Entergy

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May 11, 2006

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

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

License Renewal Application, Amendment 1

REFERENCE: Entergy letter to U.S. NRC, License Renewal Application, dated January 25, 2006, Letter No. 2.06.003

LETTER NUMBER: 2.06.040

Dear Sir or Madam:

By the referenced letter, Entergy Nuclear Operations, Inc. submitted the License Renewal Application for Pilgrim Nuclear Power Station. Based on recent discussions between industry and the NRC staff, Entergy is providing additional information concerning the drywell shell. The attached information on the drywell shell is provided as Amendment 1 to the license renewal application.

Just prior to the submittal of this letter, proposed license renewal interim staff guidance was published in the Federal Register (May 9, 2006). The NRC proposed guidance, "LR-ISG-01: Plant-Specific Aging Management Program for Inaccessible Areas of Boiling Water Reactor Mark I Steel Containment Drywell Shell," was issued for public comment. The proposed guidance is expected to be finalized by the NRC staff after the comment period.

This letter contains no commitments.

Please contact Bryan Ford, (508) 830-8403, if you have any questions regarding this subject.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 11, 2006.

Sincerely,

Stephen J. Bethay

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DWE/dm
Attachment: Pilgrim Nuclear Power Station Drywell Shell Information (6 pages)

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cc: with Attachment

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Attachment to

Letter Number 2.06.040

Pilgrim Nuclear Power Station Drywell Shell Information

Pilgrim Nuclear Power Station Drywell Shell Information

Purpose

For license renewal, the NRC evaluates the potential for corrosion of the Mark I steel containment drywell shell. This issue previously was the subject of generic NRC communications in the 1980s. Specifically, Generic Letter (GL) 87-05 addressed potential degradation of Mark I drywells due to corrosion. The following provides additional information on the Pilgrim Station drywell shell relative to recent industry experience in this area.

Background

In 1980, the Oyster Creek Station observed water coming from lines that drain water from the annulus region between the drywell wall and the surrounding concrete and the sand cushion region. The water source was initially identified in 1983 as coming from the Drywell-Refueling Cavity bellows drain line gasket. After performing ultrasonic thickness measurements in 1986, Oyster Creek Station reported that corrosion and material loss had occurred to the Drywell Shell in the area of the sand-cushion. This finding led to the issuance of NRC Information Notice 86-99, "Degradation of Steel Containments," Generic Letter 87-05, "Request for Additional Information - Assessment of Licensee Measures to Mitigate and/or Identify Potential Degradation of Mark I Drywells," and Information Notice 86-99 Supplement 1.

The purpose of GL 87-05 was "...to initiate the collection of information of the licensee's current and proposed action to assure the degradation of the Drywell Shell plates adjacent to the sand-cushion has not occurred and to determine if augmented inspections above and beyond those planned by the licensee's are necessary."

In 1995, subsequent to the GL responses, the staff approved the use of ASME Section XI, Subsection IWE (Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Plants) which exempts, in accordance with Subparagraph IWE-1220(b), "embedded or inaccessible portions of containment vessels, parts, and appurtenances that met the requirements of the original Construction Code..." However, Paragraph IWE-1240 establishes criteria for determining the need for augmented examinations.

PNPS Primary Containment Design

PNPS employs a low-leakage pressure suppression system which houses the reactor vessel, the reactor coolant recirculation loops, and other branch connections of the reactor primary system. The pressure suppression system consists of a drywell, a pressure suppression chamber containing a large volume of water, a connecting vent system between the drywell and the pressure suppression chamber, isolation valves, vacuum relief system, containment cooling systems, and other service equipment.

The drywell is a light bulb-shaped carbon steel primary containment structure with a spherical lower portion, 64 feet in diameter, and a cylindrical upper portion 34 feet 2 inches in diameter. The overall height is approximately 110 feet. The drywell is enclosed in reinforced concrete for shielding purposes and to provide additional resistance to deformation and buckling in areas where the concrete backs up the steel shell. Shielding above the drywell is provided by removable, segmented, reinforced concrete shield plugs located on the reactor building refuel floor. The reinforced concrete drywell floor contains the drywell floor drain and equipment drain sumps and supports the reactor pedestal.

The design, fabrication, inspection, and testing of the drywell complies with requirements of the ASME Boiler & Pressure Vessel Code, Section III, Subsection B, Requirements for Class B Vessels, which pertain to containment vessels for nuclear power stations.

Drywell Shell Exterior

The sand cushion at the base of the drywell is designed to provide a smooth transition to reduce thermal and mechanical discontinuities. The sand provides lateral support to the drywell in this region. The sand cushion area is drained to protect the exterior surface of the drywell shell at the sand cushion interface from water that might enter the air gap.

The coating specified for the PNPS drywell shell exterior surfaces was an alkyd-base primer (red lead or zinc chromate). No degradation of this coating in the sand cushion area was noted in 1987 when fiberscopes were used to examine the 4 inch annulus air gap drain lines.

To ensure the drywell shell exterior remains dry during refueling evolutions, the drywell to reactor building bellows assembly separates the refueling cavity filled with water from the exterior surface of the drywell shell. Any leakage through the bellows assembly is directed to a drain system (refueling bellows seal trough drains) which is equipped with an alarm for notification of operators.

The drywell exterior surface is essentially inaccessible for inspection. Surfaces that are accessible for examination include the drywell hemispherical head exterior surfaces and some penetrations in the structure.

Drywell Shell Interior

The majority of the upper portion of the drywell shell interior surfaces are accessible for inspection, except the lower portion of the drywell where it is covered by the concrete drywell floor which provides structural support for the reactor pedestal and other equipment.

The PNPS primary containment system is inerted with nitrogen gas during normal power operations so that oxygen levels are maintained at less than 4%. Inerting with nitrogen provides an atmosphere that is not conducive to corrosion of containment interior surfaces.

Operating Experience and Actions Taken to Prevent Drywell Corrosion

There has been no observed leakage causing moisture in the vicinity of the sand cushion at PNPS and no moisture has been detected or is suspected on the inaccessible areas of the drywell shell. Further, as discussed above, any potential leakage through the refueling bellows assembly is directed to a drain system. Therefore, no additional components have been identified that require aging management review as a source of moisture that might affect the drywell shell in the lower region.

As stated in the response to GL 87-05, PNPS performed UT thickness measurements of the drywell shell in January 1987. The UT thickness measurements were taken at twelve locations directly above the sand cushion region. These measurements detected no loss of wall thickness.

PNPS verified that the annulus air gap drain lines are unobstructed. In 1987, access holes were machined in the drain line elbows on all four drain lines to allow access for remote visual examination using fiberscopes. This inspection determined that the four annulus air gap drains are unobstructed and found no signs of corrosion on visible portions of the drywell surface.

PNPS monitors the annulus air gap drains during every refueling outage.

PNPS performed additional UT thickness measurements adjacent to the sand cushion region at the 9 foot elevation in 1999 and 2001. The sand cushion region of the drywell shell is inaccessible unless concrete is removed. For the examinations in 1999 and 2001, concrete at the periphery of the 9 foot elevation was chipped away to allow UT wall thickness measurements of the drywell shell to be taken at the level of the upper sand cushion. These examinations are destructive in nature and are performed in a high radiation area. The areas were then re-grouted prior to resuming operations. The observed wall thickness readings showed the drywell wall thickness in these areas to be essentially as-built. Based on the following four factors, PNPS removed UT thickness measurements in the sand cushion region from the IWE program after the 2001 outage:

- Satisfactory results from monitoring for leakage from the annulus air gap drains.
- Satisfactory drywell wall thickness at the 9 foot elevation sand cushion region (and upper drywell) after 27 years of operation (as of 1999).
- High radiation exists in areas of sand cushion UT exams.
- The potential for damage to the drywell shell from concrete removal tools used to facilitate the examinations.

<u>Ongoing Actions to Prevent Drywell Corrosion</u>

The following ongoing actions are being taken to prevent and identify drywell corrosion:

- PNPS monitors the four annulus air gap drains twice every refuel outage, once after floodup and again prior to flooddown at the end of the outage. Leakage has never been detected from the annulus air gap drains at PNPS.
- Functional checks are performed each refueling outage on the flow switch associated with the bellows seal leakage monitoring system.
- Drywell interior surfaces are examined for degradation every refueling outage as required by Technical Specification 4.7.A.2.d. Additionally, drywell interior surfaces are examined every other outage in accordance with the PNPS IWE Program. Drywell structures are examined in accordance with ASME Section XI – 1998 Edition with 2000 Addenda, Subsection IWE, Requirements for Class MC

and Metallic Liners of Class CC Components of Light-Water Cooled Plants. Since IWE requirements were mandated in 1996, no areas have been identified that exceeded code acceptance criteria on the drywell interior surfaces during these inspections.

- PNPS inspects the liner drains for the water reservoirs on the refuel floor (e.g., spent fuel pool, dryer/separator pool, and reactor cavity) for leakage. Leakage into the liner drains could be a precursor for water leaks which could wet the drywell shell exterior surface. These drains are examined for leakage after filling the refueling cavity.

- Paragraph IWE-1242 of the ASME XI code states that surface areas likely to experience accelerated degradation and aging require augmented examination. These examinations are included in the PNPS ISI Program along with other containment examinations. The IWE requirements for augmented examination are required by 10 CFR 50.55a.

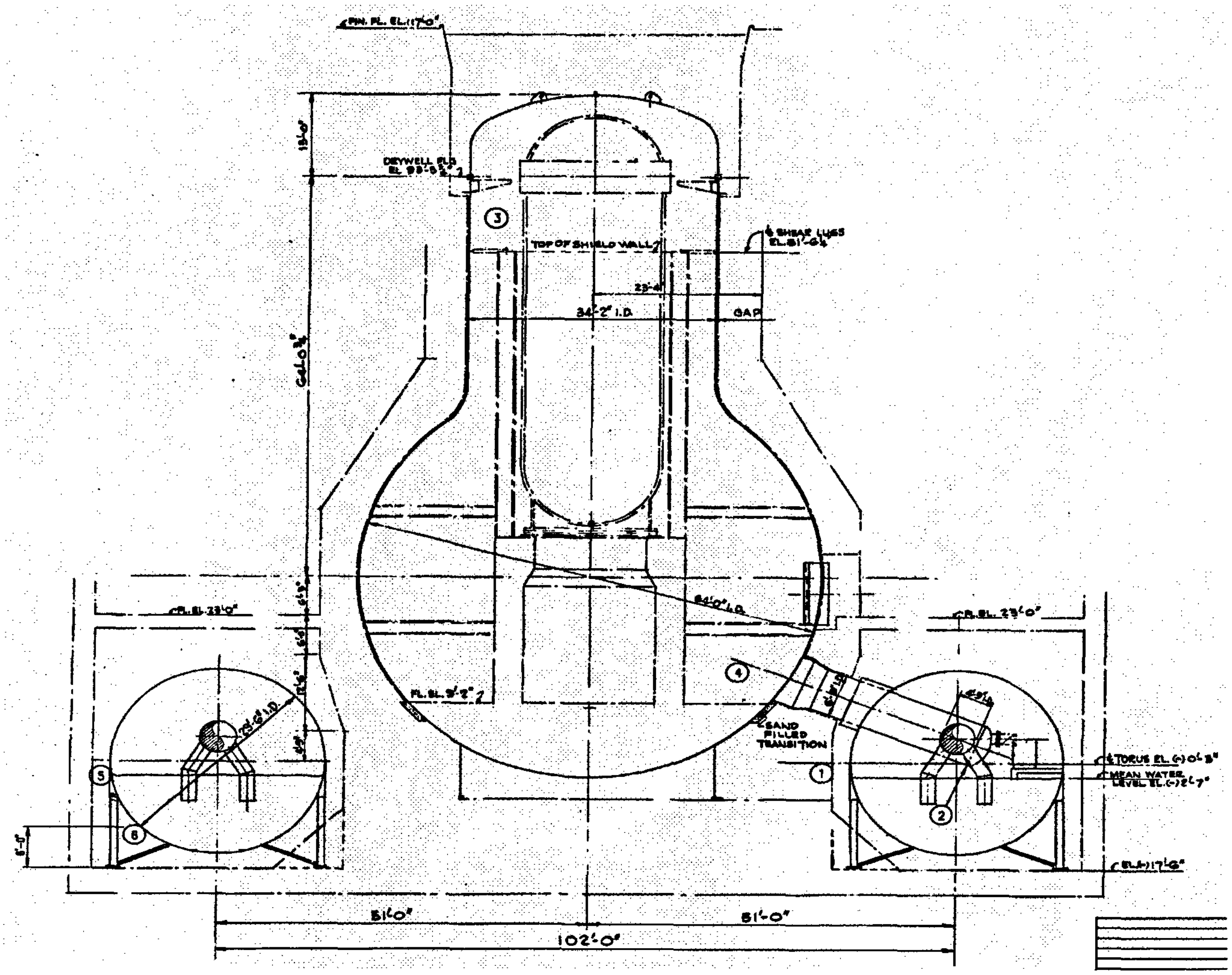
  The code requires owners to identify locations they believe are suspect or potential problem areas for augmented inspection. After a review of PNPS drywell construction methods, PNPS identified various locations for augmented examination. The presence of ethafoam rings left in place at certain elevations of the drywell caused a concern that they could trap and hold leakage from the bellows or fuel pool and cause corrosion of the shell outer surface. For this reason, augmented UT examinations in the upper drywell at elevations 72 feet and 83 feet (four locations at each elevation) were performed in vertical strips to ensure the region of interest was examined. The examinations performed in 1999 and 2001 revealed no degradation of the drywell shell thickness in the upper drywell.

- UT thickness examinations will continue to be performed under the PNPS IWE program at two locations in the upper drywell immediately adjacent to the fuel pool due to the potential for leakage from the fuel pool liner.

- The drywell shell to floor joint is inspected under the PNPS IWE Program.

<u>Conclusion</u>

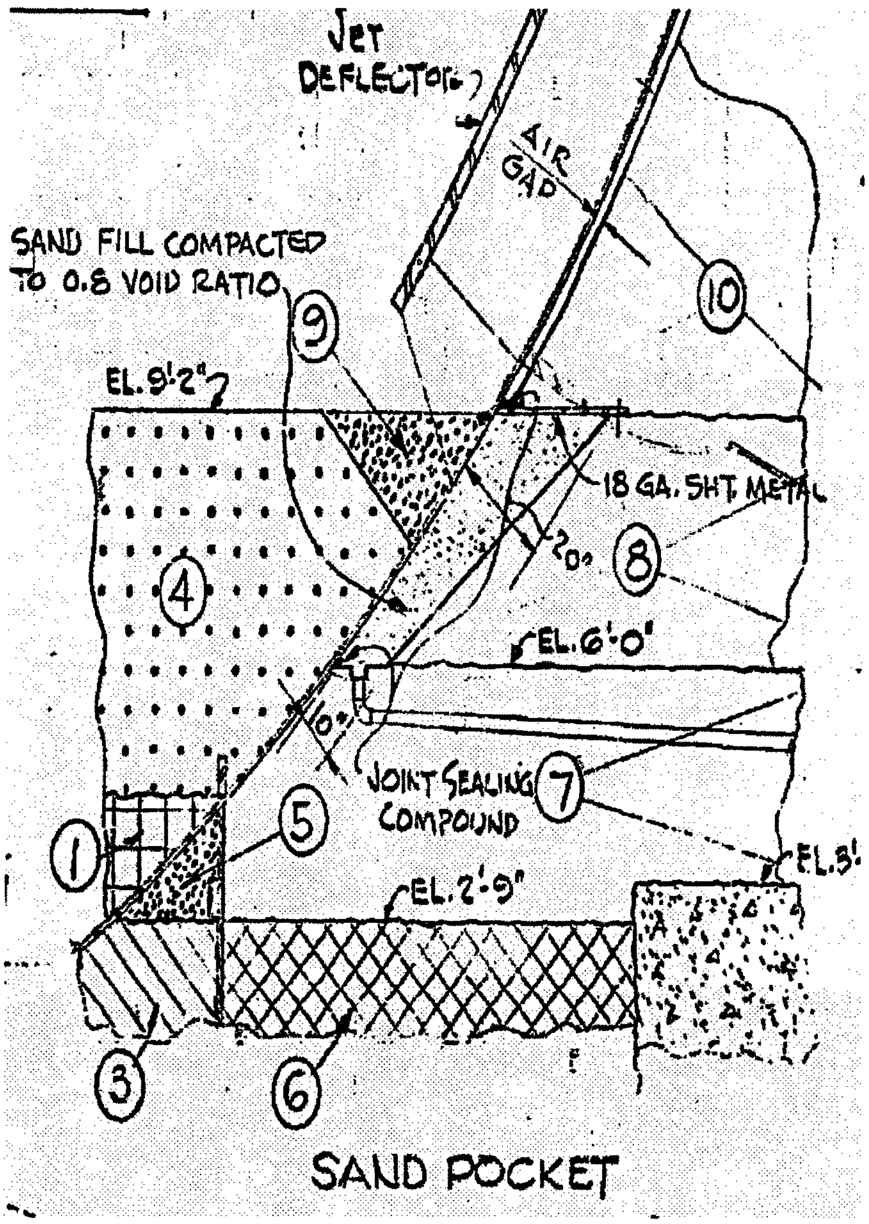
PNPS has effectively addressed the issue of drywell shell corrosion through actions taken in response to GL 87-05 as well as additional actions subsequent to the response to GL 87-05. UT examinations to determine the drywell wall thickness at the sand cushion region and upper drywell indicated no detectable loss of material and hence no discernable corrosion rate. Based on this corrosion rate, no discernable loss of drywell shell thickness is projected through the period of extended operation. The above described ongoing actions to prevent drywell shell degradation provide continuing reasonable assurance of satisfactory drywell shell condition through the period of extended operation.



Taken from ISIIWEAUG1

NOTES:

- (X) DENOTES I.E. INSPECTION POINT NUMBER.
- (1) ANNULUS AIR GAP DRAIN LINES.
- (2) VENT HEADER LOW POINTS (8 PLACES).
- (3) UPPER DRYWELL (EL. 72'-0" & 83'-0") SHELL THICKNESS.
- (4) LOWER DRYWELL (EL. 9'-0") SHELL THICKNESS.
- (5) TORUS SHELL THICKNESS AT MEAN WATER LINE EL. (-) 2'-7" (FROM O.D.).
- (6) TORUS SHELL THICKNESS AT EL. (-) 11'-6" (FROM O.D.).



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