ Numbers:	Salt Service Water System pipe spool JF29-8-4, American Society of Mechanical Engineers (ASME) Class 3, ASTM A-234 Grade WPB carbon steel material (rubber lined)
Code of Record:	ASME Section XI, 2001 Edition through 2003 Addenda as amended by 10 CFR 50.55a (piping design code ASME B31.1 1967 edition)
Description:	Salt Service Water pipe spool JF29-8-4, located downstream of Reactor Building Closed Cooling Water (RBCCW) heat exchanger E-209B
Unit / Inspection Interval:	Pilgrim Nuclear Power Station (PNPS) / Fourth 10-Year Interval

2. Applicable Code Requirements

The ASME Boiler and Pressure Vessel Code, Rules for In-service Inspection of Nuclear Power Plant Components, Section XI, 2001 Edition through 2003 Addenda, as amended by 10 CFR 50.55a.

The request for relief applies to the requirements of ASME Code Section XI, 2001 Edition through 2003 Addenda, Article IWD-3000, which establishes flaw size acceptance standards (IWD-3500) and provides analytical evaluation criteria (IWD-3600) for flaws identified during performance of in-service inspections and tests. In the 2001 Edition through 2003 addenda, IWD-3500 and IWD-3610 default to IWC-3500 and IWC-3610, respectively. IWC-3610 defaults to IWB-3610. IWB-3610 does not include analytical evaluation criteria for acceptance of through-wall flaws.

ASME Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping, Section XI, Division 1," which has been conditionally approved by the NRC in Regulatory Guide 1.147, "In-service Inspection Code Case Acceptability, ASME Section XI, Division 1", provides analytical evaluation rules for temporary acceptance of flaws in piping. However, Code Case N-513-3 does not apply to through-wall flaws located in the pressure retaining base material of pipe fittings such as elbows.

Paragraph 1(c) of Code Case N-513-3 states:

> *"The following flaw evaluation criteria are permitted for pipe and tube. The flaw evaluation criteria are permitted for adjoining fittings and flanges to a distance of* $(R_o t)^{1/2}$ *from the weld centerline."*

The through-wall flaw in spool JF29-8-4 is located in a 90° elbow and not bounded by this criterion, therefore Code Case N-513-3 as conditionally approved by the NRC cannot be applied in this case.

Accordingly, this relief request proposes an alternative to the referenced provision of Code Case N-513-3 that prohibits application to fittings such as elbows.

3. Reason for Request

On February 24, 2014, seawater was observed leaking from Salt Service Water (SSW) pipe spool JF29-8-4, an elbow, located in the Class 3 SSW system downstream of Reactor Building Closed Cooling Water (RBCCW) heat exchanger E-209B. Leakage of approximately 60 drops-per-minute (dpm) was found to originate from an approximately 3/8"diameter hole in the extrados of the downstream elbow of the 18 " rubber-lined carbon steel (schedule 20, 0.312" nominal wall thickness) pipe spool. Leakage is minimized due to the rubber lining immediately behind the hole remaining intact and blocking flow and the fact that the normal operating pressure for the heat exchanger discharge flow at this location is 2 psig.

To determine extent of condition, ultrasonic thickness measurements were taken on the elbow in a 6" wide by 360° band around the circumference of the pipe. The only significant thinning detected was found in the immediate vicinity of the hole encompassing a region less than 4" in diameter and in another small adjacent area measuring approximately 1.5"x1.5". The thinnest reading adjacent to the hole was 0.046" compared to the pipe nominal thickness of 0.312". The combined flaw size was calculated to be 5 ¼ x 5 ¼ inches square. Attachment 5 provides the Non-destructive Examination (NDE) data sheet for the SSW spool JF29-8-4. No other leakage was visually observed elsewhere in the service water system discharge piping from RBCCW heat exchanger, E-209B.

A brief description of the Salt Service Water System is provided for clarity. The SSW system is designed to function as the ultimate heat sink for all the systems cooled by the RBCCW and Turbine Building Closed Cooling Water (TBCCW) systems during all planned operations in all operating states by continuously providing adequate cooling water flow to the secondary sides of the RBCCW and TBCCW heat exchangers. The SSW system consists of two open loops. The SSW pumps (two per loop plus a common spare) take suction from Cape Cod Bay, the ultimate heat sink, and discharge to a common header from which independent piping supplies each of the two cooling water loops. Each loop contains one reactor building and one turbine building cooling water heat exchanger. The water then returns to the bay from the outlet of the heat exchanger. Two division valves are included in the common pump discharge header to permit the SSW system to be operated as two independent loops. Either of the two subsystems is capable of providing the required cooling capacity (4500 gpm) to support the required systems with two pumps operating. The maximum design and operating temperatures for the discharge side of the SSW system is 100°F and 80°F respectively. The maximum design and operating pressure for the discharge side of the SSW system is 10 psig.

NRC Inspection Manual Chapter, IMC 0326, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality of Safety, Appendix C, Specific Operability Issues, Item C.1 1, "Flaw Evaluation" (dated January 31, 2014), addresses evaluations of ASME Class 2 and Class 3 system components with through-wall flaws. When ASME Class 2 or Class 3 components or construction code acceptance standards, the requirements of NRC-endorsed ASME Code Case or NRC approved

alternative, then a determination of whether the degraded or nonconforming condition results in Technical Specifications required system, structure, or component being inoperable is required.

This section of the NRC Inspection Manual also states that whenever a flaw does not meet ASME Code or construction code acceptance standards or the requirements of an NRC endorsed ASME code case, a relief request needs to be submitted in a timely manner after completing the operability determination process documentation.

An operability evaluation for spool JF29-8-4 was performed. The basis for the operability evaluation includes Structural Integrity Associates (SIA) Calculations No. 1400287.301, Rev. 0 (Attachment 3) and No. 1400287.302 Rev. 0 (Attachment 4). The flaw evaluation of the weeping flaw in the 18-inch elbow of the SSW piping at Pilgrim has been evaluated (Attachment 4) using the methods of a pending revision to Code Case N-513-3, currently in the ASME approval process.

Code Case N-513-3 does not provide evaluation criteria for flaws in elbows, while the pending revision does provide evaluation criteria for flaws in elbows. This pending revision has not been approved by the ASME or reviewed by the NRC; however, it is recognized in ASME committee that the technical approach is very conservative. The most limiting flaw size is 8 inches in the circumferential direction. The leak is easily bounded in the axial and circumferential directions by 8 inches. Thus, the acceptance criteria of the pending revision are met as shown in the SIA calculation (Attachment 4).

The approximate 3/8" diameter hole is located on the extrados of the Schedule 20 rubber-lined carbon steel elbow that is butt-welded to the downstream end of SSW spool JF29-8-4. The spool is located on the discharge side of RBCCW heat exchanger E-209B. Downstream of this spool, the discharge flow from the TBCCW heat exchanger combines with the RBCCW heat exchanger discharge flow and discharges into Cape Cod Bay.

The degradation mechanism causing the leak in spool JF29-8-4 is internal corrosion of the carbon steel piping caused by local failure of the rubber lining. PNPS has extensive experience with this failure mechanism in the SSW system and it is well understood by PNPS staff. Internal corrosion of the pipe wall with the rubber lining remaining intact indicates that the lining in the immediate vicinity of the flaw has been compromised and seawater has migrated to and settled at the flaw location causing localized corrosion of the pipe wall.

The lining of this spool was known to be degraded following an internal inspection of the rubber lining in RFO19 in April 2013. Localized Belzona repairs of the lining were implemented on April 25, 2013. The current condition may indicate a failed Belzona repair as some of the RFO19 repairs were made to the elbow ID within a few inches of the current pressure boundary flaw.

The visually-estimated leakage of 60 dpm presents a housekeeping concern as it is insignificant compared to the design capacity of the system. If the rubber lining which is currently limiting leakage to 60 dpm should delaminate at the location of the flaw or become more significantly compromised, the resultant leakage from the 3/8" diameter hole (estimated at 6 gpm) would not affect the ability of the SSW system to perform its design cooling functions because the location of the flaw is downstream of the RBCCW and TBCCW heat exchangers. Proper cooling capacity to the RBCCW and TBCCW heat exchangers will be maintained for all postulated leakage rates related to this pipe spool. Additionally, the low design and normal operating pressures (10 and 2 psig, respectively) in this segment of the SSW system contribute to minimize leakage from pressure boundary defects at this location.

Significant leakage from this location would be managed by a 14" dewatering line between Auxiliary Bay 'B' and the Torus Compartment, which is of sufficient size to handle any potential leakage or flooding from the flaw location.

Spool JF29-8-4 can be isolated from the upstream portion of the SSW system by valves MO-3806, 29-HO-3834 and 29-HO-3839 but not from the downstream portion of the system, which discharges to Cape Cod Bay.

4. Hardship to Repair

Performing a code repair/replacement activity now to correct the flaw discovered in pipe spool JF29-8-4 would require the plant to shut down (i.e., entry into a 24 hour cold shutdown Technical Specification requirement) and create a hardship based on the potential risks associated with unit cycling and emergent equipment issues incurred during shutdown and startup evolutions.

No compensating increase in the level of quality and safety would be gained by immediate repair of the flaw. The operability evaluation of the through-wall flaw determined that the affected system continues to be capable of performing its required safety functions and is not susceptible to sudden or catastrophic failure.

5. Burden Caused by Compliance

It is impractical to complete a suitable Code-acceptable repair to the identified SSW leak at Pilgrim Station without shutting the plant down. Shutting the plant down in mid-cycle creates undue and unnecessary stress on plant systems, structures, and components

6. Proposed Alternative and Basis for Use

The request for relief applies to the requirements of ASME Code Section XI, 2001 Edition through 2003 Addenda. As noted in Section 2 of this request, Article IWD-3000 establishes flaw size acceptance standards (IWD-3500) and provides analytical evaluation criteria (IWD-3600) for flaws identified during performance of in-service inspections and tests. However, the Code does not include analytical evaluation criteria for acceptance of through-wall flaws in pressure retaining base material of ferritic pipe or fittings.

Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping, Section XI, Division 1," which has been conditionally approved by the NRC in Regulatory Guide 1.147, "In-service Inspection Code Case Acceptability, ASME Section XI, Division 1," provides analytical evaluation rules for temporary acceptance of flaws in piping. Code Case N-513-3 however does not apply to through-wall flaws located in the pressure retaining base material of pipe fittings such as elbows.

Pursuant to 10CFR50.55a(a)(3)(ii), Entergy proposes the following alternative to the paragraph 1(c) provision of Code Case N-513-3 that prohibits its application to pipe fittings such as moderate energy class 3 elbows.

Entergy is proposing an alternative to the flaw evaluation methodology of Code Case N-513-3. The Code Case N-513-3 flaw evaluation methodology is applicable to straight pipe. The Entergy proposed alternative methodology is based upon and consistent with a pending revision to Code Case N-513-3 and is used in the SIA calculation (Attachment 4) to evaluate the flaw in SSW spool JF29-8-4. The evaluation criteria provided in Code Case N-513-3 are only for straight

pipe since the technical approach relies on ASME Section XI, Appendix C methods. The pending revision of Code Case N-513-3 referenced above includes rules for the evaluation of piping components such as elbows, branch tees and reducers. Flaws in these components may be evaluated as if in straight pipe provided the stresses used in the evaluation are adjusted to account for geometric differences. For elbows, hoop stress is adjusted by considering flaw location and primary stress due to elbow ovalization from axial loads. For axial stresses, the stress scaling follows the same approach given in ASME Section III, ND-3600 [5] design by rule using stress indices and stress intensification factors for the adjustment. Details are provided in the pending revision to Code Case N-513-3 for determining these adjusted stresses.

The pending revision to Code Case N-513-3 used to evaluate the flaw in SSW spool JF29-8-4 in Attachment 4 has not been approved by the ASME or reviewed by the NRC; however, it is recognized in ASME committee that the technical approach is very conservative. Simple treatment of piping component flaw evaluation using hand calculations was an important objective in the development of the approach recognizing the trade-off being conservative results. The methodology in the pending revision allows for more sophisticated analysis by the user.

Entergy evaluated the as-found condition of the SSW elbow and proposes temporary acceptance of the condition of the pipe spool to allow continued operation in lieu of performing an immediate code repair/replacement activity. The as-found condition was evaluated using the proposed alternative methodology discussed herein and is documented in the SIA calculation (Attachment 4). The evaluation concluded, in part, that the allowable through-wall flaw sizes are greater than 10" in the axial and 8" in the circumferential direction, that the through-wall flaw is stable and the pipe will not fail catastrophically under design loading conditions.
The proposed alternative methodology is based on PNPS performing the following actions:

1. PNPS will perform a daily visual walk down of pipe spool JF29-8-4, with the insulation removed, to confirm that the analysis supported by ultrasonic testing (UT) examinations remains valid (i.e., no new significant leakage).

2. PNPS will perform periodic UT examinations on at least a monthly frequency that bound the flaw location and adjacent pipe wall to establish a wear rate and validate that the bounding flaw size from the evaluation completed in support of the operability evaluation is not exceeded over the mission time of the discharge pipe.

3. PNPS will replace pipe spool JF29-8-4 no later than when either

   (1) The predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria, or

   (2) During the next scheduled outage, whichever occurs first.

   The next scheduled outage is the refueling outage planned to begin in April 2015.

4. A sample size of at least five of the most susceptible and accessible locations, or, if fewer than five, all susceptible and accessible locations shall be examined within 30 days of detecting the flaw in accordance with the requirements (including scope expansion) of the pending revision to Code Case N-513-3.

Basis for Use:

The Pilgrim Operability Evaluation contains the basis for determining the pipe spool as operable but degraded/nonconforming with compensatory measures. The operability evaluation is based on Structural Integrity Associates Calculation No. 1400287.302 Rev.0 (Attachment 4) provide the basis for the requested relief from the referenced Code Case N-513-3 requirements that limit its use to pipe and tube.

7. Duration of Proposed Alternative

The requested Code relief shall be used until Code repair/replacement activities are performed on pipe spool JF29-8-4 either during the next scheduled outage or when the predicted flaw size exceeds acceptance criteria. The next scheduled outage is the refueling outage planned to begin in April 2015.

8. Precedents

This relief request is similar in nature to the relief requests listed below, which were authorized by the NRC and involved through-wall flaws in ASME Class components.

1. McGuire Nuclear Station, Unit 1, March 26, 2008, (ML 080580577)
2. Turkey Point Unit 3, January 1, 2014, (ML 14030A183)
3. San Onofre Units 2 and 3, May 19, 2010, (ML 101440381)
4. Turkey Point Unit 3, October 23, 2013, (ML 13318A010)
5. Palisades Nuclear Power Plant, October 30, 2013, (ML 12305A362)
6. Palisades Nuclear Power Plant, December 3, 2013, (ML 13339A740)
7. Seabrook Station, February 9, 2014 (TAC No. MF2731)

ATTACHMENT 2

TO ENTERGY LETTER 2.14.023

PILGRIM RELIEF REQUEST PRR-25

LIST OF REGULATORY COMMITMENTS

(1 Page)

ATTACHMENT 2

LIST OF REGULATORY COMMITMENTS

This table identifies actions discussed in this letter for which Entergy commits to perform. Any other actions discussed in this submittal are described for the NRC's information and are not commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
LR-LAR-2014-00046-01: PNPS will perform a daily visual walk down of pipe spool JF29-8-4, with the insulation removed, to confirm that the analysis from ultrasonic testing (UT) examinations remains valid (i.e., no new significant leakage).	X		PNPS will perform a daily visual walk down of pipe spool JF29-8-4 until replacement of spool.
LR-LAR-2014-00046-02: PNPS will perform periodic UT examinations on at least a monthly frequency that bound the flaw location and adjacent pipe wall to establish a wear rate and validate that the bounding flaw size from the evaluation completed in support of the operability evaluation is not exceeded over the mission time of the discharge pipe.	X		PNPS will perform a monthly UT of affected area of the spool JF29-8-4 until replacement of spool.
LR-LAR-2014-00046-03: PNPS will replace pipe spool JF29-8-4 no later than when either: (1) The predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria, or (2) During the next scheduled outage whichever, occurs first.	X		During Refueling Outage 20.
LR-LAR-2014-00046-04: A sample size of at least five of the most susceptible and accessible locations, or, if fewer than five, all susceptible and accessible locations shall be examined within 30 days of detecting the flaw in accordance with the requirements (including scope expansion) of the pending revision to Code Case N-513-3.	X		Within 30 days of detecting the flaw in accordance with the requirements (including scope expansion) of the pending revision to Code Case N-513-3.