Entergy

Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

Michael A. Balduzzi
Site Vice President

December 8, 2003

US. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

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

Proposed License Amendment: Changes to the Reactor Vessel Material Surveillance Program, Technical Specification Surveillance 4.6.A.2.

REFERENCES:

1. NRC letter from W. H. Bateman to C. Terry (BWRVIP Chairman), NRC Staff Review of BWRVIP-86-A, "BWR Vessel Internal Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan," dated December 16, 2002.

2. Regulatory Issue Summary No. 2002-05, "NRC Approval of Boiling Water Reactor Pressure Vessel Integrated Surveillance Program," dated April 8, 2002.

3. Entergy Letter No. 2.02.100, Proposed Change to Applicability of Pilgrim's Pressure-Temperature Curves as Described in Technical Specification Figures 3.6.1, 3.6.2, and 3.6.3, Revision 1, dated December 4, 2002.

LETTER NUMBER: 2.03.099

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Entergy Nuclear Operations, Inc. (Entergy) hereby proposes to amend the Pilgrim Station Operating License, DPR-35.

The proposed license amendment replaces the existing Reactor Vessel Material Surveillance Program with the Boiling Water Reactor Vessel and Internal Project (BWRVIP) Integrated Surveillance Program (ISP), as approved by the NRC (References 1 and 2). This proposed amendment also meets Entergy's commitment made in Reference 3 to remove the capsule surveillance schedule from the Technical Specifications and describe Pilgrim's participation in the BWRVIP ISP and Supplemental Surveillance Program.

The enclosure provides Entergy's evaluation of the proposed changes, mark-up of Pilgrim's Technical Specifications and associated Bases, and Updated FSAR.

Entergy has reviewed the proposed amendment in accordance with 10 CFR 50.92 and concludes it does not involve a significant hazards consideration.

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Entergy requests approval of the proposed amendment by December 31, 2004. Once approved, the amendment will be implemented within 60 days.

If you have any questions or require additional information, please contact Bryan Ford at (508) 830-8403.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on the 8th day of December, 2003

Sincerely,

Michael A. Balduzzi

Michael A. Balduzzi

Enclosure:	Evaluation of Proposed License Amendment (4 pages)
Attachment 1:	Proposed Pilgrim Technical Specifications Change (mark-up) (3 pages)
Attachment 2:	Proposed Pilgrim Updated FSAR Change (1 pages)
Attachment 3:	List of Regulatory Commitments (1 page)
Attachment 4:	Retyped Pilgrim TS and Bases Pages (3 pages)

cc:

Mr. Travis Tate, Project Manager
Office of Nuclear Reactor Regulation
Mail Stop: 0-8B-1
U.S. Nuclear Regulatory Commission
1 White Flint North
11555 Rockville Pike
Rockville, MD 20852

Mr. Robert Walker
Radiation Control Program
Commonwealth of Massachusetts
Exec Offices of Health & Human Services
174 Portland Street
Boston, MA 02114

U.S. Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, PA 19408

Mr. Steve McGrail, Director
Mass. Emergency Management Agency
400 Worcester Road
Framingham, MA 01702

Senior Resident Inspector
Pilgrim Nuclear Power Station

ENCLOSURE

Evaluation Of The Proposed Changes

Subject: Proposed Changes to the Reactor Vessel Material Surveillance Program.

1. <u>Description</u>

This letter requests an amendment to the Pilgrim Operating License DPR-35. The proposed amendment applies to the Reactor Vessel Material Surveillance Program for compliance with 10 CFR 50, Appendix H requirements.

The proposed license amendment replaces the existing Reactor Vessel Material Surveillance Program specified in Technical Specification (TS) Surveillance 4.6.A.2 with the NRC approved Boiling Water Reactor Vessel and Internal Project (BWRVIP) Integrated Surveillance Program (ISP) and Supplemental Surveillance Program (SSP) (References 1 and 2). This proposed amendment also meets Entergy's commitment made in Reference 3 to remove the capsule surveillance schedule from TS and describes Pilgrim's participation in the NRC approved BWRVIP ISP/SSP.

Entergy requests approval of this proposed license amendment by December 31, 2004. Once approved, Entergy will implement the amendment within 60 days.

2. <u>Proposed Changes</u>

- The proposed changes to the TS Surveillance and Bases are as follows:

  <u>TS Surveillance 4.6.A.2</u>: The first paragraph on page 3/4.6-2, *"Test specimens of the reactor vessel base.. ... NDT temperature irradiation shifts."* is deleted.

  <u>TS Table 4.6-3 (page 3/4.6-13)</u>: Table 4.6-3, *"Reactor Vessel Material Surveillance program Withdrawal Schedule"* is deleted and the page is marked as, "This page is intentionally left blank".

  Attachment 1 provides the mark-up of the above-proposed TS changes. Also included for information is the mark-up of TS Bases page B3/4.6-2, which will be implemented following approval of the proposed TS changes.

- <u>Licensing Basis Change</u>: A new section 2.3.1, "Reactor Vessel Materials Surveillance Program" (Attachment 2), will be inserted into Pilgrim's Updated Final Safety Analysis Report (UFSAR) Appendix M. This section provides a description of Pilgrim's participation in the BWRVIP Integrated Surveillance Program for compliance with 10 CFR 50, Appendices G and H, replacing the program specified in TS Surveillance 4.6.A.2 and TS Table 4.6-3.

Attachment 3 provides commitments made in this submittal. Attachment 4 provides retyped TS and Bases pages. The proposed change to the FSAR will be implemented following approval of the proposed TS changes.

3. <u>Background</u>

Appendix H of 10 CFR 50, "Reactor Vessel Material Surveillance Program Requirements," requires a surveillance program to monitor a reactor pressure vessel beltline region that complies with American Society for Testing & Materials (ASTM) E-185, except as modified by Appendix H. ASTM E-185 provides guidelines for designing a surveillance program, selecting materials, evaluating test results, and recommendations for the minimum number of surveillance capsules and their withdrawal schedules. 10 CFR 50, Appendix H requires that the proposed withdrawal schedule be submitted with a technical justification and approved prior to the implementation.

The Pilgrim reactor vessel material surveillance program was designed in accordance with 10 CFR 50, Appendix H and the ASTM E-185-66. The surveillance capsule withdrawal schedule was established in accordance with the ASTM E-185-66.

Over the last several years, BWRVIP developed an ISP to replace the individual plant programs and submitted it for NRC approval. The NRC staff completed its review of the BWRVIP ISP (References 1 and 2) and found it acceptable for BWR licensee implementation provided that all licensees use one or more neutron fluence methodologies acceptable to the NRC staff to determine surveillance capsule and RPV neutron fluences. The staff also required licensees who elect to participate in the ISP to submit a license amendment to the NRC confirming their incorporation of the ISP in to the licensing basis for each BWR facility.

Pilgrim is participating in the BWRVIP Integrated Surveillance/ Supplemental Surveillance programs. These programs will provide new surveillance data to verify adjustments to the Pressure-Temperature (P-T) curves for vessel heat-up and cool-down applications. Pilgrim intends to perform new neutron transport calculations using R.G. 1.190 methodology and develop revised P-T curves for operation beyond cycle 16 using R.G. 1.99, Rev. 2 methodology and submit revised P-T curves in 2006, as explained in Reference 3.

4. Technical Analysis

4.1 Regulatory Requirement

10 CFR 50, Appendix H, "Reactor Vessel Material Surveillance Requirements" requires Entergy to monitor changes to the fracture toughness properties of ferritic materials in the Pilgrim reactor vessel beltline region which result from exposure of these materials to neutron irradiation and the thermal environment. Under the program, fracture toughness test data will be obtained from material specimens exposed in surveillance capsules, which will be withdrawn periodically from the reactor vessel.

4.2 BWRVIP ISP/SSP and Pilgrim Reactor Vessel Material Program

At the time of original licensing, Pilgrim had 3 surveillance capsules located circumferentially along the reactor vessel inside radius at the 30-degree, 120-degree and 300-degree azimuths and axially at the reactor vessel core mid-plane. The 30-degree capsule was withdrawn during the 1980 refueling outage after 4.17 Effective Full Power Years (EFPYs) of operation. The flux measurements from the removed 30-degree capsule and the neutron transport calculations subsequently performed were used to predict adjustments to the reactor vessel P-T limits.

Pilgrim is a participant in the BWRVIP ISP/SSP program. BWRVIP ISP/SSP is an alternative to individual plant-specific RPV surveillance program within the scope of paragraph III.C of Appendix H of 10 CFR 50. NRC has approved BWRVIP ISP/SSP (References 1 and 2) for plant-specific use. Under the NRC approved program, the two remaining Pilgrim specimens in the Pilgrim vessel are deferred and representative specimens from host plants are selected to provide the required data for compliance with Appendix G and H requirements. The Pilgrim representative samples and withdrawal schedules are described in BWRVIP-86-A, "BWR Vessel and Internal Project Updated BWR Integrated Surveillance Program (ISP) Implementation Plan". Pilgrim will continue to follow the BWRVIP ISP/SSP program to demonstrate fracture toughness requirements and P-T limits to comply with Appendices G and H of 10 CFR 50. Pilgrim will provide future fluence calculations and P-T curves based upon the NRC approved methodology prescribed in R.G. 1.190, R.G. 1.99, Rev. 2, and dosimetry data obtained from BWRVIP ISP/SSP.

Based on the Entergy participation in the NRC approved BWRVIP ISP/SSP for compliance with Appendices G and H of 10 CFR 50, Pilgrim is deleting TS Table 4.6-3, revising TS 4.6.A.2, and amending the licensing basis describing the BWRVIP ISP/SSP in the UFSAR.

5. Regulatory Safety Analysis

5.1 No Significant Hazards Consideration

The proposed license amendment replaces the current Pilgrim reactor vessel (RPV) material surveillance program specified in Technical Specification (TS) Surveillance 4.6.A.2 and Table 4.6-3 with the NRC approved BWR Vessel and Internal Project (BWRVIP) Integrated Surveillance Program (ISP). The proposed license amendment revises TS Surveillance 4.6.A.2 and deletes TS Table 4.6-3 and revises Pilgrim's licensing basis incorporating NRC approved BWRVIP ISP into the Updated Final Safety Analysis Report (UFSAR) to comply with Appendix H of 10 CFR 50.

Entergy has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR50.92, "Issuance of Amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed changes to the licensing basis continue to assure that applicable regulatory requirements are met and the same assurance of reactor pressure vessel integrity continues to be provided. The proposed changes to the TS and licensing basis follow the NRC Safety Evaluation approving the implementation of the ISP. The proposed changes ensure that the reactor pressure vessel will continue to be operated within the design, operational, and testing limits.

   The proposed changes do not modify the reactor coolant pressure boundary, (i.e., there are no changes in operating pressure, materials, or seismic loading). The proposed changes do not adversely affect the integrity of the reactor coolant pressure boundary such that its function in the control of radiological consequences is affected.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   The proposed change does not involve a modification to the design of plant structures, systems, or components. Thus, no new modes of operation are introduced by the proposed change. The proposed change will not create any failure mode not bounded by previously evaluated accidents. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   The proposed implementation of ISP has been previously approved by the NRC and found to provide an acceptable alternative to plant-specific reactor vessel material surveillance programs. Operation of Pilgrim within the program ensures that the reactor vessel materials will continue to behave in a non-brittle manner, thereby preserving the original safety design bases. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Entergy concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

Based on the considerations discussed above, Entergy concludes that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 Environmental Consideration

The amendment changes a requirement with respect to use of a facility component located within the restricted area as defined in 10 CPR Part 20. Pilgrim has determined that the amendment involves no significant increases in the amounts, and no significant change in the types, of any effluents that may be released offsite, and there is no significant increase in individual or cumulative occupational radiation exposure. Pilgrim also finds that the proposed amendment involves no significant hazards consideration. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Hence, pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 References

1. NRC letter from W. H. Bateman to C. Terry (BWRVIP Chairman), NRC Staff Review of BWRVIP-86-A, "BWR Vessel Internal Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan", dated December 16, 2002.

2. Regulatory Issue Summary No. 2002-05, "NRC Approval of Boiling Water Reactor Pressure Vessel Integrated Surveillance Program", dated April 8, 2002.

3. Entergy Letter No. 2.02.100, Proposed Change to Applicability of Pilgrim's Pressure-Temperature Curves as Described in Technical Specification Figures 3.6.1, 3.6.2, and 3.6.3, Revision 1, dated December 4, 2002.

ATTACHMENT 1

PROPOSED PILGRIM TECHNICAL SPECIFICATION CHANGE (MARK-UP)

TS 4.6.A.2 (page 3/4.6-2),

Table 4.6-3 (page 3/4.6-13), and

Bases 3/4.6.A (page B3/4.6-2)

mark-up.pdf

LIMITING CONDITION FOR OPERATION

3.6 PRIMARY SYSTEM BOUNDARY (Cont)

A. Thermal and Pressurization Limitations (Cont)

In the event this requirement is not met, achieve stable reactor conditions with reactor vessel temperature above that defined by the appropriate curve and obtain an engineering evaluation to determine the appropriate course of action to take.

3. The reactor vessel head bolting studs shall not be under tension unless the temperature of the vessel head flange and the head is greater than 55°F.

4. The pump in an idle recirculation loop shall not be started unless the temperatures of the coolant within the idle and operating recirculation loops are within 50°F of each other.

5. The reactor recirculation pumps shall not be started unless the coolant temperatures between the dome and the bottom head drain are within 145°F.

6. Thermal-Hydraulic Stability

Core thermal power shall not exceed 25% of rated thermal-power without forced recirculation.

SURVEILLANCE REQUIREMENTS

4.6 PRIMARY SYSTEM BOUNDARY (Cont)

A. Thermal and Pressurization Limitations (Cont)

~~Test specimens of the reactor vessel base, weld and heat affected zone metal subjected to the highest fluence of greater than 1 Mev neutrons shall be installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The specimens and sample program shall conform to the requirements of ASTM E 185-66. Selected neutron flux specimens shall be removed at the frequency required by Table 4.6-3 and tested to experimentally verify adjustments to Figures 3.6-1, 3.6-2, and 3.6-3 for predicted NDT temperature irradiation shifts.~~

3. When the reactor vessel head bolting studs are tensioned and the reactor is in a Cold Condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

4. Prior to and during startup of an idle recirculation loop, the temperature of the reactor coolant in the operating and idle loops shall be permanently logged.

5. Prior to starting a recirculation pump, the reactor coolant temperatures in the dome and in the bottom head drain shall be compared and permanently logged.

~~Note: Tables 4.6-1 and 4.6-2 have been deleted.~~

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PNPS
TABLE 4.6-3

REACTOR VESSEL MATERIAL
SURVEILLANCE PROGRAM WITHDRAWAL SCHEDULE

Capsule Number	Effective Full Power Years (EFPY)
1	4.17
2	21 (approx.)
3	32 (End of Life)

BASES:

3/4.6 PRIMARY SYSTEM BOUNDARY (Cont)

A. Thermal and Pressurization Limitations (Cont)

The bottom head, defined as the spherical portion of the reactor vessel located below the lower circumferential weld, was also evaluated. Reference transition temperatures (RT_{ndt}) were developed for the bottom head and the resulting pressure vs. temperature curves plotted on Figures 3.6-1 and 3.6-2. It has been determined that the bottom head temperatures are allowed to lag the vessel shell temperatures (Reference: Structural Integrity Associates (SIA) Report SIR-00-108, dated September 11, 2000). The referenced analysis utilizes the stress results established in the Combustion Engineering Inc., Pilgrim Reactor Vessel Design Report, No. CENC 1139, dated 1971, and combines the stress analysis results, specific to the bottom head, with the pressurization temperatures necessary to maintain fracture toughness requirements in accordance with the ASME Boiler and Pressure Vessel Code, Section III, the criteria of 10CFR50, Appendix G, and the supplementary guidelines of Reg. Guide 1.99, Rev. 2.

For Pilgrim pressure-temperature restrictions, two locations in the reactor vessel are limiting. The closure region controls at lower pressures and the beltline controls at higher pressures.

The nil-ductility transition (NDT) temperature is defined as the temperature below which ferritic steel breaks in a brittle rather than ductile manner. Radiation exposure from fast neutrons (>1 Mev) above about 10^{17} nvt may shift the NDT temperature of the vessel metal above the initial value. Impact tests from the first material surveillance capsule removed at 4.17 EFPY indicated a maximum RT_{ndt} shift of 55 degrees F for the weld specimens.

Neutron flux wires and samples of vessel material are installed in ~~the reactor~~ vessel adjacent to the vessel wall at the core midplane ~~level. The~~ wires and samples will be periodically removed and ~~tested to~~ experimentally verify the values used for Figures 3.6-1, 3.6-2, and ~~3.6-3.~~ The withdrawal schedule of Table 4.6-3 has been established as ~~required~~ by 10CFR50, Appendix H.

The RT_{ndt} of the closure region is +10 degrees F. The initial RT_{ndt} for the beltline weld and base metal are -48 degrees F and 0 degrees F, respectively. These RT_{ndt} temperatures are based upon unirradiated test data, adjusted for specimen orientation in accordance with USNRC Branch Technical Position MTEB 5-2.

The closure and bottom head regions are not exposed to neutron fluence (> 1 Mev) over the vessel life sufficient to cause a shift in RT_{ndt}. The pressure-temperature limitations (Figures 3.6-1, 3.6-2, and 3.6-3) of the closure and bottom head regions will therefore remain constant throughout vessel life. Only the beltline region of the reactor vessel will experience a shift in RT_{ndt} with a resultant increase in pressure-temperature limits.

The curves apply to 100% bolt preload condition but are conservative for lesser bolt preload conditions.

ATTACHMENT 3

LIST OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by ENGC in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Mr. Bryan Ford at (508) 830-8403.

REGULATORY COMMITMENTS	DUE DATE
Perform new neutron transport calculations and develop revised P-T curves for operation beyond cycle 16 and submit revised P-T curves in 2006 (see Reference 3)	December 31, 2006
Revise Pilgrim FSAR, App. M, describing BWRVIP ISP/SSP program	60 days of issue

ATTACHMENT 4

Retyped Pilgrim TS and Bases Pages

TS 4.6.A.2 (page 3/4.6-2),

Table 4.6-3 (page 3/4.6-13), and

Bases 3/4.6.A (page B3/4.6-2)

LIMITING CONDITION FOR OPERATION

3.6 PRIMARY SYSTEM BOUNDARY (Cont)

A. Thermal and Pressurization Limitations (Cont)

In the event this requirement is not met, achieve stable reactor conditions with reactor vessel temperature above that defined by the appropriate curve and obtain an engineering evaluation to determine the appropriate course of action to take.

3. The reactor vessel head bolting studs shall not be under tension unless the temperature of the vessel head flange and the head is greater than 55°F.

4. The pump in an idle recirculation loop shall not be started unless the temperatures of the coolant within the idle and operating recirculation loops are within 50°F of each other.

5. The reactor recirculation pumps shall not be started unless the coolant temperatures between the dome and the bottom head drain are within 145°F.

6. Thermal-Hydraulic Stability

   Core thermal power shall not exceed 25% of rated thermal power without forced recirculation.

SURVEILLANCE REQUIREMENTS

4.6 PRIMARY SYSTEM BOUNDARY (Cont)

A. Thermal and Pressurization Limitations (Cont)

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4. Prior to and during startup of an idle recirculation loop, the temperature of the reactor coolant in the operating and idle loops shall be permanently logged.

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The bottom head, defined as the spherical portion of the reactor vessel located below the lower circumferential weld, was also evaluated. Reference transition temperatures (RT_{ndt}) were developed for the bottom head and the resulting pressure vs. temperature curves plotted on Figures 3.6-1 and 3.6-2. It has been determined that the bottom head temperatures are allowed to lag the vessel shell temperatures (Reference: Structural Integrity Associates (SIA) Report SIR-00-108, dated September 11, 2000). The referenced analysis utilizes the stress results established in the Combustion Engineering Inc., Pilgrim Reactor Vessel Design Report, No. CENC 1139, dated 1971, and combines the stress analysis results, specific to the bottom head, with the pressurization temperatures necessary to maintain fracture toughness requirements in accordance with the ASME Boiler and Pressure Vessel Code, Section III, the criteria of 10CFR50, Appendix G, and the supplementary guidelines of Reg. Guide 1.99, Rev. 2.

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The curves apply to 100% bolt preload condition but are conservative for lesser bolt preload condition.