June 28, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
Entergy Nuclear Operations, Inc.	)	Docket No. 50-293-LR
	)	
(License Renewal for Pilgrim Nuclear Power Station)	)	

AFFIDAVIT OF DR. JAMES A. DAVIS CONCERNING ENTERGY'S MOTION FOR SUMMARY DISPOSITION OF PILGRIM WATCH CONTENTION 1

I, James A. Davis, do hereby state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission ('NRC") as a Senior Materials Engineer in the Office of Nuclear Reactor Regulation ("NRR"), Division of License Renewal. Since November 2005, I have served as an Audit Team Leader and as an audit team member for license renewal audits. Prior to joining the Division of License Renewal, I was the lead researcher on steam generator issues in the Materials Engineering Branch of the Office Nuclear Regulatory Research and a technical reviewer in the Materials and Chemical Engineering Branch of NRR, Division of Engineering, responsible for conducting reviews of coating issues, corrosion of metals, service water issues, threaded fasteners, and license renewal. I have worked on coatings and corrosion control since 1968 and have worked on coating issues in nuclear facilities for the past sixteen years at the NRC. A copy of my professional qualifications is attached.

2. As part of my official duties, I was an Audit Team Leader for the license renewal safety audit at Pilgrim Nuclear Power Station (Pilgrim or PNPS). I also reviewed the License Renewal Application (LRA) including the following aging management programs: B.1.2; "Buried

Pipe and Tanks Inspection;" B.1.3, "BWR Control Rod Return Line;" B.1.4, "BWR Feedwater Nozzle;" and "Identification of TLAAs and Exemptions." I also prepared portions of the Safety Evaluation Report With Open Items Related to the License Renewal of Pilgrim Nuclear Power Station (March 2007) (SER), specifically, B.1.2, "Buried Piping and Tanks Inspection," B.1.3, "BWR Control Rod Drive Return Line," and B.1.4, "BWR Feedwater Nozzle."

3. The purpose of this affidavit is to respond to Entergy's Motion for Summary Disposition of Pilgrim Watch's Contention 1 (Motion) and accompanying Statement of Material Facts, filed June 8, 2007, by Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc. (collectively, Entergy).

4. I have reviewed Entergy's Motion, and the attachments. As stated in paragraph 2, I have reviewed the LRA. I have also reviewed relevant answers to Requests for Information (RAIs), and other NRC staff (Staff) and applicant documents related to the subject matter of Contention 1.

5. Contention 1 states:

> The Aging Management Program proposed in the Pilgrim Application for license renewal is inadequate with regard to aging management of buried pipes and tanks that contain radioactively contaminated water, because it does not provide for monitoring wells that would detect leakage.

6. On the basis of my review of Entergy's Motion and attachments, the LAR, and the documents referred above, and my knowledge of piping systems and the behavior of coatings on buried piping from my work at the NRC, in the coating industry, and on consensus coating standards committees such as ASTM D-33, "Protective Coatings for Power Generation Facilities," National Association of Corrosion Engineers Technical Practices Committee on Coatings for Underground Piping, American Water Works Association Technical Advisory Committee on Underground Coatings, I am satisfied that Entergy has demonstrated that the

effects of aging of underground pipes and tanks that may contain radioactively contaminated water will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis (CLB) for the period of extended operation, as required by 10 C.F.R. § 54.21(a)(3). I am also satisfied that the Statement of Facts submitted in support of Entergy's Motion is correct, except as noted below.

7. I agree with material facts 1, 2, and 3 because they describe the license renewal process and are just intended for general background.

8. Material fact 4 states that leakage of radioactive liquid from buried piping and tanks is not a design basis event that could cause accident consequences. I agree.

9. I agree with material fact 5 which states that preventing radioactive liquid leakage from buried pipes and tanks is not an intended safety function or other license renewal function. Rather, it is a current operating issue and, therefore, is not in scope of license renewal.

10. Material facts 6, 7, and 8 provide correct information regarding which buried pipes and tanks are in scope for license renewal. I agree that the condensate storage system is the only system within license renewal scoping criteria that contains radioactive liquid, and that the salt service water system could contain radioactive liquid, but it is unlikely because it is designed to contain only non-radioactive water.

11. Material facts 9-16 describe the buried pipes and tanks at Pilgrim and identify which ones would not contain radioactive materials and which ones could. I agree with Entergy's identification of the relevant buried pipes and tanks.

12. Material fact 17 states the Aging Management Programs (AMPs) that are used to manage the effects of aging for buried pipes and tanks are the Buried Piping and Tanks Inspection Program, the Water Chemistry Control-BWR Program, the Service Water Integrity Program, and the One-Time Inspection Program. I agree that all of these programs are

recommended to manage the effects of aging for buried piping and tanks. The Generic Aging Lessons Learned (NUREG-1801, Volume 2, Revision 1) (GALL) Report recommends the Buried Piping and Tanks Inspection Program or Buried Piping and Tanks Surveillance Program for monitoring the outside of buried piping and tanks. GALL recommends the Water Chemistry Control-BWR Program, the Service Water Integrity Program, and the One-Time Inspection Program for monitoring the inside of buried piping and tanks. The Staff concluded in the SER that the AMPs that Entergy will be using to manage aging of the buried pipes and tanks are consistent with GALL (SER Section 3.0.3.3.6, "Water Chemistry Control-BWR Program,") and consistent with GALL with exceptions or enhancements (Section 3.0.3.2.8 "One-Time Inspection," and Section 3.0.3.2.16, "Service Water Integrity Program").

13. Material fact 18 provides a definition of the AMPs as applied to buried pipes and tanks and I agree with the assessment.

14. As stated in material fact 19, the Buried Piping and Tanks Inspection Program manages corrosion of the outside of the buried piping and tanks in contact with a soil environment. The outside surface of the piping and tanks are coated to control corrosion caused by contact with soil. The Buried Piping and Tanks Inspection Program ensures that the coating remains intact and looks for evidence of corrosion of the piping and tanks external surfaces. I agree.

15. Material fact 20 states that preventive measures employed at Pilgrim for buried pipes and in accordance with standard industry practice for installing external coatings and wrappings. During the audit and review, I reviewed the external coatings and wrappings procedures and found that they follow standard industry practice.

16. Material fact 21 states that industry practice has shown that properly applied coatings will prevent corrosion of the piping as long as the soil is not extremely aggressive (as

Entergy states is not the case at Pilgrim) or unless there is damage during application of the coating and handling of the pipe. During my many years working in the pipeline industry and working on many pipeline coating standards committees, I have found this to be an accurate statement.

17. In material facts 22 and 23, Pilgrim states that the operating experience at Pilgrim indicates that the coatings are performing as expected. During the aging management program audit at Pilgrim, I reviewed the operating history for buried piping and tanks and concluded that the coatings were performing as expected. *See* SER at Section 3.0.3.2.1.

18. Entergy stated in material fact 24 that the condition of the buried piping and tanks will be established within the 10 years before entering the period of extended operation and during the first 10 years of extended operation. The condition assessment will be conducted using either a focused inspection, or the coatings will be assessed during maintenance activities. Entergy has committed to conducting these assessments as part of the LRA and has put this commitment in their commitment tracking system which is periodically reviewed during regional inspections. In material facts 25 and 26, Pilgrim stated that the frequency of inspections at Pilgrim is consistent with industry experience. I agree that the frequency of inspections at Pilgrim is consistent with the GALL report recommendations, which is acceptable to the Staff as stated in the GALL report, Page 3-37. *See also* SER at Section 3.0.3.2.1

19. Material facts 27-30 and 35-36 discuss additional AMPs that are recommended in the GALL Report for control of internal corrosion of buried piping and tanks including the Water Chemistry Control Program-BWR, the Service Water Integrity Program, and the One-Time Inspection Program. These programs were reviewed during the audit and review and were found to be acceptable. These programs are discussed in the SER, pages 3-34, 3-93, and 3-128.

20. In material fact 31, Entergy states that, “The purpose of AMPs implemented under 10 C.F.R. Part 54 is to ensure that the intended functions of in-scope systems and components, as identified in the scoping criteria of 10 C.F.R. § 54.4, are maintained for the period of extended operation.” While the statement is correct, there is an additional purpose of AMPs: that is to manage any effects of aging identified for the period of extended operation so that the intended functions are maintained for the period of extended operation.

21. In material facts 32 to 34, Entergy discusses the objective and purpose of the buried pipes and tanks AMP, which is to maintain the pressure boundary integrity of the buried pipes and tanks, and not to monitor or detect radioactive leaks that do not affect the intended license renewal functions or protect groundwater from contamination. I agree with Entergy because any radioactive leaks are current operating issues that do not fall within the scope of license renewal.

22. Material fact 37, points out, correctly, that Pilgrim is a boiling water reactor, and the spent fuel pool is above grade. Thus, leaks from the spent fuel pool would be detected by plant personnel. Any water that leaks from the spent fuel pool would not come into contact with the soil because of its location inside containment. Therefore, possible leaks from the spent fuel pool are unrelated to underground piping.

23. Material facts 38-42 discuss events at other nuclear power plants that resulted in radioactive contamination and why these events either are not related to corrosion of buried piping and tanks as a result of contact with soil, or do not apply to Pilgrim because they do not have similar components. Entergy’s analyses of these events seem reasonable and I agree with them

24. Material fact 43 states that review of operating experience for the Pilgrim license renewal application identified no occurrences of degraded buried piping containing radioactively

contaminated water. The staff reviewed the operating experience during the license renewal audits and did not uncover any occurrences of degraded buried piping containing radioactively contaminated water. *See* SER at Section 3.0.3.2.1.

25. Material fact 44 discusses NRC Bulletin 88-05 which alerted utilities to potential counterfeit and substandard pipe fittings and flanges. Entergy stated that the previous owner and operator identified, located, and remediated, as appropriate, any counterfeit and substandard pipe fittings and flanges at PNPS. The NRC issued Bulletin 88-05, which required a written response from each owner and operator of each operating nuclear power plant. The responses were reviewed and approved by the staff. PNPS responded to the bulletin and the response was accepted by the staff. Since this issue has been resolved by the staff, it is not a license renewal issue.

27. In sum, the Staff reviewed the AMPs that Entergy has made applicable to the buried pipes and tanks and found them to be acceptable. The Staff also reviewed the operating history of the buried pipes and tanks and performed an onsite audit. The Staff concluded that Entergy has demonstrated that the effects of aging of underground pipes and tanks that may contain radioactively contaminated water will be adequately managed so that the intended

function(s) will be maintained consistent with the current licensing basis (CLB) for the period of extended operation, as required by 10 C.F.R. § 54.21(a)(3).

/RA/

James A. Davis, PhD

Executed in Rockville, MD
this 28th day of June, 2007

James A. Davis, Ph.D
Statement of Professional Qualifications

CURRENT POSITION:

Senior Materials Engineer	Division of License Renewal, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Rockville, MD

EDUCATION:

B. Met. E., The Ohio State University, 1965, Metallurgical Engineering
M.S., The Ohio State University, 1965, Metallurgical Engineering
Ph.D., The Ohio State University, 1968, Metallurgical Engineering

SUMMARY:

over 39 years of experience in material engineering with over 20 years of experience in the nuclear power industry. Significant experience in the following areas:

- Materials Engineering
- Corrosion and Control
- Protective Coatings and Linings
- Welding and Special Repair Processes
- License Renewal
- Nuclear Facilities Audits
- Allegations
- Reviews of Navy Submarine Power Plant Designs
- Quality Assurance
- ASME Code Committees
- ASTM D-33 Committee on Coatings for Power Generation Facilities

EXPERIENCE:
U.S. Nuclear Regulatory Commission, 11/11/1990 - Present

11/13/2005 to Present - Senior Materials Engineer, Division of License Renewal, Office of Nuclear Regulatory Research

- Audit Team Leader for the license renewal safety audit at the Indian Point Nuclear Power Plant

- Backup Audit Team Leader for the license renewal safety audit at the Wolf Creek Generating Station

- Audit Team Leader for the license renewal safety audit at the Pilgrim Nuclear Power Station

- Audit Team Member for the license renewal safety audit at the Oyster Creek Generating Station

- 12/15/2001 - 11/13/ 2005 – Senior Materials Engineer in the Division of Engineering Technology, Office of Nuclear Regulatory Research

- Program Manager on the Steam Generator Tube Integrity Program overseeing work conducted at Argonne National Laboratory

- Acting Program Manager for Non-Destructive Examination research at Pacific Northwest National Laboratory

11/11/1990 - 12/15/2001 - Technical Reviewer in the Materials and Chemical Engineering Branch

I was a technical reviewer in the Chemical Engineering and Metallurgy Section of the Division of Engineering, the Office of Nuclear Reactor Regulation.

- Coatings for nuclear power plants,

- License renewal for Calvert Cliffs, Oconee, Arkansas Nuclear One, Hatch, and Turkey Point.

- I was responsible for all threaded fastener issues (such as stress corrosion cracking, boric acid corrosion, and fatigue),

- chemical decontamination,

- Boiling Water Reactor internals cracking,

- pump and valve internals cracking,

- pipe integrity issues,

- corrosion behavior for dry cask storage, and interaction of coatings with spent fuel water,

- I coordinated the responses to a generic letter on containment coatings for nuclear power plants.

- The NRC representative to ASTM D-33 on coatings for power generation facilities.

- Member of the Board of Directors for the National Board of Registration for Nuclear Safety Related Coating Engineers & Specialists.

- Member of ASME on Welding and Special Repair Processes.

- Member of an Augmented Inspection Team at Palisades on fuel handling problems, Point Beach on the hydrogen burn as a result of interactions between borated water and the inorganic Zinc coating during dry cask loading operations and Davis-Besse on the Boric acid corrosion of he vessel head.

- Contract Technical Monitor and Project Officer for numerous contracts at Brookhaven National Labs.

- Technical reviewer for the design of the Navy Seawolf Submarine and the Virginia Class Submarine

- Reviewer on the DOE project to produce tritium in a commercial reactor (Watts Bar

- Numerous presentations to senior NRC management including the Chairman, the Executive Director for Operations, the Committee to Resolve Generic Issues, and the Advisory Committee on Reactor Safety and Safeguards.

- Testified before Representative Dingle's staff on the safety of fasteners in nuclear power plants as a result of concerns raised by a private citizen. I convinced his staff that there is no safety issue because of the redundant design of mechanical joints, the fact that the joints will leak before they break, and that the joints are inspected every refueling outage

Polyken Division of the Kendall Company. Senior Research Associate, 1981 – 1990:

Responsible for Technical Marketing for the pipeline coating division providing technical data and reports to domestic and international customers. Company representative to the National Association of Corrosion Engineers, the American Water Works Association coatings committees, and ASTM coating committees.

Arthur D. Little, Senior Consultant, 1979 - 1981:

Consultant to DOE on Defense Nuclear Waste issues and Waste Tank corrosion issues. Consultant on numerous commercial contracts on corrosion, coating, metallurgical, and plating issues.

Allied Tube and Conduit Corp., Director of Research, 1978-1979:

Responsible for research and development for metallurgical tube forming, welding, chemical cleaning of steel, galvanizing, surface treatment and coating of electrical conduit, fence posts, and specialty tubing. Responsible for Quality Assurance and Process Control.

Allegheny Ludlum Steel Corp., Research Specialist, 1976-1978:

Responsible for customer service for use of stainless steels in corrosive service. Responsible for conducting failure analysis. Conducted research on corrosion mechanisms for stainless steels.

Bell Aerospace Company, Senior Research Scientist, 1970-1976:

Program Manager on numerous Navy sponsored programs involving corrosion of aluminum alloys, stainless steels, and titanium alloys in high velocity sea water for the Navy's high performance ships program. Conducted research on corrosion fatigue, stress corrosion, and fouling in sea water. Conducted research on the compatibility of rocket fuels and oxidizers with fuel handling equipment.

U.S, Steel Corporation, Senior Research Engineer, 1968-1970:

Conducted research on the mechanism of pitting/crevice corrosion, stress corrosion cracking, hydrogen embrittlement, and intergranular corrosion using electrochemical techniques, transmission electron microscopy, optical microscopy, and scanning electron microscopy.