



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I**  
2100 RENAISSANCE BOULEVARD, SUITE 100  
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

June 13, 2012

Mr. Robert G. Smith  
Site Vice President  
Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
600 Rocky Hill Road  
Plymouth, MA 02360-5508

SUBJECT: PILGRIM NUCLEAR POWER STATION - NRC INSPECTION REPORT  
05000293/2012007

Dear Mr. Smith:

On May 3, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Pilgrim Nuclear Power Station. The enclosed report documents the results of the inspection, which were discussed on May 3, 2012, with you and members of your staff.

This inspection was an examination of license renewal activities under Temporary Instruction (TI) 2516/001, Review of License Renewal Activities. The inspection reviewed the completion of commitments made during the renewed license application process and compliance with the Commission's rules and regulations and the conditions of your operating license. Within these areas, the inspection involved examination of selected procedures and representative records, observations of activities, and interviews with personnel.

On the basis of the samples selected for review, there were no findings of significance identified during this inspection. The NRC determined that the commitments associated with the license renewal application had been implemented. The inspectors noted that, for several commitments, there were incomplete results or progress was being made in these areas. Accordingly, we plan an additional inspection in this area to ensure completeness for those commitments. We plan to complete this inspection prior to your next refueling outage.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

Richard J. Conte, Chief  
Engineering Branch 1  
Division of Reactor Safety

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Site Vice President  
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Sincerely,  
/RA/

Richard J. Conte, Chief  
Engineering Branch1  
Division of Reactor Safety

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R. Smith

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Enclosure:  
NRC Inspection Report 05000293/2012007

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U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Docket: 50-293

License: DPR-35

Report : 05000293/2012007

Licensee: Entergy Nuclear Operations, Inc. (Entergy)

Facility: Pilgrim Nuclear Power Station

Location: Plymouth, MA

Dates: April 16 - May 3, 2012

Inspectors: G. Meyer, Senior Reactor Inspector, Division of Reactor Safety (DRS)  
M. Modes, Senior Reactor Inspector, DRS  
J. Lilliendahl, Reactor Inspector, DRS  
S. Chaudhary, Reactor Inspector, DRS

Approved By: Richard J. Conte, Chief  
Engineering Branch 1  
Division of Reactor Safety

## SUMMARY OF FINDINGS

IR 05000293/2012007; 4/16/2012 – 5/3/2012; Pilgrim Nuclear Power Station; Review of License Renewal Activities.

The report covers a two week inspection of the implementation of license renewal activities at Pilgrim. It was conducted by four region based engineering inspectors under Temporary Instruction 2516/001. No findings were identified.

A. NRC-Identified and Self-Revealing Findings

No findings of were identified.

B. Licensee-Identified Violations

None.

## Report Details

### **4. OTHER ACTIVITIES (OA)**

#### **40A2 Other – License Renewal Activities (TI 2516/001)**

##### **a. Inspection Scope**

This inspection was performed by NRC Region I based inspectors to evaluate the license renewal activities at the Pilgrim Nuclear Power Station in accordance with Temporary Instruction (TI) 2516/001. As noted in this TI: "This procedure was written to allow for timely verification by NRC inspectors that Entergy has made sufficient progress in implementing its license renewal commitments before entering its post-40-year license period and to allow documentation of these inspection activities while the operating license is being considered for renewal." The inspectors performed in-plant observations of license renewal related activities and sampled Entergy actions on completed commitments, including review of the commitment closure summaries, procedures, and records; discussions with responsible plant personnel; and observations of in-plant conditions. The bases for the review were the NRC staff's safety evaluation report (SER)(NUREG-1891), the Pilgrim License Renewal Application (LRA), and related Entergy letters associated with licensee renewal regulatory commitments including Letter 2.11.034, dated May 18, 2011 (ML11145A1131).

In Inspection Report 05000293/2011010, license renewal activities during the April 2011 refueling outage were reviewed, including the completion of review on three commitments (6, 16, and 44) and the identification of additional actions needed on two commitments (23 and 46) related to selective leaching and torus hold-down bolts. Commitment numbers not listed were not sampled for this review.

##### **b. Findings and Observations**

No findings were identified.

##### **b.1 Commitments Reviewed**

###### **Commitment 1 – Buried Piping and Tanks Inspection**

Review of this commitment occurred under Commitment 50, which superseded Commitment 1.

###### **Commitment 4 – Sampling of Security Diesel Generator Fuel Storage Tank**

Commitment 4 provides that by June 8, 2012, Entergy "Enhance the Diesel Fuel Monitoring Program to include quarterly sampling of the security diesel generator fuel storage tank. Particulates (filterable solids), water and sediment checks will be performed on the samples. Filterable solids acceptance criteria will be = 10 mg/l. Water and sediment acceptance criteria will be = 0.05 percent."

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The inspectors reviewed the commitment closure summary report, modification to add sample port, preventive maintenance work order, chemistry sample procedure, and the last four quarterly sample results. The procedure, samples, and results met the specified values. The inspectors observed conditions at the security diesel generator with the system engineer and design engineer.

The inspectors determined that Entergy had implemented Commitment 4.

**Commitment 5 – Monitoring of Security Diesel Generator Fuel Storage Tank**

Commitment 5 provides that by June 8, 2012, Entergy "Enhance the Diesel Fuel Monitoring Program to install instrumentation to monitor for leakage between the two walls of the security diesel generator fuel storage tank to ensure that significant degradation is not occurring."

The inspectors reviewed the commitment closure summary report, modification to connect the existing switch into alarm circuitry, post modification testing, condition reports to address identified problems, and revised diesel operating procedure. The inspectors observed conditions at the security diesel generator with the system engineer and design engineer.

The inspectors determined that Entergy had implemented Commitment 5.

**Commitment 7 – Diesel Fire Pump Inspections**

Commitment 7 provides that by June 8, 2012, Entergy will "Enhance the Fire Protection Program procedures to state that the diesel engine subsystems (including the fuel supply line) shall be observed while the pump is running . . . to clarify that the diesel-driven fire pump engine is inspected for evidence of corrosion in the intake air, turbocharger, and jacket water system components as well as lube oil cooler . . . Also, the engine exhaust piping and silencer are inspected for evidence of internal corrosion or cracking."

The inspectors reviewed the commitment closure summary report, and the diesel fire pump testing and maintenance procedures to verify that the surveillance and maintenance procedures had been enhanced to include the requirements above. The inspectors walked down the diesel-driven fire pump to evaluate the material condition of the fire pump and the feasibility of the revised procedures. The inspectors also interviewed the system engineer and project manager to review any operating experience or implementation issues.

The inspectors reviewed 3.M.4-123, Diesel Fire Pump Engine Maintenance Procedure, and noted that the procedure provided inadequate guidance for the inspection of the intake filter, turbocharger, jacket water heat exchanger, lube oil cooler, and exhaust piping. For example, the procedure had a single line to inspect the turbocharger for signs of internal corrosion without any direction on how to access the internals of the turbocharger. Entergy initiated CR-PNP-2012-2053 to evaluate the appropriate methods

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of performing the diesel fire pump inspections and to the inadequate procedural guidance. Entergy revised 3.M.4-123 to provide adequate guidance to perform the inspections. The inspectors reviewed the changes to the procedure to perform visual inspections, oil filter examinations, and analyses of lube oil and jacket water.

The commitment includes an inspection of the engine exhaust piping and silencer for evidence of internal corrosion or cracking. It was unclear from the commitment what form of inspection was required. Entergy determined that performing an internal inspection of the exhaust piping and silencer for internal corrosion was unfeasible and unnecessary. Entergy evaluated this under their commitment change process to clarify the commitment and determined that an exterior inspection with insulation removed was appropriate. The inspectors reviewed the commitment change evaluation and agreed with Entergy's conclusions.

The inspectors determined that Entergy had implemented Commitment 7.

#### **Commitment 8 – Halon Flex Hoses**

Commitment 8 provides that by June 8, 2012, Entergy will "Enhance the Fire Protection Program procedure for Halon system functional testing to state that the Halon 1301 flex hoses shall be replaced if leakage occurs during the system functional test."

The inspectors reviewed the commitment closure summary report and the Halon functional test procedure for the cable spreading room to verify that the surveillance procedure had been enhanced to include the requirement to replace the Halon flex hoses if leakage occurs during the testing. The inspectors walked down the Halon flex hoses to evaluate the material conditions of the hoses. The inspectors also interviewed the fire protection engineer and project manager to review any operating experience or implementation issues.

The inspectors determined that Entergy had implemented Commitment 8.

#### **Commitment 9 – Fire Hose Reels**

Commitment 9 provides that by June 8, 2012, Entergy will "Enhance Fire Water System Program procedures to include inspection of hose reels for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion."

The inspectors reviewed the commitment closure summary report and the fire hose reel inspection procedures to verify that the procedures had been enhanced to include the requirement to inspect for significant corrosion. The inspectors walked down a sample of fire hose reels in safety related areas to evaluate the material condition of the hose reels. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

The inspectors determined that Entergy had implemented Commitment 9.

#### **Commitment 10 – Fire Sprinkler Testing**

Commitment 10 provides that by June 8, 2012, Entergy will “Enhance the Fire Water System Program to state that a sample of sprinkler heads will be inspected using guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1. NFPA 25 also contains guidance to repeat this sampling every 10 years after initial field service testing.”

The inspectors reviewed the commitment closure summary report and applicable fire protection work orders to verify that all sprinkler systems which will reach 50 years of age during the period of extended operation will be subjected to testing in accordance with NFPA 25-2002, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. The inspectors noted work orders to perform the testing of the sprinkler systems and documentation tracking the scheduling of the inspections at 10 year intervals after the initial 50 year inspection. The inspectors walked down a sample of sprinkler heads in safety relate areas to evaluate the material condition of the sprinkler heads. The inspectors interviewed the fire protection engineer and project manager to review any operating experience or implementation issues.

The inspectors determined that Entergy had implemented Commitment 10.

#### **Commitment 11 – Fire Protection Piping Wall Thickness Measurements**

Commitment 11 provides that by June 8, 2012, Entergy will “Enhance the Fire Water System Program to state that wall thickness evaluations of fire protection piping will be performed on system components using nonintrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term and at intervals thereafter during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.”

The inspectors reviewed the commitment closure summary report and ultrasonic test results to verify that representative samples were selected and that the test results did not indicate any concerns. The inspectors noted that based upon worst case test results and conservative estimates of corrosion rates, all samples are expected to be above the minimum required wall thickness at the end of the period of extended operation. The inspectors walked down the test locations and other portions of the fire water system to evaluate the material condition of the fire water piping. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

The inspectors determined that Entergy had implemented Commitment 11.

**Commitment 12 – Heat Exchanger Monitoring**

Commitment 12 provides that by June 8, 2012, Entergy will "Implement the Heat Exchanger Monitoring Program as described in LRA Section B.1.15." Section B.1.15 of the LRA describes the monitoring of an additional population of heat exchangers. B.1.15 states that representative tubes within the sample population of heat exchangers will be eddy current tested at a frequency determined by internal and external operating experience to ensure that effects of aging are identified prior to loss of intended function. The additional population of heat exchangers includes the residual heat removal (RHR) heat exchangers, core spray pump motor thrust bearing lube oil coolers, high pressure coolant injection (HPCI) gland seal condenser, HPCI turbine lube oil cooler, reactor control injection cooling (RCIC) lube oil cooler, recirculation pump motor generator set fluid coupling oil bearing coolers, control rod drive (CRD) pump oil coolers, recirculation pump motor lube oil coolers, clean up recirculation pump lube oil coolers and stuffing box cooler, and emergency diesel generator (EDG) lube oil coolers.

The inspectors reviewed the commitment closure summary report, program procedure, heat exchanger maintenance and testing procedure, and preventive maintenance orders to perform eddy current testing, and discussed the heat exchanger monitoring program with the responsible system engineer.

The inspectors determined that Entergy had implemented Commitment 12.

**Commitment 13 – Instrument Air Sample Point**

Commitment 13 provides that by June 8, 2012, Entergy "Enhance the Instrument Air Quality Program to include a sample point in the standby gas treatment and torus vacuum breaker instrument air subsystem in addition to the instrument air header sample points."

The inspectors reviewed the commitment closure summary report, piping and instrument drawing, revised air sampling procedure, sample results for the most recent four quarterly tests, and an applicable condition report. The inspectors observed the in-plant conditions of the sample point and discussed the test results with the chemistry supervisor.

The inspectors determined that Entergy had implemented Commitment 13.

**Commitment 14 – Metal Enclosed Bus**

Commitment 14 provides that by June 8, 2012, Entergy will "Implement the Metal-Enclosed Bus Inspection Program as described in LRA Section B.1.18." The Metal-Enclosed Bus (MEB) program includes visual and thermographic inspections of the MEBs.

The inspectors reviewed the commitment closure summary report, completed work orders, thermography results, and MEB photographs taken during the inspections to verify that the required inspections were completed and the MEB internal conditions were adequate. The inspectors walked down the MEB enclosures to evaluate their material condition. The inspectors also interviewed the system engineer and project manager to review any operating experience or implementation issues.

As part of the MEB program, Pilgrim committed to 1) inspecting the integrity of bus supports and 2) verifying the enclosure elastomer seals were not hardened by visual inspecting the seals and by flexing them. The inspectors noted that the MEBs are located in the upper and lower switchgear rooms; consequently, there are two procedures for the inspections – one for the upper switchgear room and one for the lower switchgear room. The upper switchgear room procedure was not updated for inspecting either requirement; consequently, the upper switchgear room inspections did not explicitly direct the maintenance personnel to inspect the bus supports or elastomer seals. For the lower switchgear room, the inspection procedure was revised to inspect the integrity of bus supports but was not revised to inspect the enclosure elastomer seals. Nonetheless, when the inspection was performed in the lower switchgear room, the older revision to the procedure was used which did not explicitly direct the maintenance personnel to inspect the bus supports or elastomer seals.

The inspectors noted that the inspections of the bus supports and elastomer seals were not explicitly performed. Because these inspections cannot be performed without de-energizing the safety-related buses to remove the MEB access panels, these inspections will not be performed before the period of extended operation. The inspectors questioned the adequacy of the inspections that were performed. Entergy initiated CR-PNP-2012-2054 to evaluate the issues with the inspections. Based on interviews with maintenance supervisors and based on reviewing the photos taken during the inspections, the inspectors determined that although the inspection procedures did not explicitly state to inspect the above items, it was reasonable to assume that the items would have been observed during the inspection; and the material condition of the MEBs appeared to be acceptable. Entergy was planning to repeat the inspections at the next available outage.

The MEB program documentation included the specification to inspect a sample of MEB bolted connections every 10 years if they are inspected with thermography and every five years if they are inspected visually. The inspectors noted that although the MEB program documentation stated the specified sample size of MEB bolted connections was 25 or more, there appeared to be only 24 total connections, and only 12 appeared to have been inspected with thermography. The inspectors questioned what the correct sample size was and whether the inspections would be completed in 10 years or five years. Entergy stated that the sample size and testing frequency were not appropriate and would be established as part of CR-PNP-2012-2054. Entergy stated, and the inspectors agreed, that the completed inspection was adequate for at least five years, because all of the connections were inspected visually.

The inspectors determined that Entergy had implemented Commitment 14.

Enclosure

### **Commitment 15 – Non-Environmental Qualification Inaccessible Cables**

Commitment 15 provides that by June 8, 2012, Entergy will "Implement the Non-EQ Inaccessible Medium-Voltage Cable Program as described in LRA Section B.1.19. Include developing a formal procedure to inspect manholes for in-scope medium voltage cable." Entergy revised this commitment in writing prior to the issuance of Supplement 2 to the SER to state, "Implement the Non-EQ Inaccessible Medium-Voltage Cable Program as described in LRA Section B.1.19. Inspections for water accumulation in manholes containing in-scope inaccessible low-voltage and medium-voltage cables with a license renewal intended function will be performed at least annually. Additional condition-based inspections of these manholes will be performed based upon natural events for a coastal site. The inspection results will be reviewed to determine the need for more frequent inspections. Inaccessible medium and low-voltage (400V to 2kV) cables with a license renewal intended function are included in this program. Inaccessible medium and low-voltage cables will be tested for cable insulation degradation prior to the PEO and at least once every six years after entering the PEO. A proven, commercially available test will be used for detecting deterioration of the insulation system of low and medium voltage inaccessible cables with a license renewal function. Review test results to determine the need for more frequent testing."

The inspectors reviewed the commitment closure summary report, cable test results, and manhole inspection results to verify that potential aging effects to inaccessible cables were being adequately managed. The inspectors also interviewed the system engineer and project manager to review any operating experience or implementation issues.

The inspectors reviewed insulation resistance test results to verify that cable testing frequencies were established based on cable performance and were to be at least once every six years. The inspectors verified that the cable testing program included medium and low voltage cables with a license renewal function.

In accordance with guidance from the Electric Power Research Institute (EPRI) and the Nuclear Energy Institute (NEI), Entergy also performed destructive testing on three sections of cable which were installed at Pilgrim from 1973 to 2002. The sections of cable tested were the same type that was currently installed in the plant. The testing included visual, partial discharge, insulation resistance, dissipation factor, and AC voltage breakdown. All test results demonstrated that the cable sections were in good condition, which provided added assurance that the installed cables were also in good condition.

The inspectors also reviewed the manhole inspection results, and determined that all of the manholes had been inspected and future work orders were designed to inspect the manholes on appropriate frequencies at least once every year. The inspectors reviewed 2.1.37, Coastal Storm – Preparations and Actions Operating Procedure, to verify that the manholes were to be inspected under conditions of heavy rain. The inspectors observed a manhole inspection to verify the adequacy of the guidance provided in the work orders and the thoroughness of the inspections.

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The inspectors determined that Entergy had implemented Commitment 15.

**Commitment 17 – Non-Environmental Qualification Cables and Connections**

Commitment 17 provides that by June 8, 2012, Entergy will "Implement the Non-EQ Insulated Cables and Connections Program as described in LRA Section B.1.21." The program as described in the LRA was to manage the aging effects of cables and connections exposed to adverse localized environments by visually inspecting a representative sample of accessible insulated cables and connections.

The inspectors reviewed the commitment closure summary report and inspection results to verify that potential aging effects to cables and connections were being adequately managed. The inspectors reviewed PNPS-NE-09-00001, Cable and Connection Inspection Walkdown Summary Report, which documented the inspection of the plant for adverse localized environments and aging effects to cables and connections. The inspectors reviewed the work orders and condition reports that were generated as a result of the walkdown to verify that conditions adverse to quality were being identified and resolved. The inspectors walked down a sample of safety related areas, which had been inspected as part of Entergy's walkdown, to evaluate the material condition of cables and connections. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

The inspectors determined that Entergy had implemented Commitment 17.

**Commitment 18 – CRD Pump Lubricating Oil**

Commitment 18 provides that by June 8, 2012, Entergy "Enhance the Oil Analysis Program to periodically change CRD pump lubricating oil. A particle count and check for water will be performed on the drained oil to detect evidence of abnormal wear rates, contamination by moisture, or excessive corrosion."

The inspectors reviewed the commitment closure summary report, revised lubrication change and sample procedure, preventive maintenance orders, and work order completed on June 6, 2010, on the B CRD pump. The inspectors discussed the lubrication program and oil analysis with the lubrication engineer.

The inspectors determined that Entergy had implemented Commitment 18.

**Commitment 19 – Lubricating Oil for Miscellaneous Pumps**

Commitment 19 provides that by June 8, 2012, Entergy "Enhance Oil Analysis Program procedures for security diesel and reactor water cleanup pump oil changes to obtain oil samples from the drained oil. Procedures for lubricating oil analysis will be enhanced to specify that a particle count and check for water are performed on the oil samples from the fire water pump diesel, security diesel, and reactor water cleanup pumps."

The inspectors reviewed the commitment closure summary report, revised maintenance procedures, revised lubrication procedure, and lubrication sample results in the lubrication database. The inspectors discussed the lubrication program and oil analysis with the lubrication engineer.

The inspectors determined that Entergy had implemented Commitment 19.

#### **Commitment 20 – One-Time Inspection**

Commitment 20 provides that by June 8, 2012, Entergy "Implement the One-Time Inspection Program as described in LRA Section B.1.23."

The inspectors reviewed the commitment closure summary report, program procedure, One-Time Inspection Summary Report, and applicable condition reports, and discussed this commitment with applicable plant staff and license renewal personnel. The inspectors reviewed a sample of the approximately 150 one-time inspections performed, which included thorough descriptions and included attached photographs.

The inspectors noted that the "One-Time Inspection Program as described in LRA Section B.1.23" included inspection of the cast austenitic stainless steel (CASS) main steam line flow restrictors. However, the inspection matrix listed these inspections as not applicable. Entergy personnel stated that it had been determined that the inspections were unnecessary, as the material was determined to be non-susceptible to any reduction in fracture toughness. The inspectors reviewed the basis for this conclusion. Nonetheless, Entergy had not initiated any regulatory process to revise its commitment. Entergy issued CR-PNP-2012-02056 to address followup actions to revise the commitment via an appropriate regulatory process.

The purpose of the One-Time Inspection Program includes verification that existing aging management programs, comprised of the water chemistry control, oil analysis, and diesel fuel monitoring program, have been effective. The inspectors noted that the One-Time Inspection Program included the effectiveness verification for the water chemistry control program but neglected to address the oil analysis and diesel fuel monitoring programs. The inspection matrix did not include samples in the lube oil and fuel oil environments to accomplish verification of the additional programs. Entergy stated that some inspections in the fuel oil and lube oil environments had been performed, and no degradation had been found. Entergy issued CR-PNP-2012-02056 to evaluate followup actions to address the fuel oil and lube oil environments.

The inspectors determined that Entergy made progress on Commitment 20 and that needed followup actions were being addressed under CR-PNP-2012-02056.

#### **Commitment 22 – Reactor Vessel Surveillance Program**

Commitment 22 provides that by June 8, 2012, Entergy "Enhance the Reactor Vessel Surveillance Program to proceduralize the data analysis, acceptance criteria, and corrective actions described in LRA Section B.1.26."

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Pilgrim's Reactor Vessel Surveillance Program was based on surveillance capsules irradiated in other (host) plants as part of the Boiling Water Reactor Vessel and Internals Project (BWRVIP). The program followed the guidance contained in GALL AMP XI.M31, Reactor Vessel Surveillance, and used BWRVIP-78, BWR Integrated Surveillance Program Plan, and BWRVIP-86-A, BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation. The guidance provides shared data that bounds all the operating Boiling Water Reactor plants including Pilgrim. The capsules in the Pilgrim reactor vessel are spares that are not scheduled for withdrawal.

The Vessels and Internals Project integrated details of BWRVIP-78 and 86-A into BWRVIP-116, BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal, which describes the implementation of the surveillance program during the period of extended operation. BWRVIP-116, as accepted by the NRC in a Safety Evaluation Report issued March 1, 2006, was the basis for proceduralizing the data analysis, because it contained a testing schedule for the host plant capsules, details about controlling the program and the data, as well as contingency planning in the event a host plant either declined to renew its license or its application was denied by the NRC.

Entergy procedure SEP-FTP-PNPS, Reactor Vessel Fracture Toughness and Surveillance Material Testing at Pilgrim Nuclear Power Station, was produced to satisfy Commitment 22. The procedure included acceptance criteria and corrective actions described in the license renewal application at B.1.26. For example, at 5.2.1 the procedure stipulates the "reactor vessel beltline materials must maintain an upper shelf energy threshold, throughout the life of the vessel, of no less than 50 ft-lb. (10 CFR 50, Appendix G)"

The inspectors determined that Entergy had implemented Commitment 22.

### **Commitment 23 – Selective Leaching**

Commitment 23 provides that Entergy will "Implement the Selective Leaching Program in accordance with the program as described in LRA Section B.1.27" by June 8, 2012. The Selective Leaching Program performs one-time inspections of a sample of components made of materials which are susceptible to selective leaching, i.e., the removal of some elements from gray cast iron and copper alloys (including aluminum bronze and copper alloys with greater than 15 percent zinc) to determine whether selective leaching has occurred. Inspection Report 05000293/2011010 documented an initial review of the Selective Leaching Program, which determined that a susceptible material, i.e., aluminum bronze with more than 15 percent aluminum had not been covered within the program and no testing on this material had been performed.

The inspectors reviewed the commitment closure summary report, selective leaching program procedure, summary report of inspections, and two laboratory reports of destructive evaluations regarding selective leaching. Entergy had determined that all aluminum bronze components at Pilgrim had been replaced by non-susceptible materials; this was sufficient to complete the review of aluminum bronze components.

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The inspectors reviewed the material – environment combination of gray cast iron in raw water. Entergy had determined that gray cast iron components in the circulation water system, i.e., condenser water box and pump columns, had experienced selective leaching and were addressed by aging management activities, such as periodic replacement, passive cathodic protection, coatings and coating inspections.

Nonetheless, Entergy was unable to demonstrate that the inspections of components in other systems met the sample plan to show that selective leaching was not present in other systems. Entergy issued CR-PNP-2012-02055 to resolve this concern.

The inspectors determined that progress was made on Commitment 23 and that needed followup actions were being addressed under CR-PNP-2012-02055.

#### **Commitment 25 – Structures Monitoring Program**

Commitment 25 provides that before June 8, 2012, Entergy will “Enhance the Structures Monitoring Program procedure to clarify that the discharge structure, security diesel generator building, trenches, valve pipes, manholes, duct banks, underground fuel oil tank foundations, man-way seals and gaskets, hatch seals and gaskets, underwater concrete in the intake structure, and crane rails and girders are included in the program. In addition, the Structures Monitoring Program will be revised to require opportunistic inspections of inaccessible concrete area when they become accessible.”

The inspectors reviewed the commitment closure summary report and procedure EN-DC-150. The inspectors verified that in order to fulfill this commitment, Procedure EN-DC-150, “Condition Monitoring of Maintenance Rule Structures,” had been issued as Revision 1, which included the applicable structures within the program, and no additional action was required.

The inspectors determined that Entergy had implemented Commitment 25.

#### **Commitment 26 – Structures Monitoring Program as Applied to Filler Materials**

Commitment 26 provides that before June 8, 2012, Entergy will “Enhance the Structures Monitoring Program guidance for performing structural examinations of elastomers (seals, gaskets, seismic joint filler, and roof elastomers) to identify cracking and change in materials properties.”

The inspectors reviewed the commitment closure package and procedure EN-DC-150. The inspector verified that in order to fulfill this commitment, EN-DC-150, “Condition Monitoring of Maintenance Rule Structures,” had been issued as Revision 1. Entergy had added all of the above commitment items to Pilgrim Station’s structures monitoring program, and no additional action was required.

The inspectors determined that Entergy had implemented Commitment 26.

### **Commitment 27 – Water Control Structures Monitoring Program**

Commitment 27 provides that before June 8, 2012, Entergy will “Enhance the Water Control Structures Monitoring Program scope to include the east breakwater, jetties, and onshore revetments in addition to the main breakwater.”

Therefore, in order to fulfill this commitment, all onshore revetments, jetties and east breakwater need to be monitored. The added structures include the east breakwater, discharge channel, stone revetment between the shorefront west of the discharge channel, and the stone revetment between the intake structure and the barge slip. To detect degradation of water control structures, periodic inspections need to be performed at least once every five years.

The inspectors reviewed the commitment closure summary report and procedure 3.M.5-3. The inspectors verified that to fulfill this commitment the procedure had been revised, issued as Revision 2, and renamed as “Water Control Structures Monitoring Procedure” and added the east breakwater, jetties, and onshore revetments to the scope. It also specified that the new structures are inspected annually following the winter storm season and after a major storm. No additional action was needed.

The inspectors determined that Entergy had implemented Commitment 27.

### **Commitment 29 – Cast Austenitic Stainless Steel**

Commitment 29 provides that by June 8, 2012, Entergy “Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.1.31.”

The Cast Austenitic Stainless Steel Program as described in the license renewal application at Section B.1.31 says, “The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program will be consistent with the program described in NUREG-1801, Rev 1, Section XI.M13, Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program.” The application includes the statement that “future Boiling Water Reactor Vessel Internals Project (BWRVIP) reports, EPRI reports, and other industry operating experience will provide additional bases for evaluations and inspections under this program.” This statement allows the future modification of the program to include guidance taken from future reports issued by the Vessels Internals Project and the Electric Power Research Institute. The NRC agrees that other industry operating experience should provide additional bases for evaluations and inspections.

NUREG-1801, Section XI.M13, suggests material specific screening criteria to establish the need to evaluate the targeted component in order to detect the effects of loss of fracture toughness due to thermal aging and neutron irradiation embrittlement. The material specific criterion used to identify susceptible components includes the ferrite and molybdenum content, casting process, and operating temperature. The NRC suggests, in its guidance, a screening threshold of neutron fluence greater than  $10^{17}$  n/cm<sup>2</sup> (E>1 MeV). Any component exceeding the referenced screening criteria

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thresholds then must be subjected to an augmented examination, with a defined periodicity for the examination. Alternatively, Entergy may perform a component-specific evaluation, including a mechanical loading assessment to determine the maximum tensile loading on the component during ASME Code Level A, B, C, and D conditions. If the loading is compressive or low enough ( $<5$  ksi) to preclude fracture, then supplemental inspection of the component is not required.

Entergy identified the following components as susceptible to the effects of thermal embrittlement based on stress levels defined generically in BWR VIP-234: Orificed Fuel Support, Control Rod Drive Guide Tube Base, Core Spray Sparger, Core Spray Sparger Nozzle Elbows, Jet Pump Assembly, and the Jet Pump Restrainer Bracket. The fluence screening level, used in BWR VIP-234, is  $3 \times 10^{20}$  n/cm<sup>2</sup>. Entergy Nuclear Operations, Inc. has accepted the position of EPRI Report TR 1015379 that fluence effects on thermal embrittlement are not measurable below  $1 \times 10^{21}$  n/cm<sup>2</sup>, however, a threshold at this level might be too high. As a consequence, Entergy Nuclear Operations, Inc. has chosen a conservatively bounding threshold of  $3 \times 10^{20}$  n/cm<sup>2</sup>.

The inspectors determined that Entergy had implemented Commitment 29.

#### **Commitment 30 – CRD Weld Repair**

Commitment 30 provides that by June 30, 2015, Entergy “Perform a code repair of the CRD return line nozzle to cap weld if the installed weld repair is not approved via accepted code cases, revised codes, or an approved relief request for subsequent inspection intervals.”

Because the N-10 Nozzle was capped and the cap weld over-laid in 2003, the BWR CRD Return Line Nozzle Program proposed in the license renewal application did not fully align with the program described in NUREG 1801, Rev 1 at XI.M6, “BWR Control Rod Drive Return Line Nozzle”. As a consequence, the application included three exceptions.

- Exception 1. The applicable Code required ultrasonic testing of base metal on either side of the Return Drive Line Nozzle weld to a distance of one half the vessel wall thickness. Because the structural overlay covered a large part of the area intended to be tested Entergy was only able to insonify one half inch of the base metal.
- Exception 2. XI.M6 suggested that inspection be as described in guidance contained in NUREG-0619, *BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking*, November 1980. The program described in the NUREG required liquid penetrant testing of the control rod drive return line nozzle blend radius and bore regions. The weld overlay covered the nozzle, the nozzle-to-cap weld, and part of the cap and was examined in conformance with BWR VIP-75, making the liquid penetrant testing of the nozzle blend radius and bore regions unnecessary. Also, because the line was capped, the thermal vortex shearing that could cause cracking on the inner blend radius or bore regions was obviated.

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- Exception 3. Entergy placed the overlay without removing the flaw, or reducing its size, in the nozzle, choosing to examine the overlay by ultrasonic testing in lieu of radiography. At the time of the repair, Entergy received approval in a letter from the NRC, dated February 25, 2005.

The exceptions of coverage and examination methodology were subsequently addressed in Code Case N-613-1, which was approved in Regulatory Guide 1.147, Rev. 14. Entergy made programmatic changes that referred to the approved Code Case, approval documents, and applicable Code Relief Requests granted by the NRC, incorporating the references into their ASME Ten Year ISI Program. In addition, the nozzle was examined and a schedule established for re-examination in conformance with BWR VIP-75.

The inspectors determined that Entergy had implemented Commitment 30.

### **Commitment 31 – Environmental Effects on Metal Fatigue**

Commitment 31 provides that by June 8, 2010, “for the locations identified in NUREG/CR-6260 for BWRs of the PNPS vintage, PNPS will refine our current fatigue analyses to include the effects of reactor water environment and verify that the cumulative usage factors (CUFs) are less than 1.” The commitment included detailed analysis guidance and results options.

The fatigue lives of carbon and low-alloy steels, austenitic stainless steels, and Nickel-Chrome-Ferrite alloys are decreased in light water reactor environments. ASME Boiler and Pressure Vessel Code rules for Class I components in Section III, NB-3121, states the effects of coolant environments on fatigue resistance of a material were not intended to be addressed in the ASME design curves. As a consequence, the originally calculated fatigue life, expressed as a cumulative usage factor (CUF), may not accurately represent the component life during the period of extended operation. In NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components*, February 1996, component evaluations were performed generically for the reactor vessel shell and lower head, reactor vessel feedwater nozzle, reactor recirculation piping (including inlet and outlet nozzles), residual heat removal system Class I piping, core spray line reactor vessel nozzle and Class I piping, and feedwater line Class I piping.

These components were not necessarily the locations with the highest design CUFs in the plant, but were chosen to give a representative overview of components that had higher CUFs and/or were important from a risk perspective. For these reasons, it was important to determine if the analysis performed in NUREG/CR-6260 was bounding for Pilgrim and if the effects of environment on the fatigue curve for all fatigue limited components negatively affected the life of the component for the extended period of operation.

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Entergy analyzed the NUREG/CR-6260 locations for their configuration. This included an appraisal and adjustment of the transient nature and count. This was accomplished by reviewing plant exposure logs, operating summaries sent to the NRC, paper reels stored in the archival vault, etc. For the feedwater nozzle re-analysis, a previously developed three dimensional model of the nozzle was used. For the ASME Class I piping associated with the core-spray system, a piping model was created of the piping from the reactor vessel to the outboard containment isolation valves, including the connecting reactor core isolation cooling, reactor water clean-up, and high pressure core injection.

As a consequence of the re-analysis of the reactor lower head, for environmental assisted fatigue, Entergy determined the control rod drive penetrations were more limiting than the bottom head itself. The projected end-of-60-year-life environmental assisted fatigue calculation for the bottom head is 0.11 CUF while the penetrations are 0.4724 CUF. The limiting CUF for the reanalysis for environmentally assisted fatigue is the feedwater nozzle forging with a calculated end-of-60-year-life CUF of 0.9598.

The inspectors determined that Entergy had implemented Commitment 31.

#### **Commitment 32 – Bolting Integrity Program**

Commitment 32 provides that before June 8, 2012, Entergy will "Implement the enhanced Bolting Integrity Program described in Attachment C of Pilgrim Licensing Renewal Application Amendment 5 (Letter 2.06.064)."

The program enhancement needed in the Bolting Integrity Program were: to verify gasket compression, if applicable, following assembly; to clarify that actual yield strength is used in specifying materials for low susceptibility to stress corrosion cracking; and to clarify the prohibition on the use of lubricants containing molybdenum disulfide for bolting at Pilgrim.

The inspectors reviewed the commitment closure summary report and procedures 3.M.4-92, EN-DC-141, and EN-EV-112. The inspectors verified that the procedures had been revised to address the specified enhancements and the program implemented.

The inspectors determined that Entergy had implemented Commitment 32.

#### **Commitment 33 – Thermal Sleeve Welds**

Commitment 33 provides that "PNPS will inspect the inaccessible jet pump thermal sleeve and core spray thermal sleeve welds if and when the necessary technique and equipment become available and the technique is demonstrated by the vendor, including delivery system."

There was no current technique, or equipment, available and demonstrated, that can inspect the inaccessible jet pump thermal sleeve or core spray thermal sleeve welds. Entergy continued to track this commitment.

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The inspectors determined that Entergy had implemented Commitment 33.

#### **Commitment 34 – Reactor Shroud Access Hole Covers**

Commitment 34 provides that “Within the first 6 years of the period of extended operation and every 12 years thereafter, PNPS will inspect the access hole covers with UT methods. Alternatively, PNPS will inspect the access hole covers in accordance with BWRVIP guidelines should such guidance become available.”

Access hole covers are located in the reactor shroud support baffle plate approximately 180 degrees apart. The holes were used for access during construction and were closed by welding a one inch thick plate in the hole. The access hole cover plates now maintain leak integrity between the annulus and plenum.

BWRVIP-180: BWR Vessel and Internals Project, Access Hole Cover Inspection and Flaw Evaluation Guidelines, was issued in November 2007. Entergy transitioned from inspecting the access hole covers in compliance with GE SIL 462, Shroud Support Access Hole Cover Cracks, to the BWRVIP program by way of Entergy Program CEP-RVI-005, PNPS Reactor Vessel and Internals (RVI) Inspection Program Plan. BWRVIP-180 required Entergy perform a baseline Ultrasonic Test of the access hole cover welds during the April 2015 outage. Entergy Nuclear Operations, Inc. will have to re-inspect the access hole covers within 12 years after the baseline examination during April 2015 by either visual or ultrasonic testing. SEP-RVI-005, “PNPS Reactor Vessel and Internals (RVI) Inspection Program Plan”, Rev. 1, December 1, 2010, includes the requirement at Appendix B.

The inspectors determined that Entergy had implemented Commitment 34.

#### **Commitment 35 – Fatigue Analysis**

Commitment 35 provides that “At least 2 years prior to entering the period of extended operation, for reactor vessel components, including the feedwater nozzles; PNPS will implement one or more of the following:

1. Refine the fatigue analyses to determine valid CUFs less than 1. Determine valid CUFs based on numbers of transient cycles projected to be valid for the period of extended operation. Determine CUFs in accordance with an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case).
2. Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC).
3. Repair or replace the affected locations before exceeding a CUF of 1.0. Should PNPS select the option to manage the aging effects due to fatigue during the period of extended operation, details of the AMP such as scope, qualification,

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method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation."

As reported above in Commitment 31, Entergy implemented a process to refine the fatigue analysis to determine valid CUFs less than 1. Entergy re-evaluated the cycle counts used in fatigue analysis for 32 separate events using projected 60 year estimates as the basis to recalculate the CUF for the components identified in NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components*, February 1996. For example, the number of cycles reported for the event "Turbine Roll and Increase to Rated Power," was 152 on March 28, 2009, originally projected to be 158 at the end of 40 years. For this event, the 60 year cycle count was estimated to be 204. The highest projected cycle count for the 60 year estimate was 682 for the event "Daily Reduction 50 percent Power."

Entergy then developed environmental adjustment factors ( $F_{en}$ ) for all available dissolved oxygen levels using the methodology in NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels*, NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels*, and NUREG/CR-6335, *Fatigue Strain-Life Behavior of Carbon and Low-Alloy Steels, Austenitic Stainless Steels, and Alloy 600 in LWR Environments*, 1995. This resulted in a CUF for the feedwater nozzle of 1.64. Using a three dimensional finite element analysis model previously developed for the feedwater nozzle, with the refined transient definitions developed as part of the commitment reanalysis the CUF was computed using ASME Section III, NB-3200 methodology, using the six stresses indicated in NRC Regulatory Information Summary 2008-30. For the safe-end the recomputed 60 year CUF was 0.2354, for the blend radius the 60 year CUF was 0.5061.

A detailed reanalysis was performed of the recirculation outlet and inlet nozzles, the core spray nozzle and safe end, residual heat removal return piping, feedwater piping, recirculation inlet nozzle thermal sleeve, and a detailed reanalysis performed for the control rod drive penetrations, the limiting component of the reactor bottom head. In addition to the components identified in NUREG/CR-6260, PNPS specific locations were reanalyzed to assure the limiting component was identified. This resulted in evaluations of the reactor vessel closure region, steam outlet nozzle, vent nozzle, instrument nozzle, and closure studs.

The inspectors determined that Entergy had implemented Commitment 35.

#### **Commitment 36 – Ultrasonic Examination of Condensate Storage Tank**

Commitment 36 provides that by June 8, 2012, "To ensure that significant degradation on the bottom of the condensate storage tank is not occurring, a one-time ultrasonic thickness examination in accessible areas of the bottom of the condensate storage tank will be performed. Standard examination and sampling techniques will be utilized."

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The inspectors reviewed the commitment closure summary report, work orders for the ultrasonic tests (UTs) of the condensate storage tanks, and the calculation for the acceptance criteria. The work orders provided specific instructions for the UT examination. At the time of the inspection, preparations were in progress to have divers enter the tanks to perform the ultrasonic thickness measurements. The inspectors verified that both tanks A and B were scheduled to be completed by the end of May 2012.

The inspectors determined that actions were underway to implement Commitment 36 by June 8, 2012.

### **Commitment 37 – Steam Dryer Inspections**

Commitment 37 provides that "The BWR Vessel internals Program includes inspections of the steam dryer. Inspections of the steam dryer will follow the guidelines of BWRVIP-139 and General Electric SIL 644 Revision 1."

In the LRA, Entergy stated they would evaluate BWRVIP-139: "BWR Vessel and Internals Project Steam Dryer Inspection and Flaw Evaluation Guidelines," April 2005, when approved by the NRC, and either include its recommendations in their vessel internals program or inform the staff of exceptions to that document. Entergy was managing cracking due to flow-induced vibration in the steam dryers following the requirements in GE-SIL-644, Revision 1, and the requirements in GE-SIL-644 were incorporated into BWRVIP-139. Entergy committed in its response dated October 6, 2006, to inspect the steam dryer following the guidelines of BWRVIP-139 and GE SIL 644, Revision 1.

The inspectors determined that Entergy had implemented Commitment 37.

### **Commitment 38 – Diesel Fire Pump Day Tank**

Commitment 38 provides that by June 8, 2012, Entergy "Enhance the Diesel Fuel Monitoring Program to include periodic ultrasonic thickness measurement of the bottom surface of the diesel fire pump day tank. The first ultrasonic inspection will occur prior to the period of extended operation, following engineering analysis to determine acceptance criteria and test locations. Subsequent test intervals will be determined based on the first inspection results."

The inspectors reviewed the commitment closure summary report, tank fabrication drawing, tank acceptance criteria, ultrasonic examination report, and preventive maintenance order for 10 year ultrasonic thickness examinations. All thickness measurements were within the acceptance criteria. The inspectors observed the in-plant conditions of the day tank with the system engineer.

The inspectors determined that Entergy had implemented Commitment 38.

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### **Commitment 39 – Main Stack Foundation One Time Inspection**

Commitment 39 provides that before June 8, 2012, Entergy will “Perform a one-time inspection of the Main Stack foundation prior to the period of extended operation.”

The inspectors reviewed the commitment closure summary report and the inspection results documented in the completed inspection checklist. Entergy had performed inspection of the Main Stack foundation during RFO 17 on May 9, 2009. No additional action was needed to close Commitment 39.

The inspectors determined that Entergy had implemented Commitment 39.

### **Commitment 41 – Augmented Inspection of Drywell Shell**

Commitment 41 provides that by June 8, 2012, Entergy “Enhance the Containment Inservice Inspection (CII) Program to require augmented inspection in accordance with ASME Code Section XI IWE-1240, of the drywell shell adjacent to the sand cushion following indications of water leakage into the annulus air gap.

SEP-ISI-PNPS-001, “ASME Section XI Fourth Ten-Year Interval Inservice Inspection Program Plan, July 1, 2005 to June 30, 2015,” Rev. 0, October 12, 2011, Part 2.4.4.2.1, Subsection IWE Code Examination Category E-C Augmented Examinations, A. included the following statement:

“Per License Renewal Application (LRA) Commitment No. 41, additional augmented inspection in Accordance with ASME Section XI IWE-1240, of the drywell shell adjacent to the sand cushion, is required following indication of any water leakage into the annulus air gap. The additional augmented inspection is to be made by the UT examination method at El. 9’-2” during the refueling outage (RFO) when found, and during the subsequent refueling outages.”

The inspectors determined that Entergy had implemented Commitment 41.

### **Commitment 42 – Bolted Cable Connections**

Commitment 42 provides that by June 8, 2012, Entergy will, “Implement the Bolted Cable Connections Program. Details are provided in LRA Amendment 23, Attachment 7.” The program as described in the LRA was a one-time program to confirm that loosening of bolted connections was not occurring.

The inspectors reviewed the commitment closure summary report and associated work orders to verify that the inspection program demonstrated that the loosening of bolted cable connections was not occurring. The inspectors also interviewed the system engineer and project manager to review any operating experience or implementation issues.

The inspectors noted that the commitment completion review report did not document the technical basis for the sample selection, specifically, the circuit loading and the environment of the connections. Entergy agreed that the technical basis for the sample selection was not clearly documented and initiated CR-PNP-2012-02059 to revise the report with the full documentation. Entergy provided information to the inspectors to demonstrate that the samples selected did include connections with high loading and adverse environments.

The inspectors noted that the 23kV connections were excluded from the samples, based on testing under the inaccessible cable testing program. The inspectors questioned the adequacy of this testing to detect aging effects for the bolted connections. Entergy agreed that the inaccessible cable testing would not be adequate to evaluate the bolted connections and agreed to inspect the connections during the 23kV line replacement prior to the period of extended operation. The inspection of the 23kV connections was completed satisfactorily on May 7, 2012. Because there was only one 23kV line at Pilgrim within the scope of license renewal, this inspection represented all of the 23kV connections.

The inspectors determined that Entergy had implemented Commitment 42.

#### **Commitment 43 – Groundwater Sampling within Structures Monitoring Program**

Commitment 43 provides that before June 8, 2012, Entergy will "Include within the Structures Monitoring Program, provisions to ensure groundwater samples are evaluated periodically to assess the aggressiveness of groundwater to concrete, as described in Attachment E of License Renewal Application Amendment 12 (Letter 2.07.005), prior to the period of extended operation."

The inspectors reviewed the commitment closure summary report, interviewed responsible technical personnel, and held discussions with responsible engineering personnel to verify the resolution and implementation of this enhancement. The inspectors verified that, for tritium, the well locations are shown on Drawing C2. Based on discussions with chemistry personnel, the only existing working well suitable for monitoring the aggressiveness of groundwater to concrete is MW-4, because it is up gradient of the building foundations. This well was sampled and water tested for pH, chlorides, sulfates, and total phosphates on October 27, 2005 and again on June 13, 2006. Based on the results of these tests, the groundwater was determined not to be non-aggressive to concrete structures. The results of the water quality tests were documented in Attachment 2 of the procedure.

The inspectors determined that Entergy had implemented Commitment 43.

#### **Commitment 45 – Groundwater Collection in Torus Room**

Commitment 45 provides that by June 8, 2012, "If groundwater continues to collect on the Torus Room floor, obtain samples and test water to determine its pH and verify the water is non-aggressive as defined in NUREG-1801 Section III.A1 item 1-4, once prior to

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the period of extended operation and once within the first ten years of the period of extended operation.”

The inspectors reviewed the commitment closure summary report, accompanying water sample test results, and Entergy’s processes and procedures to verify the adequacy and technical validity of the established requirements and implementation of test procedures. The inspectors noted that groundwater migration has been highly localized and the migration path has been through vertical joints in the concrete structure. Water sample analyses had demonstrated that the groundwater and the water on the floor within the Torus Bay were non-aggressive. Also, Action Request (A/R) No. 00047038 was written to repeat these tests at a frequency of every five years.

The inspectors determined that Entergy had implemented Commitment 45.

#### **Commitment 46 – Torus Hold-down Bolts**

Commitment 46 provides that by June 8, 2012, Entergy “Inspect the condition of a sample of the torus hold-down bolts and associated grout and determine appropriate actions based on the findings prior to the period of extended operation.” Inspection Report 05000293/2006007 had documented conditions in the Torus Room, in which pooling of water had periodically existed on the floor. To evaluate material conditions under hold-down plates and hardware, some non-functional hardware (for installation purposes only) was removed to evaluate the functional parts on a sample of the hold-down bolts most susceptible to damage due to periodic wetting. Inspection Report 05000293/2011010 documented the review of the hold-down bolt inspections, including photographs of the conditions in 2007 and 2009, and inspected the condition of the hold-down equipment in the torus room. At that time, a condition report (CR-PNPS-2011-02095) was issued to determine the appropriate as-left conditions of the exposed bolts.

The inspectors reviewed the resolution of CR-PNPS-2011-02095. An analysis determined the amount of corrosion did not impact the design function of the bolt, and coupled with the groundwater remediation plan, Entergy concluded the corrosion would not impact the future function of the bolts. The corrective action was closed.

Subsequently, Entergy coated the hold-down struts, including the four they had disassembled with a zinc-oxide paint. The condition of the coating was noted during walk-downs of the area. During this inspection, the inspectors toured the torus room, noting the condition of the hold-downs, the absence of water on the floors, the evidence of prior water ingress, and the bucket placements for sand drain leakage monitoring.

The inspectors determined that Entergy had implemented Commitment 46.

#### **Commitment 47 – Pressure-Temperature (P-T) Operational Curves**

Commitment 47 provides that by September 15, 2007, Entergy “Submit to the NRC an action plan to improve benchmarking data to support approval of new P-T curves for Pilgrim.”

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The action plan to improve benchmarking data to support approval of new P-T curves for Pilgrim was submitted to the NRC on August 23, 2007 and revised by submittal on September 12, 2007. The P-T curves were modified by an amendment to the Pilgrim Technical Specifications on January 26, 2011.

The inspectors determined that Entergy had implemented Commitment 47.

#### **Commitment 48 – Limiting Fluence Values**

Commitment 48 provides that “On or before June 8, 2010, Entergy will submit to the NRC calculations consistent with Regulatory Guide 1.190 that will demonstrate limiting fluence values will not be reached during the period of extended operation.”

By way of Entergy’s January 24, 2010, “Proposed License Amendment to Technical Specifications: Revised P-T Limit Curves and Relocation of Pressure-Temperature (P-T) Curve to the Pressure and Temperature Limits Report (PTLR),” Entergy submitted calculations consistent with Regulatory Guide 1.190 that demonstrated limiting fluence values will not be reached during the period of extended operation.

The inspectors determined that Entergy had implemented Commitment 47.

#### **Commitment 50 – Buried Piping and Tanks Inspection**

Commitment 50 provides that “Buried carbon steel (CS) piping in all in-scope systems except fire protection will be inspected by 12/31/2013, using a direct visual inspection of the entire circumference of at least ten linear feet of exposed pipe. Results not meeting the inspection acceptance criteria will be entered into the PNPS corrective action program for evaluation and corrective actions. Prior the period of extended operation, Entergy will implement the corporate Buried Piping and Tanks Inspection and Monitoring Program which defines the requirements for continuing inspection of buried and underground piping and tanks.”

The inspectors reviewed the commitment closure summary report, corporate program procedure (EN-DC-343, Buried Piping and Tanks Inspection and Monitoring Program, Revision 5), and site engineering procedure. For exposed piping inspections of the station blackout diesel fuel and coolant piping, emergency diesel generator fuel piping and tanks, standby gas treatment piping, and condensate storage tank piping, the inspectors reviewed work orders, inspection reports, UT examination reports, applicable condition reports, acceptance criteria calculations, and preventive maintenance orders. The records demonstrated that sufficient lengths of piping had been inspected. The inspectors also reviewed action plans, soil sample results, and risk evaluations associated with the program.

The inspectors determined that Commitments 1 and 50 had been implemented.

### **Commitment 51 – Structures Monitoring Quantitative Acceptance Criteria**

Commitment 51 provides that Entergy “Enhance the existing Structures Monitoring Program to invoke quantitative acceptance criteria for inspections of concrete structures in accordance with ACI 349.3R, “Evaluation of Existing Nuclear Safety-Related Structures” prior to the period of extended operation”. This commitment was to be fulfilled.

The inspectors reviewed the commitment closure summary report and verified that governing procedure EN-DC-150 had been revised and Revision 2 provided the direct reference to the ACI-349.3R standard. The revised procedure specifically stated in Attachment 9.25, Pre-Screen/Acceptance Criteria under Section 1.1, ‘General’, “Recording criteria presented in Attachment 9.4 [Reinforced Concrete Inspection Checklist] is consistent with first tier criteria from Section 5.1. of ACI 349.3R and screening criteria were consistent with second tier criteria from Section 5.2 of ACI 349.3R. The inspectors noted that Revision 2 of EN-DC-150 had been enhanced to include qualitative acceptance requirements that are consistent with the first and second tier inspection criteria, from Sections 5.1 and 5.2 of ACI 349.3R. These requirements are defined in Attachment 9.25, specifically for the inspection of concrete structures as specified by this commitment.

The inspectors determined that Entergy had implemented Commitment 51.

### **Commitment 52 – Environmental Effects on Metal Fatigue**

Commitment 52 provides that by June 8, 2012, “Entergy will review design basis ASME Code Class 1 fatigue evaluations to determine whether the NUREG/CR-6260 locations that have been evaluated for the effects of the reactor coolant environment of fatigue usage are the limiting locations for the Pilgrim plant configuration. If more limiting locations are identified, the most limiting location will be evaluated for the effects of reactor coolant environment on fatigue usage. PNPS will use the NUREG/CR-6909 methodology in the evaluation of the limiting locations consisting of nickel alloy, if any. This evaluation will be completed prior to the period of extended operation.”

Entergy implemented a series of calculations to determine if the locations specified in NUREG/CR-6260, when evaluated for the effects of environment, were the limiting locations for the plant. An evaluation was performed of all Class 1 locations to confirm each location had a usable margin to the end of the extended period of operation. The CRDM nozzles of the reactor head bottom were more limiting than the vessel head bottom and were evaluated separately. Additional components were identified, outside of those evaluated in NUREG/CR-6260, for fatigue evaluation which included all the components required ASME Section III to calculate fatigue as part of their design. The additional evaluations included: closure flange and transition, feedwater nozzle, feedwater piping at the tee/sweepolet (the inspectors specifically evaluated this fatigue calculation for adequacy), steam outlet nozzle, reactor recirculation inlet nozzle, reactor recirculation outlet nozzle, core spray nozzle, vent nozzle, instrument nozzle, and shroud stabilizer. This evaluation was complete at the time of this inspection and showed there were no locations outside those analyzed in NUREG/CR-6260 that were more limiting

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than those analyzed in NUREG/CR-6260. The analysis also showed the fatigue usage factors, adjusted for environmental effects, are within acceptable limits for 60 and 80 years of operation for all Class 1 components.

The inspectors determined that Commitment 52 had been implemented.

b.2 Other Reviews

Title 10, Code of Federal Regulations § 54.21 "Contents of Application – Technical Information"

"(b) CLB [current licensing basis] changes during NRC review of the application. Each year following submittal of the license renewal application and at least 3 months before scheduled completion of the NRC review, an amendment to the renewal application must be submitted that identifies any change to the CLB of the facility that materially affects the contents of the license renewal application, including the FSAR supplement."

The rule requires an annual update to the application, including the FSAR supplement, to identify any changes to the facility's licensing basis that materially affect the application. A current licensing basis change materially affects the content of the application, when including information about the change in the amendment would reasonably be expected to cause the NRC to come to a different conclusion about the subject of the change, than if the information were not included.

The inspectors reviewed samples of Entergy's updates submitted subsequent to the NRC Safety Evaluation Report Supplement 2, dated June 2011. Although NEI 95-10, Rev. 6, June 2005, Section 7.1, states the end of the staff review is coincidental with the issue of the final SER, the NRC is not bound by this constraint. The NRC directed Entergy to submit annual updates until the Atomic Safety Licensing Board has concluded their review of the admitted contentions. The inspectors verified these actions were being taken by Entergy.

Title 10, Code of Federal Regulations § 54.37 "Additional Records and Recordkeeping Requirements."

"(b) After the renewed license is issued, the FSAR update required by 10 CFR 50.71(e) must include any systems, structures, and components newly identified that would have been subject to an aging management review or evaluation of time-limited aging analyses in accordance with § 54.21. This FSAR update must describe how the effects of aging will be managed, such that the intended function(s) in § 54.4(b) will be effectively maintained during the period of extended operation."

Although the renewed license had not been issued, Entergy was implementing SEP-PNP-LR-001, Rev 000 "10 CFR 54.37(b) Determination," dated March 26, 2012. This procedure required the assignment of a "site renewed license program coordinator," responsible for performing a periodic review of condition reports to identify items which warrant review for 10 CFR 54.37(b) applicability, reviewing operating experience to

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determine if any is subject to 10 CFR 54.37(b), and providing the necessary information for inclusion in the annual UFSAR update.

Prior to the routine implementation of this program under the renewed license, Entergy was performing this review and supplying the requisite information in the annual update. The inspectors reviewed a sample of the annual updates to determine the extent and applicability of the submitted information, and did not identify any concerns.

c. Summary

No findings were identified.

Based on the review of the sampled commitments, the inspectors concluded that Entergy had implemented the commitments or made significant progress in implementing Commitments 20 and 23 pending further needed actions. For the areas that were incomplete, the inspectors noted that actions were being addressed within the Pilgrim corrective action program.

4OA6 Exit Meeting

The inspectors presented the inspection results to Mr. Robert Smith, Site Vice President, and other members of his staff on May 3, 2012. The inspectors noted that NRC followup inspection was planned of the corrective actions taken to implementation shortcomings identified during this inspection. The inspectors confirmed that no proprietary material was taken back to the regional office or discussed at the exit meeting.

ATTACHMENT: SUPPLEMENTAL INFORMATION

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**ATTACHMENT**  
**SUPPLEMENTAL INFORMATION**  
**KEY POINTS OF CONTACT**

Licensee Personnel

R. Smith, Site Vice President  
J. Lynch, Licensing Manager  
F. Mogolesko, License Renewal Team Project Manager  
R. Byrne, Licensing Engineer  
D. Heard, License Renewal Team  
D. Lach, License Renewal Team  
P. Smith, License Renewal Team

**LIST OF DOCUMENTS REVIEWED**

General:

Entergy Letter 2.06.064, LRA Amendment 5, July 19, 2006  
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Entergy Letter 2.11.021, Pilgrim License Renewal Application Annual Update, March 16, 2011  
Status of Regulatory Commitments, April 26, 2011

Commitment 4 (Security Diesel Fuel Tank Sampling)

Commitment Closure Summary Report, May 24, 2010  
EC 15542, Security DG Fuel Tank Modification  
7.8.1, Chemistry Sample and Analysis Program, Rev 54  
PMRQ 50080710-06  
Completed test results for four samples



Commitment 5 (Security Diesel Fuel Tank Monitoring)

Commitment Closure Summary Report, January 25, 2010  
EC 15542, Security DG Fuel Tank Modification  
WO 00204960-01  
CR-PNP-2009-04545  
CR-PNP-2009-04565

2.2.153, Security Diesel Generator and Backup Power System, Rev 12

Commitment 7 (Diesel Fire Pump Inspections)

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8.B.15, Functional Tests of Fire Pumps – P-125, P-140, P-181, Rev 45  
A-16732, Commitment Change Evaluation for Diesel Fire Pump Inspection, Dated 5/21/12  
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8.B.3.2, Fire Hose Station Equipment Inspection – ANI Related, Rev. 28  
RC.07.2029.09, Commitment Closure Summary Resolution for C-9, Dated 8/30/11

Commitment 10 (Fire Sprinkler Testing)

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M218, Sheet 3, P&ID Fire Protection System, Rev 48  
RC.07.2029.10, Commitment Closure Summary Resolution for C-10, Dated 2/13/12  
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Commitment 12 (Heat Exchanger Monitoring)

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Commitment 17 (Non-Environmental Qualification Cables and Connections)

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License Renewal Application Appendix B, Section B.1.29.3, Water Control Structures Monitoring

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Commitment Closure Summary Report, "Resolution for C-35 (RC07-2029.35)" February 28,  
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Commitment 36 (Condensate Storage Tank UTs)

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### LIST OF ACRONYMS

AMP	Aging Management Program
BWR	Boiling Water Reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Project
CLB	Current Licensing Basis
CR	Condition Report
CRD	Control Rod Drive
CUF	Cumulative Usage Factor
FSAR	Final Safety Analysis Report
EDG	Emergency Diesel Generator
EPRI	Electric Power Research Institute
HPCI	High Pressure Coolant Injection
ISI	Inservice Inspection
LRA	License Renewal Application
NEI	Nuclear Energy Institute
RCIC	Reactor Control Injection Cooling
RHR	Residual Heat Removal
TI	Temporary Instruction
UT	Ultrasonic Test