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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Eric J. Leeds, Director

In the Matter of	)	Docket No. 50-293
	)	
Entergy Nuclear Operations, Inc.	)	License No. DPR-35
	)	
Pilgrim Nuclear Power Station	)	

PROPOSED DIRECTOR'S DECISION UNDER 10 CFR 2.206

1. Introduction

By letter dated July 19, 2010, as supplemented by letter dated August 6, 2010, Ms. Mary Lampert of Pilgrim Watch (the Petitioner), filed a petition pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 2.206, "Requests for Action under This Subpart," to Mr. R. W. Borchardt, Executive Director for Operations, U.S. Nuclear Regulatory Commission (NRC).

Action Requested

The Petitioner requested that the NRC issue a Demand for Information requiring Entergy Nuclear Operations, Inc. (Entergy or the Licensee) to demonstrate that all non-environmentally qualified (non-EQ) inaccessible cables at Pilgrim Nuclear Power Station (Pilgrim) are capable of performing their required function, be it safety or nonsafety-related. The Petitioner further requested that the NRC (i) certify that the location, age, and repair history of all cables (accessible and inaccessible) have been identified, (ii) ensure that the Licensee monitors all cables before continued operation to demonstrate that the cables can perform their design

functions, and (iii) ensure that the Licensee incorporates in its monitoring program, at a minimum, recommendations from certain aging management guidelines and NRC generic guidance. The Petitioner also asked that the NRC commit to verifying, during the license renewal period, Entergy's implementation through routine baseline inspections and to a timely upgrade of the regulatory guidance for maintaining cable qualification and the verification that the cables can perform their design functions.

As the basis of the request, the Petitioner asserted, in part, the following concerns:

- The NRC regulations require that plant owners ensure that electrical wiring is qualified to perform in the environmental conditions experienced during normal operation and during accidents. Pilgrim has no program today, as required by NRC regulations, to ensure operability of the submerged and/or wetted wires.
- Most electrical cables at Pilgrim have been exposed to significant moisture over the 40 years since their initial construction. The wires, and possibly the connections and splices inside conduits, are designed to operate properly only in a dry environment and are not designed to operate in a moist or wet environment. Thus, there is no assurance that these electrical cables will not fail if they are wet, submerged, or previously exposed to moisture.
- Wires degrade with age, and the oldest wires are most susceptible to degradation. Pilgrim is one of the oldest operating commercial reactors in the country, and the majority of the conduits and wires at Pilgrim were installed during the initial construction. There are no existing methods to ensure operability, short of visual inspection or replacing cables with ones designed to operate in a wet or submerged environment.
- As identified in several pertinent sections of Pilgrim's license renewal application (LRA) and safety evaluation report (SER), Pilgrim's aging management program,

for the period 2012-2032, is insufficient and does not provide reasonable assurance to the public. The Petitioner further stated that compliance with the NRC's regulations is intended to provide reasonable assurance that an electrical wire failure will neither initiate an accident nor make an accident more severe. The Petitioner also noted that Pilgrim has a long history of cables being submerged and/or wetted with no verification of the long-term operability that provides reasonable assurance of continued operation of these cables.

Determination for NRC Review under 10 CFR 2.206

On August 9, 2010, the Petitioner and consultants of the Petitioner participated in a conference call with the NRC Office of Nuclear Reactor Regulation's Petition Review Board (PRB) to provide additional explanation and clarify the basis for the petition. The transcript of this meeting is a supplement to the petition and is available under the Agencywide Documents Access and Management System (ADAMS) Accession No. ML102290198.

On December 13, 2010, the Petitioner requested a hearing on a contention related to Entergy's management of inaccessible cables in the Pilgrim license renewal proceeding. The PRB met on January 4, 2011, and determined that, because of the Petitioner's hearing request on December 13, 2010, her 10 CFR 2.206 petition concerns related to inaccessible cables would be held in abeyance until final disposition of the issues in the Pilgrim license renewal adjudicatory proceeding, which is consistent with NRC Management Directive (MD) 8.11, "Review Process for 10 CFR 2.206 Petitions," ADAMS Accession No. ML041770328 (Criteria for Petition Evaluation). The NRC informed the Petitioner of this determination in letters dated February 23 and May 31, 2011 (ADAMS Accession Nos. ML103400692 and ML111160334). Following the issuance of Pilgrim's renewed license on May 29, 2012, the PRB reconvened on June 5, 2012, and recommended returning the petition to the 10 CFR 2.206 process and accepting Ms. Lampert's petition, in part, for NRC staff review. In a letter dated August 2, 2012

(ADAMS Accession No. ML121910227), the NRC informed the Petitioner that the petition was partially accepted for review under 10 CFR 2.206 and was being referred to the Office of Nuclear Reactor Regulation for appropriate action.

All publicly available documents related to the petition can be inspected at the Commission's Public Document Room (PDR) at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, Maryland, 20852 and from the NRC's ADAMS Public Electronic Reading Room on the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. The petition and supplemental letter are under ADAMS Accession Nos. ML102090024 and ML102210411. The NRC MD 8.11 describes the petition review process. People who do not have access to ADAMS or who have problems accessing the documents in ADAMS should contact the NRC PDR reference staff by telephone at 1-800-397-4209, 301-415-4737, or by e-mail to PDR.Resource@nrc.gov.

II. Discussion

The Petitioner raised several concerns to support her request for enforcement action. The NRC staff placed those concerns into three categories: cable reliability and monitoring, wet/submerged environments, and aging management. Each of these is addressed in this section.

A. Cable Reliability and Condition Monitoring

The Petitioner is concerned that Pilgrim does not have a program, as required by NRC regulations, to ensure operability of submerged or wetted wires. The NRC regulations in 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants," require plant owners to ensure that electrical wiring (cables) is designed to function in environmental conditions during normal operation and during accidents. The Petitioner asserted that Pilgrim has a long history of cables being submerged or wetted and is

concerned that there is no verification of the long-term operability that provides reasonable assurance of continued operation of these cables.

The NRC regulations in Criterion XI, “Test Control,” of Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” require licensees to assess the condition of their components; to monitor the performance of structures, systems, and components in a manner sufficient to give reasonable assurance that they are capable of fulfilling their intended functions; and to establish a suitable test program to ensure that all testing necessary to demonstrate that components will perform satisfactorily in-service is identified and performed.

Entergy Nuclear Management Manual EN-DC-346, “Cable Reliability Program,” Revision 3, is the Licensee’s procedure to monitor the condition of power cables at Pilgrim. The objective of the Cable Reliability Program is to ensure the capability of underground medium-voltage (2 kilovolts to 35 kilovolts) and low-voltage (400 Volt to 2 kilovolts) power cables to perform their intended functions. The program includes several testing methods that can be used for condition monitoring and aging assessments for the various medium and low voltage cables. The monitoring techniques and inspection methods that Entergy uses for this procedure are consistent with the methods described in Regulatory Guide (RG) 1.218, “Condition-Monitoring Techniques for Electric Cables Used in Nuclear Power Plants.” The NRC reviewed the Cable Reliability Program and found no deficiencies, as documented in NRC Inspection Report dated July 23, 2012 (ADAMS Accession No. ML12205A176).

B. Wet/Submerged Environments

The Petitioner asserts that most electrical cables at Pilgrim have been exposed to significant moisture over the past 40 years since initial construction of the plant, and that the wires and possibly the connections and splices inside conduits are designed to operate properly only in a dry environment and not in a moist or wet environment. The Petitioner is concerned

that there is no assurance that the wires and splices will not fail if they are wet, submerged, or previously exposed to moisture.

The NRC regulations in 10 CFR 50.49 require that (1) cables important to safety must be designed to meet its intended function for the environment that they are subjected to; and (2) if cables have been exposed to conditions for which they are not designed, licensees must demonstrate, through adequate testing or a condition monitoring program, reasonable assurance that the cables can perform their intended design function for the licensed operating term.

The NRC acknowledges the validity of the issue the Petitioner raises, as stated in RG 1.218, that cables that are not designed to operate in a submerged condition are likely to experience early failures, which can potentially result in significant safety consequences. A submerged condition in this case is referring to long-term cable submergence in water (i.e., greater than 3 consecutive days which recognizes that temporary flooding is possible due to heavy rains or snow melt). This guidance should not be interpreted that all cables are not designed for submergence or permitted to be installed in a wet environment or allowed to be wetted. An example of a wet environment is a direct earth-buried cable where the soil could contain moisture. An example of a wetted environment is a cable that can be subject to high humidity or water spray (like rain). The NRC recognizes that many medium and low voltage power cables, which are commonly used in nuclear power plants, are in fact, designed for wet and wetted environments (strictly as defined in the preceding sentences). The NRC also has described examples of several failures as a result of cable submergence in various NRC generic communications.

The NRC acknowledges that more recent industry experience that the NRC licensees submitted in response to Generic Letter (GL) 2007–01, “Inaccessible or Underground Cable Failures That Disable Accident Mitigation Systems or Cause Plant Transients” (ADAMS Accession No. ML070360665), shows an increasing trend of inaccessible power cable failures

and that the presence of water, moisture, or submerged conditions appear to be the predominant factor contributing to cable failure. As such, the NRC recently updated its inspection guidance on flood protection measures (IP 71111.06, “Flood Protection Measures”) to require inspection of underground bunkers/manholes subject to flooding that contain cables whose failure could disable risk-significant equipment. Based on the inspection guidance, two to four bunkers/manholes should be inspected on an annual basis. Furthermore, NRC inspectors will rotate through the bunkers/manholes until all are inspected; and then the cycle would be recommenced.

Operating Experience

On February 7, 2007, the NRC issued GL 2007-01, which requested licensees to provide failure history information for power cables within the scope of 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” (the maintenance rule), and a description of inspection, testing, and monitoring programs to detect degradation of inaccessible or underground cables supporting systems within the scope of the maintenance rule.

The Licensee responded to GL 2007–01 by letters dated May 3, 2007, and December 9, 2007 (ADAMS Accession Nos. ML071300361 and ML073521293). In these letters, the Licensee reported that it has had one cable failure within the scope of GL 2007–01. The Licensee stated that the cause of the failure was due to installation damage. In its letters dated January 7, 2011, and May 16, 2011, the Licensee further stated that it had conducted a review of more recent operating experience and indicated that there have been no failures found involving medium-voltage or low-voltage inaccessible cables. The Licensee has since researched operating experience in the corrective action program database since its response to GL 2007-01. Based on its review, the Licensee did not identify any failures of in-scope inaccessible 400 Volt to 2 kilovolts cables.

To date, the NRC has not identified any power cable failures at Pilgrim beyond the one failure identified above; however, it has identified two inspection findings there between 2009 and 2011 related to cable submergence. On July 28, 2011, the NRC issued Inspection Report 05000293/2011003 (ADAMS Accession No. ML112092393), which documented the results of a routine inspection at Pilgrim. The NRC inspectors observed partially submerged medium-voltage cables in a manhole and vault containing startup transformer cables. The inspectors found that these cables were not designed to be installed in a submerged environment. The inspectors also noted that no automatic dewatering or drainage systems existed in the manhole to prevent the cables from becoming submerged. They also observed that Entergy had previously identified submerged cables from this manhole on multiple occasions and that corrective actions were insufficient to preclude these cables from being submerged. This finding was issued in NRC Inspection Report 05000293/2010003 (ADAMS Accession No. ML102100150).

Entergy initiated a condition report to address the issue, specified actions to increase the frequency of the dewatering activities to 1-week intervals, and completed its corrective actions to install an automatic dewatering device in the affected manhole. The cables were placed under load during the subsequent refueling outage to demonstrate their ability to handle electrical current. The corrective actions taken and the Licensee's continued implementation of its cable condition monitoring program are acceptable to the NRC.

The NRC determined the findings to be of very low safety significance because the condition did not contribute to the likelihood of a reactor trip or the unavailability of mitigating systems equipment. In the most recent NRC inspection of Pilgrim's flood protection measures affecting cables located in underground manholes, the NRC inspectors monitored Entergy's maintenance inspection and dewatering activities associated with a sample of manholes containing underground safety- and nonsafety-related power cables. The NRC identified no deficiencies or findings (Inspection Report 05000293/2012003 dated July 23, 2012, ADAMS

Accession No. ML12205A176). While the NRC's inspection findings did not identify any specific violations of its requirements, the NRC staff will continue to evaluate cable submergence issues at Pilgrim (and at other nuclear power plants) and to verify compliance with regulations and the adequacy of corrective actions through its reactor oversight process (ROP).

C. Aging Management of Inaccessible Cables

The Petitioner asserts that wires degrade with age, that the oldest wires are the most susceptible to degradation, that Pilgrim is one of the oldest operating commercial reactors in the country, and that the majority of the conduits and wires at Pilgrim were installed during the initial construction. The Petitioner is concerned that there are no existing methods to ensure operability, short of visual inspection or replacement, with cables designed to operate in a wet or submerged environment. The Petitioner also is concerned that Pilgrim's aging management program, from 2012–2032, as identified in several pertinent sections of Pilgrim's LRA[1] and the NRC staff's SER[2], is insufficient and does not provide the public with reasonable assurance.

The NRC generically communicated the issue that the Petitioner described in NRC Information Notice 2010–26, "Submerged Electrical Cables," which documented that operating experience shows that the number of cable failures is increasing with plant age and that cable failures have been occurring within the nuclear power plant's 40-year licensing periods. These cable failures have resulted in plant transients and shutdowns, loss of safety functions and redundancy, entries into technical specification limiting conditions for operation, and challenges to plant operators. In many cases, the failed cables were identified through existing testing practices, but some of the failures might have occurred before the failed condition was identified. Based on this operating experience, the NRC staff determined that the inaccessible or underground power cables are no longer inherently reliable as initially thought during the

[1] License Renewal Application, Pilgrim Nuclear Power Station, dated January 25, 2006 (ADAMS Accession No. ML060300028).
[2] Safety Evaluation Report Related to the License Renewal of Pilgrim Nuclear Power Station (NUREG-1891), dated November 30, 2011 (ADAMS Accession No. ML073241016).

implementation of the NRC's maintenance rule. Therefore, the NRC staff has emphasized that it is necessary to monitor the condition of electric power cables throughout their installed life through the use of cable-monitoring techniques, as described in RG 1.218. The NRC considers the Licensee's Cable Reliability Program, as discussed in Section A of this director's decision, an acceptable procedure for monitoring the condition of its electric power cables.

License Renewal

As documented in the NRC staff's SER, Supplement 2, related to the "License Renewal of Pilgrim Nuclear Power Station," dated June 2011, the NRC evaluated Pilgrim's "Non-EQ Inaccessible Medium Voltage Cable Program," and found it acceptable, as it was consistent with industry and plant-specific operating experience and current NRC staff recommendations. In response to the NRC staff recommendations of Revision 2 to NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," and its review of information provided in industry responses to GL 2007-01, including the NRC and Electric Power Research Institute guidance documents, Entergy elected to enhance its existing aging management program (AMP) for non-EQ inaccessible medium-voltage cables to include monitoring of low-voltage cable (400 Volt to 2 kilovolts) with a license renewal intended function and to increase the minimum frequency of non-EQ inaccessible cable testing and inspections. Entergy's enhancements to its AMP for these cables included commitments to test cables for degradation once every 6 years, to inspect the manholes yearly, and to increase the frequency of testing and inspection based on its evaluation of test results. The Licensee also revised its cable-monitoring program to include condition-based (event-driven) inspections (e.g., as a result of heavy rain or flooding), including the verification of the dewatering system function.

Based on the license renewal review of Entergy's proposed inaccessible cable monitoring program, the NRC staff concluded that the Entergy's program will adequately manage the aging effects of inaccessible power cables (consistent with industry operating

experience) to the extent that there is reasonable assurance that inaccessible power cables at Pilgrim (400 Volt to 35 kilovolts) subject to moisture will be adequately managed during the period of extended operation.

The medium-voltage cable condition monitoring program at Pilgrim was subsequently inspected by the NRC in May 2012. The inspection was documented in NRC Inspection Report 05000293/2012007 (ADAMS Accession No. ML12166A058). Specifically, the inspection of the commitment associated with the cable condition-monitoring program (Commitment 15, License Renewal, Implement the non-EQ Inaccessible Medium-Voltage Cable program as described in LRA Section B.1.19) was acceptable. The NRC's inspection identified no significant findings.

The Petitioner requested several non-enforcement-type actions in the petition. Specifically, she requested that the NRC do the following:

(i) Certify that the location, age, and repair history of all cables (accessible and inaccessible) have been identified.

(ii) Ensure that the Licensee monitors all cables before continued operation to demonstrate that the cables can perform their design functions.

(iii) Ensure that the Licensee incorporates in its monitoring program, at a minimum, recommendations from certain aging management guidelines and NRC generic guidance.

(iv) Verify Entergy's implementation through routine baseline inspections during the license renewal period.

(v) Commit to a timely upgrade of the regulatory guidance for maintaining cable qualification and the verification that the cables can perform their design functions.

The NRC notes that requested action items (iv) and (v) are addressed, in part, by the completion of planned activities following the submission of the petition. Specifically, the NRC's

baseline inspection of license renewal activities under Temporary Instruction (TI) 2516/001 was completed by inspection report dated June 13, 2012.

The NRC determined that the commitment associated with non-EQ inaccessible cables program was implemented and inspected with no finding of significance identified, thereby completing requested action item (iv). Additionally, NRC RG 1.218, issued in April 2012, gave specific guidance on condition monitoring of cables. Therefore, requested action item (v) is addressed.

In summary, while the NRC staff acknowledges that the Petitioner presents valid points to support her concerns, the NRC has previously identified the generic issues raised and has documented them in numerous NRC generic communications (e.g., IN 2002-12, GL 2007-01, IN 2010-26, RG 1.218). Specifically, in terms of addressing these issues at Pilgrim, the NRC staff has concluded that the Licensee's programs will adequately manage the aging effects of inaccessible power cables to give reasonable assurance that cables subject to moisture will be adequately managed during extended operation. The NRC follows existing regulatory processes, policies, and programs (for example, its reactor oversight process) to verify that the Licensee properly implements these approved programs. For the performance deficiencies and inspection findings that the NRC identified at Pilgrim, the agency will continue to monitor the progress of the Licensee's completion of corrective actions through planned inspections consistent with the NRC's ongoing ROP.

III. Conclusion

Based on the discussion above, the Office of Nuclear Reactor Regulation has denied the Petitioner's request to issue a Demand for Information to require Entergy to demonstrate that all inaccessible cables at Pilgrim are capable of performing their functions. The Office has also denied the Petitioner's request for the NRC to take certain actions to demonstrate that accessible and inaccessible cables can perform their design functions. These actions included

requests for NRC to certify that (1) all cables have been identified as to their location, age, and repair history, (2) all cables are monitored by the Licensee prior to continued operation, and (3) the Licensee's monitoring program incorporates at a minimum, recommendations for certain aging management guidelines and NRC generic guidance. As explained above, the NRC staff has determined the that the Licensee's programs for cable condition monitoring and managing aging effects of inaccessible power cables have been properly implemented, to the extent that there is reasonable assurance that cables subject to moisture will be adequately managed during the period of extended operation. The NRC did not identify any violations of regulatory requirements during its review. Based on the above, enforcement action as requested by the Petitioner is not warranted.

As provided for in 10 CFR 2.206(c), a copy of this Director's Decision will be filed with the Secretary of the Commission for the Commission to review. The Decision will constitute the final action of the Commission 25 days after the date of the Decision, unless the Commission, on its own motion, institutes a review of the Decision within that time.

Dated at Rockville, Maryland, this day of 2013.

FOR THE NUCLEAR REGULATORY COMMISSION

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation