



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

January 16, 2017

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555-0001

SUBJECT: Notification for Information Only – Pilgrim Deviation from BWRVIP-76, Rev.1-A Guidelines

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

REFERENCES

1. BWRVIP-76, Rev. 1-A, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines".
2. BWRVIP-94NP, Rev. 2, "BWR Program Implementation Guidelines".
3. BWRVIP-03, Rev. 18, "Reactor Pressure Vessel and Internals Examination Guidelines".

LETTER NUMBER: 2.17.005

Dear Sir or Madam:

Entergy hereby informs the Nuclear Regulatory Commission (NRC) Staff of a specific deviation from the inspection guidelines described in BWRVIP-76 Rev.1-A (Reference 1), in accordance with BWRVIP-94NP Rev.2 (Reference 2) at Pilgrim Nuclear Power Station (PNPS).

Reference 2 requires notification to the NRC Staff anytime a utility does not implement any portion of an applicable "mandatory" or "needed" BWR Vessel and Internals Project (BWRVIP) guideline that has been approved by the BWRVIP Executive Committee within 45 days of the utility executive concurrence with the deviation disposition.

The deviation documented in the Attachment is a deviation from BWRVIP guidelines that is classified as a "needed" element of the BWRVIP program. The deviation is due to plant configuration interferences that prevent inspection access to selected core shroud vertical welds.

Entergy announced in October 2015 that PNPS will be permanently retired from active service no later than June 1, 2019.

ADD  
NRR

The Attachment describes the deviation from BWRVIP guidelines, the justification for the deviation, and any alternative actions in lieu of the BWRVIP requirements.

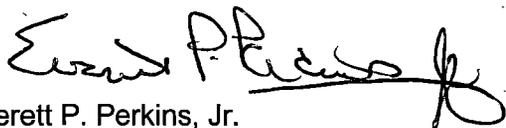
This deviation from the listed BWRVIP guidelines has been reviewed and approved in accordance with Entergy procedures and NEI 03-08 "Guideline for the Management of Materials Issues" guidance. The deviation will remain in effect until the end of operating cycle 22 (projected to be June 1, 2019, when PNPS will be retired from active service).

If you have any questions or require additional information, please contact me at 508-830-8323.

This is a notification of deviation only. No action is being requested from the NRC Staff.

There are no regulatory commitments made in this letter.

Sincerely,



Everett P. Perkins, Jr.  
Regulatory Assurance Manager

EPP/mw

Attachment: BWRVIP Deviation DD-2016-006 Summary

cc:

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NRC Senior Resident Inspector  
Pilgrim Nuclear Power Station

**Attachment**

Letter Number 2.17.005

BWRVIP Deviation DD-2016-006 Summary

(3 Pages)

## **BWRVIP Deviation DD-2016-006 Summary**

### **Guideline Requirement**

Pilgrim is required by BWRVIP-76 Rev.1-A, Section 3.3 to perform either a full volumetric or two-sided EVT-1 visual examination of core shroud vertical welds every 10 years.

### **Deviation**

Pilgrim installed a pre-emptive tie rod repair in 1995 to structurally replace core shroud horizontal welds which had the unintended effect of preventing inspection access to core shroud vertical welds V7 and V8 from the outside surfaces. This request is required because the resulting lack of inspection coverage for welds V7 and V8 constitutes a deviation from BWRVIP-76 Rev.1-A inspection guidelines.

### **Justification for Deviation**

Pilgrim is a BWR-3 design with a repaired Category C core shroud constructed with ASTM A-240 Type 304 stainless steel. The vertical welds in question are 1.5 inches thick, 31.75 inches long and are located in the uppermost cylinder of the core shroud between horizontal welds H1 and H2. The welds are located directly outboard of the Core Spray spargers and top guide assembly.

The plant installed a pre-emptive core shroud repair in 1995 to structurally replace shroud horizontal welds H1 through H10 as shown on drawing M1B50, thereby eliminating the need for inspection of any of the core shroud horizontal welds. Two of the four tie rod assemblies were installed at azimuths 45° and 225° which are the exact azimuthal locations of shroud vertical welds V7 and V8. The welds are located directly behind the core shroud tie rod repair stabilizer support and upper spring assemblies preventing outer diameter (OD -side) inspection access to the welds and to the weld heat affected zones (HAZ). The design specification for the Pilgrim core shroud repair does not contain inspection requirements for V7 and V8 welds as these welds are not design reliant. Placement of the tie rods at these azimuthal locations prevents inspection access to both welds from the core shroud exterior surface.

Access to the inside weld (ID) surfaces on the core shroud ID side is similarly obstructed by the Core Spray spargers with limited access below the spargers due to the obstruction posed by the outer periphery of the top guide assembly. These interferences have prevented attempts to clean the inside surface of the welds and also have prevented the required EVT-1 inspection angle of vision from being obtained which is required for EVT-1 quality examinations as required by BWRVIP-03 guidelines.

The V7 and V8 welds in the upper core shroud cylinder are located above the top of active fuel and are estimated to have an accumulated neutron fluence of  $1.28E19$  n/cm<sup>2</sup> by 2019, a value that is orders of magnitude below the BWRVIP low-fluence threshold value of  $1.0E21$  n/cm<sup>2</sup>. These welds are located outside the beltline region and due to the relatively low neutron fluence are considered less likely to experience Irradiation Assisted Stress Corrosion Cracking (IASCC) during plant life.

Due to the lack of inspection access to the welds and associated heat affected zones, a site-specific evaluation following the guidelines in BWRVIP-76 Revision 1-A was performed in 2013 to re-define the inspection interval for welds V7 and V8. The calculation uses a conservative safety factor of 10 combined with a higher differential pressure across the core shroud wall to account for the uncertainty of the inaccessibility of these welds from the core shroud ID side due to interferences. The higher than normal safety factor also accounts for other potential loads such as seismic, acoustic, etc., as applicable. The analysis determined that the end of inspection interval (EOI) for inspection of welds V7 and V8 occurs in the year 2031 (9 two-year cycles from 2013) confirming that the Pilgrim shroud is a highly flaw tolerant design. The evaluation concluded that there should be no need to inspect vertical welds V7 and V8 for essentially the remainder of current plant life.

Entergy announced in October 2015 that Pilgrim would be shut down and cease commercial operations not later than May 2019, making RFO21 in April 2017 the final Pilgrim refueling outage. The site-specific evaluation clearly demonstrates that even if a postulated crack had initiated immediately after the 2007 EVT-1 exam from the OD surface, it would not grow to an unacceptable size during the 12 years until 2019 when Pilgrim ceases operation given that the calculated EOI is 2031.

The outside surfaces of core shroud vertical welds V7 and V8 were visually inspected in 2007 when the upper sections of the 45° and 225° tie rod assemblies were disassembled and removed for maintenance, allowing unobstructed access to the outside weld surfaces. The EVT-1 examination of both welds obtained 100% coverage with no relevant indications recorded.

No cracking has ever been discovered in any Pilgrim core shroud weld. Pilgrim has an extensive history of shroud inspections dating back to 1995 with no relevant indications by visual or UT methods reported in the examined vertical or ring segment welds. A summary of the most recent inspections of other shroud welds is included below:

- Beltline vertical welds V15, V16, V17 and V18 between H3 & H5 were examined by UT in 2007 obtaining 91-94% coverage and showed no indication of cracking.
- Beltline vertical welds V17 and V18 (between H4 & H5) were examined in 1997 by UT with 80% and 52% coverage obtained, respectively, with no indication of cracking.
- Vertical welds V30 and V31 located beneath the core plate between the H8 and H9 (BWRVIP H6 & H7) welds were examined in 2009 by UT. Results showed no indication of cracking while achieving ~72% coverage.
- Vertical weld V22 located between the H6 and H7 welds in the shroud cylinder adjacent to the core plate was examined in 2009 from the exterior surface using EVT-1 methods when the 135° tie rod was removed for maintenance. This exam achieved 100% coverage and no indications were recorded.

In addition, fleet operating experience shows "very little vertical weld cracking has occurred within the U.S. fleet" as stated in BWRVIP-278, Section 5.3.2.

**Alternative Actions / License Renewal Regulatory Commitment**

Pilgrim performed a plant-specific evaluation in accordance with BWRVIP guidelines and conservatively concluded that it is reasonable to believe that the Pilgrim core shroud V7 and V8 welds will remain structurally sound until the station ceases commercial operation not later than June 1, 2019.

There are no License Renewal Commitments for inspection of core shroud welds.