

June 9, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
Entergy Nuclear Generation Co. and)	
Entergy Nuclear Operations, Inc.)	Docket No. 50-293-LR
)	
(Pilgrim Nuclear Power Station))	ASLBP No. 06-848-02-LR

NRC STAFF PROPOSED FINDINGS OF FACT AND
CONCLUSIONS OF LAW, AND ORDER IN THE FORM OF AN INITIAL DECISION

I. INTRODUCTION

1. This initial decision rules on all outstanding issues in this 10 C.F.R. Part 2, Subpart L proceeding concerning the contention challenging the Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc. (collectively, "Entergy" or "Applicant") application for renewal of the operating license for the Pilgrim Nuclear Power Station ("Pilgrim") in Plymouth, Massachusetts. The proposed renewal would authorize the facility to operate 20 years beyond its current operating license expiration date of June 8, 2012. Intervenor Pilgrim Watch sponsored a contention challenging the Applicant's aging management programs ("AMPs") for certain buried pipes and tanks on the grounds that these AMPs did not provide for monitoring wells, which Pilgrim Watch contended were necessary to render the AMPs adequate. The Board modified and admitted this contention.

2. After considering all of the evidence in this proceeding, we find that the record shows, contrary to Pilgrim Watch's contention as admitted by the Board, that Entergy has met its burden of showing that the AMPs for those buried pipes within the scope of the admitted contention are adequate to manage the effects of aging during the proposed period of extended operation.

II. BACKGROUND

A. Procedural History

3. On January 25, 2006, Entergy filed an application to renew its operating license for Pilgrim.¹

4. The NRC published a notice of receipt of the application on February 6, 2006.² In response to the subsequent notice of docketing of the application and notice of opportunity for a hearing published in the *Federal Register*,³ Pilgrim Watch filed a petition to intervene in this matter on May 25, 2006, submitting five contentions for consideration by the Board.⁴ On May 26, 2006, the Attorney General for Massachusetts also filed a petition to intervene containing one contention.⁵

¹ Entergy Nuclear Operations, Inc., License Renewal Application – Pilgrim Nuclear Power Station (January 25, 2006) (Agencywide Documents and Access Management System (“ADAMS”) Accession No. ML060300028).

² Entergy Nuclear Operations, Inc.; Notice of Receipt and Availability of Application for Renewal of Pilgrim Nuclear Power Station Facility Operating License No. DPR-35 for an Additional 20-Year Period, 71 Fed. Reg. 6,101 (Feb. 6, 2006).

³ Entergy Nuclear Operations, Inc., Pilgrim Nuclear Power Station; Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding Renewal of Facility Operating License No. DPR-35 for an Additional 20-Year Period, 71 Fed. Reg. 15,222 (Mar. 27, 2006).

⁴ Request for Hearing and Petition to Intervene by Pilgrim Watch (May 25, 2006).

⁵ Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene with Respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plant Operating License and Petition for Backfit Order Requiring New Design Features to Protect Against Spent Fuel Pool Accidents (May 26, 2006). The Town of Plymouth also requested to participate in the proceedings and, in accordance with 10 C.F.R. § 2.315(c), the Board granted the Town's request. See Request of the Town of Plymouth to Participate as of Right Under 2.315(c) (Jun. 16, 2006); Order and Notice (Regarding Oral Argument and Limited Appearance Statement Sessions) (unpublished) (Jun. 21, 2006). The Town of Plymouth has not, however, chosen to participate substantively in the litigation over the sole contention currently admitted in this proceeding, although the Town's representative did attend the evidentiary hearing.

5. In LBP-06-23, 64 NRC 257 (2006), we rejected the Massachusetts Attorney General's petition to intervene⁶ but granted that of Pilgrim Watch, admitting two of Pilgrim Watch's proposed contentions. The first of these contentions, designated Contention 1, as modified and admitted by this Board, reads:

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.⁷

The second Pilgrim Watch contention, which we admitted in limited form, challenged the Severe Accident Mitigation Analysis in Entergy's Environmental Report.⁸ We later dismissed this contention, however, via summary disposition.⁹ Thus, only Contention 1 remained to be litigated.

6. On June 8, 2007, Entergy filed a "Motion for Summary Disposition of Pilgrim Watch Contention 1" ("SD Motion").¹⁰ The Staff filed a response supporting the SD Motion,¹¹

⁶ See *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), LBP-06-23, 64 NRC 257, 288-300 (2007). The Massachusetts Attorney General's appeal of this decision was also rejected. See *Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-07-03, 65 NRC 13 (2007).

⁷ *Pilgrim*, LBP-06-23, 64 NRC at 315.

⁸ *Id.* at 341.

⁹ See *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), LBP-07-13, 65 NRC 211 (2006). Pilgrim Watch sought interlocutory Commission review of this contention dismissal, see Pilgrim Watch Brief on Appeal of LBP-07-13 Memorandum and Order (Ruling of [sic] Motion to Discuss [sic] Petitioner's Contention 3 Regarding Severe Accident Mitigation Alternatives) (Nov. 13, 2007), but the Commission denied this request. *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-08-02, 67 NRC ____ (Jan. 15, 2008) (slip op. at 1).

¹⁰ Entergy's Motion for Summary Disposition of Pilgrim Watch Contention 1 (June 8, 2007).

¹¹ NRC Staff Response To [SD Motion] (June 28, 2007).

while Pilgrim Watch opposed it.¹² This Board denied the SD Motion on October 17, 2007, finding a “genuine dispute on the central and material issue of whether those Pilgrim [AMPs] that relate to relevant buried pipes and tanks are adequate on their own, without need of any leak detection devices (Intervenors propose monitoring wells), to assure that the pipes and tanks in question will perform their intended functions and thereby protect public health and safety.”¹³ The SD Order clarified that the issue remaining before us was

whether or not monitoring wells are necessary to assure that the buried pipes and tanks at issue will continue to perform their safety function during the license renewal period — or, put another way, whether Pilgrim’s existing AMPs have elements that provide appropriate assurance as required under relevant NRC regulations that the buried pipes and tanks will not develop leaks so great as to cause those pipes and tanks to be unable to perform their intended safety functions.¹⁴

The SD Order also clarified certain issues. For example, it stated that “prevention of leaks *per se* is not a stated objective of any relevant aging management program.”¹⁵ A “clear goal of an AMP,” meanwhile, is the “prevention of an aging-induced leak large enough to compromise the ability of buried piping or tanks to fulfill their intended safety function.”¹⁶ Lastly, the SD Order listed certain “matters...not in dispute” (specifically, the health effects of radioactive leaks, as well as “any leakage from the spent fuel pool”), and stated that “leakage events at other plants are not directly relevant to the issue at hand.”¹⁷

¹² Pilgrim Watch Answer Opposing [SD Motion] (June 27, 2007).

¹³ *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), LBP-07-12, 66 NRC 113, 128 (2007) (“SD Order”).

¹⁴ LBP-07-12, 66 NRC at 129.

¹⁵ *Id.*

¹⁶ *Id.*

¹⁷ *Id.* at 129-30. Entergy subsequently filed a motion for reconsideration of the SD Order (continued. . .)

7. On December 19, 2007, this Board issued an Order (“Scheduling Order”) that both revised the hearing schedule and responded to a pair of motions filed by Pilgrim Watch.¹⁸ In this Scheduling Order, we advised the parties that “[o]ngoing monitoring is not within the scope of this proceeding.”¹⁹ We also further clarified that “[t]he single admitted contention relates to whether or not Applicant’s AMPs are sufficient to enable it to determine whether or not certain buried pipes and tanks are leaking at such great rates that they cannot satisfy their respective intended safety functions.”²⁰ In addition, the Scheduling Order stated that, in the absence of any express indication by Entergy that it plans to utilize monitoring wells to detect whether the aforementioned large leaks are occurring, “information related to monitoring wells is irrelevant to the issues at hand before this Board.”²¹

8. On December 21, 2007, Pilgrim Watch filed a motion for clarification, which was purportedly associated with the Scheduling Order.²² This Clarification Motion sought, among other things, to expand the scope of the admitted contention to include all buried pipes and

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“Entergy’s Motion for Reconsideration of LPB-07-12 [sic]” (Oct. 29, 2007) (“Reconsideration Motion”), which the Staff supported, NRC Staff Response to [Reconsideration Motion] (Nov. 8, 2007), and which Pilgrim Watch opposed, Pilgrim Watch’s Reply to [Reconsideration Motion] (Nov. 6, 2007). The Board denied this Reconsideration Motion on November 14, 2007. Memorandum and Order (Ruling on Entergy’s Motion for Reconsideration of [LBP]-07-12) (Nov. 14, 2007) (unpublished) at 4.

¹⁸ Order (Revising Schedule for Evidentiary Hearing and Responding to Pilgrim Watch’s December 14 and 15 Motions) (Dec. 19, 2007) (unpublished). Judge Young filed a separate statement on Dec. 21, 2007, which disagreed in part with the majority’s decision. See Separate Statement of Judge Ann Marshall Young (Regarding [Scheduling Order]) (Dec. 21, 2007).

¹⁹ *Id.* at 1.

²⁰ *Id.*

²¹ *Id.* at 1-2.

²² Pilgrim Watch Motion for Clarification (Dec. 21, 2007) (“Clarification Motion”).

tanks, rather than just those that may contain radioactive water.²³ Entergy and the Staff each filed responses objecting to the attempt to expand the contention's scope.²⁴ We agreed with Entergy and the Staff, finding that Pilgrim Watch's effort to expand the contention's scope amounted to an attempt to gain admission of a new late-filed contention without demonstrating that the requirements of 10 C.F.R. §§ 2.309(c) and (f)(2) had been satisfied.²⁵

9. Pilgrim Watch had also, in the interim, filed a motion for reconsideration of the Scheduling Order on December 28, 2007.²⁶ We denied this motion as well and expressly reaffirmed our prior position that monitoring for groundwater contamination and information regarding monitoring wells were not relevant to the admitted contention.²⁷

10. Prior to the evidentiary hearing, the parties filed initial and rebuttal presentations and testimony.²⁸ We also posed a series of pre-hearing questions to the parties,²⁹ and Entergy and the Staff filed responses to these questions.³⁰

²³ *Id.* at 3-7.

²⁴ Entergy Answer Opposing Pilgrim Watch's Motion for Clarification (Dec. 31, 2007); NRC Staff Response to Pilgrim Watch Motion for Clarification (Dec. 31, 2007).

²⁵ Order (Denying Pilgrim Watch's Motion for Clarification) (Jan. 11, 2008) (unpublished) at 3-4.

²⁶ Pilgrim Watch Motion for Reconsideration ASLBP No. 06-848-02 (Dec. 28, 2007).

²⁷ Order (Denying Pilgrim Watch's Motion for Reconsideration) (Jan. 11, 2008) (unpublished) at 3-7.

²⁸ Entergy's Initial Statement of Position on Pilgrim Watch Contention 1 (Jan. 9, 2008); Exh. 1 (Entergy direct testimony); Exh. 2 (Entergy rebuttal testimony); NRC Staff Initial Statement of Position on Contention 1 (Jan. 29, 2008); Exh. 39-40 (Staff direct testimony); Exh. 41 (Staff rebuttal testimony); Pilgrim Watch Presents Statements of Position, Direct Testimony and Exhibits Under 10 CFR 2.1207 [Modified Per Request ASLB Order of February 21, 2008, section c, page 2] (Mar. 3, 2008) (adding citations and exhibits not included in Pilgrim Watch's original January 29, 2008 filing); Exh. 14-15 (Pilgrim Watch direct testimony); Exh. 13 (Pilgrim Watch rebuttal testimony).

²⁹ Order (Board Questions for the NRC Staff and Applicant) (Jan. 31, 2008) (unpublished); Order and Notice (Regarding Hearing, Limited Appearance Session, and Additional Questions for Parties) (Feb. 21, 2008) (unpublished) ("February 21 Order").

11. Entergy and the Staff subsequently filed motions in limine, challenging the admissibility of numerous aspects of Pilgrim Watch's prefiled testimony as well as several of Pilgrim Watch's prefiled exhibits.³¹ We granted these motions in part and denied them in part, striking three paragraphs of Pilgrim Watch's prefiled testimony and one of Pilgrim Watch's prefiled exhibits.³² In the same Order, we also further clarified certain issues. First, we clarified that the prefiled testimony of Dr. Ahlfeld (Exh. 15) regarding groundwater flow would potentially be relevant only to the extent that detection of small leaks should prove necessary for managing the aging of any in-scope buried pipes or tanks so as to ensure that those buried pipes or tanks would be able to perform their intended safety functions during the period of extended operation.³³ Likewise, we also clarified that detection of tritium at the Pilgrim site "may arguably be relevant to the issue of detecting leaks themselves."³⁴ Finally, we indicated that information regarding monitoring wells would not be summarily excluded, because such information would be relevant to the extent that Entergy relies upon evidence of the lack of effectiveness of

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³⁰ Affidavit of Dr. James A. Davis and Andrea T. Keim in Response to Licensing Board Questions in Order (Board Questions for the NRC Staff and Applicant) (Feb. 11, 2008); Entergy's Answer to Board Questions (Feb. 11, 2008); Exh. 41 at 14 (Staff responses to questions contained in February 21 Order); Exh. 2 at A44-A47 (Entergy responses to questions contained in February 21 Order). Pilgrim Watch was also invited to respond to the questions contained in the February 21 Order "to the extent of their capability" and to file such responses with its rebuttal testimony. February 21 Order at 2. Pilgrim Watch, however, did not file responses to these Board questions.

³¹ See Entergy's Motion in Limine to Exclude Pilgrim Watch Testimony and Exhibits (Mar. 10, 2008); NRC Staff's Motion in Limine to Strike Exhibits and Testimony Filed by Pilgrim Watch (Mar. 10, 2008).

³² Order (Ruling on Pending Matters and Addressing Preparation of Exhibits for Hearing) (Mar. 24, 2008) (unpublished) at 2.

³³ See *id.* at 2.

³⁴ See *id.*

monitoring wells to buttress its claims that its existing AMPs (which do not utilize monitoring wells) are adequate.³⁵

12. The Board held a limited appearance session on April 9, 2008, in Plymouth, Massachusetts.³⁶

13. The following day (April 10, 2008), the Board convened an evidentiary hearing on the admitted contention in accordance with the March 5, 2008 Notice published in the *Federal Register*.³⁷ At this hearing, all prefiled testimony and exhibits that were not excluded in response to motions in limine were entered into evidence. Tr. 566-589. Additional exhibits were also entered into the record as the evidentiary hearing proceeded. Tr. 645, 744-45, 764, 838.

14. At the close of the evidentiary hearing, the Board, in response to a First Circuit Court of Appeals decision ordering a brief stay of the closing of the hearing,³⁸ did not formally close the evidentiary record. Tr. 870. Nonetheless, Judge Abramson informed the parties that “there should be no further testimony from any party on this particular contention.” Tr. 871. As the Commission subsequently clarified in response to an Entergy request for Commission guidance,³⁹ the First Circuit stay was ordered to permit the Commonwealth of Massachusetts the opportunity to seek participant status in the Pilgrim renewal proceedings so that it would have the opportunity to seek a suspension of the proceedings, under 10 C.F.R. § 2.802(d), in

³⁵ See *id.* at 2-3.

³⁶ See Notice (Notice of Hearing and Opportunity to Make Limited Appearance Statements), 73 Fed. Reg. 11,957 (Mar. 5, 2008).

³⁷ See *id.*

³⁸ *Massachusetts v. NRC*, Nos. 07-1482, 07-1483 (1st Cir. Apr. 8, 2008), slip op. at 31-32.

³⁹ Entergy’s Request for Guidance on the First Circuit’s Administrative Stay (Apr. 17, 2008).

connection with a pending rulemaking petition that the Commonwealth had previously submitted to the NRC.⁴⁰ Prior to this Commission Clarification Order, we had issued an Order (Setting Deadlines for Provisional Proposed Findings and Conclusions on Contention 1, and for Pleadings Related to Pilgrim Watch's Recent Motion Regarding CUFs) (May 12, 2008) (unpublished) ("Post-Hearing Scheduling Order"). This Order directed the parties to file proposed findings of fact and conclusions of law on Pilgrim Watch Contention 1 by June 9, 2008.⁴¹ The Commission Clarification Order, issued on May 16, 2008, directed the Board to close the evidentiary record for Pilgrim Watch Contention 1, stating that doing so would not affect the right of Massachusetts to participate in the proceeding because "Massachusetts's concerns are entirely unrelated to Pilgrim Watch Contention 1."⁴²

15. On June 4, 2008, the Board issued an Order denying Pilgrim Watch motions dated May 15, 2008,⁴³ and May 27, 2008,⁴⁴ which had sought, respectively, to strike certain Entergy and Staff testimony and to add additional evidence to the Contention 1 evidentiary record.⁴⁵ This June 4 Order also formally closed the evidentiary record for Contention 1,⁴⁶ and

⁴⁰ *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-08-09, 67 NRC ____ (May 16, 2008) (slip op. at 3) ("Commission Clarification Order"). The Commonwealth has since joined the proceeding as an interested state but has not yet indicated whether it will actually seek a stay or suspension. See Commonwealth of Massachusetts' Notice of Intent to Participate as an Interested State (May 6, 2008).

⁴¹ Post-Hearing Scheduling Order at 3.

⁴² *Pilgrim*, CLI-08-09, 67 NRC at ____ (slip op. at 4-5).

⁴³ Pilgrim Watch Motion to Strike Incorrect and Misleading Testimony from the Record (May 15, 2008).

⁴⁴ Pilgrim Watch Motion to Include as Part of the Record Exhibits Attached to Pilgrim Watch Motion to Strike Incorrect and Misleading Testimony from the Record of May 15, 2008 (May 27, 2008).

⁴⁵ Memorandum and Order (Ruling on Pilgrim Watch Motions Regarding Testimony and Proposed Additional Evidence Relating to Pilgrim Watch Contention 1) (Jun. 4, 2008) (unpublished) at 10.

further confirmed that, even prior to the Order, the Contention 1 evidentiary record had been “effectively closed” by the Board’s Post-Hearing Scheduling Order of May 12, 2008.⁴⁷

B. Witnesses

16. During the evidentiary hearing on Pilgrim Watch’s Contention 1, a total of nine witnesses appeared on behalf of Entergy, Pilgrim Watch and the Staff.

17. Entergy presented the testimony and opinions of four qualified witnesses, namely: 1) Alan B. Cox, Technical Manager, License Renewal with Entergy Nuclear; 2) Brian R. Sullivan, Engineering Director for Pilgrim Nuclear Power Station; 3) Steven P. Woods, Manager, Engineering Programs and Components for Pilgrim Nuclear Power Station; and 4) William H. Spataro, Senior Staff Engineer-Corporate Metallurgist with Entergy Nuclear (retired, as of December 31, 2007). Exh. 1 at A1-A13. The professional qualifications of each witness were appended to their prefiled testimony and admitted as evidence at the evidentiary hearing as part of Exhibit 1.

18. Pilgrim Watch presented the testimony of two qualified witnesses: 1) Arnold Gundersen, Fairwinds Associates, Inc.; and 2) Dr. David P. Ahlfeld, Professor, Department of Civil and Environmental Engineering at the University of Massachusetts, Amherst. Exh. 14-15. Each witness’s qualifications were admitted as evidence at the evidentiary hearing as attachments to their prefiled direct testimony. Exh. 14-15.

19. The Staff presented testimony and opinions of three highly qualified witnesses, namely: 1) Dr. James A. Davis, a Senior Materials Engineer in the NRR Division of License

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⁴⁶ *Id.* at 3-4.

⁴⁷ *Id.* at 3.

Renewal; 2) Terence L. Chan, Branch Chief in the Piping and Nondestructive Examination Branch within NRR's Division of Component Integrity; and 3) Andrea T. Keim, Materials Engineer in NRR's Division of Component Integrity. The professional qualifications of the each witness were appended to their prefiled testimony. Exh. 39-40.

20. All of the witnesses were found to be qualified to present testimony on the areas they addressed. The Board has accorded each witness's testimony the weight appropriate to their level of knowledge, training and experience related to the subject matter of this contention. Each witness provided both written prefiled testimony and oral testimony in response to Board questioning during the evidentiary hearing.

III. LEGAL AND REGULATORY REQUIREMENTS

21. The scope of license renewal proceedings is limited. The Commission's "[l]icense renewal reviews are not intended to 'duplicate the Commission's ongoing review of operating reactors.'" *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 NRC 3, 7 (2001) (citing Nuclear Power Plant License Renewal, Final Rule, 56 Fed. Reg. 64,943, 64,946 (Dec. 13, 1991)). The license renewal safety review process focuses on the "potential detrimental effects of aging that are not routinely addressed by ongoing regulatory oversight programs." *Id.* Consequently, 10 C.F.R. Part 54 "requires renewal applicants to demonstrate how their programs will be effective in managing the effects of aging during the period of extended operation." *Id.* at 8 (citing 10 C.F.R. § 54.21(a)).

22. Applicants are required to "identify any additional actions, i.e., maintenance, replacement of parts, etc., that will need to be taken to manage adequately the detrimental effects of aging." *Id.* (citing Nuclear Power Plant License Renewal: Revisions, Final Rule, 60 Fed. Reg. 22,461, 22,463 (May 8, 1995)). The Commission has recognized that these "adverse aging effects generally are gradual and thus can be detected by programs that ensure sufficient inspections and testing." *Id.* (citing 60 Fed. Reg. at 22,475). The Commission has

also stated that, as a general matter, the Commission's ordinary "regulatory process is adequate to ensure that the licensing bases of all current operating plants provides and maintains an acceptable level of safety so that operation will not be inimical to public health and safety or common defense and security." 60 Fed. Reg. at 22,464. The only "possible exception," according to the Commission, relates to the specific aging-related issues addressed by the license renewal regulations in 10 C.F.R. § Part 54. See *id.* Accordingly, License renewal proceedings are limited to a "review of the plant structures and components that will require an aging management review for the period of extended operation and the plant's systems, structures, and components that are subject to an evaluation of time-limited aging analyses." *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-01-20, 54 NRC 211, 212 (2001) (citing 10 C.F.R. §§ 54.21(a) and (c), 54.4; 60 Fed. Reg. 22,461).

23. The regulations defining the scope of NRC license renewal reviews and requirements are found at 10 C.F.R. §§ 54.4 and 54.21. First, Section 54.4(a) contains the standards for determining which "systems, structures, and components" ("SSC") will fall within the general scope of license renewal. 10 C.F.R. § 54.4(a). This determination is based upon whether an SSC performs one or more of the functions set forth at 10 C.F.R. § 54.4(a)(1)-(3). Second, within the set of SSCs that do fall within the general scope of license renewal, license renewal aging management requirements, which are described in § 54.21, will apply only to "structures and components" ("SC") that perform one or more of the functions listed at § 54.4(a)(1)-(3). § 54.21(a)(1), (a)(3); see also § 54.4(b) ("The intended functions that these [SSCs] must be shown to fulfill in § 54.21 are those functions that are the bases for including them within the scope of license renewal as specified in [54.4(a)(1)-(3)]."). Thus, even if a particular "system" falls within the scope of Part 54, not all SCs comprising that system will necessarily be subject to Part 54 aging management requirements. In other words, what

matters is whether an SC performs a § 54(a) function, not whether an SC happens to be part of a larger “system” that performs a § 54(a) function.

24. Once it has been determined that a particular SC both falls within the scope of license renewal and is subject to Part 54’s aging management provisions, it must next be determined whether the SC satisfies the substantive standards set forth at §§ 54.21 and 54.29. Pursuant to § 54.21, a renewal applicant must demonstrate that its AMP(s) for the SC in question will adequately manage the effects of aging “so that the intended function(s) [of the SC] will be maintained consistent with the CLB for the period of extended operation.” §54.21(a)(3). Pursuant to § 54.29(a), one of the findings the Staff must make before renewing a license is that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis (“CLB”).⁴⁸ Together, §§ 54.21 and 54.29 require that an applicant establish that its AMP(s) for the SC in question will be adequate to provide reasonable assurance that any § 54.4(b) intended

⁴⁸ CLB is defined in 10 C.F.R. § 54.3 as:

[T]he set of NRC requirements applicable to a specific plant and a licensee’s written commitments ensuring compliance with and operation within the applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR Parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 54, 55, 70, 72, 73, 100 and appendices thereto; orders; license conditions; exemptions; and technical specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2 as documented in the most recent final safety analysis report (FSAR) as required by 10 CFR 50.71; and the licensee’s commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports.

functions of the SC will be maintained in accordance with the CLB⁴⁹ during the period of extended operation.

25. Although reasonable assurance appears in many areas of the Commission case law and regulations, it is not specifically defined in either the Atomic Energy Act or the Commission's regulations. The courts, however, have stated that "reasonable assurance" does not mean zero risk or absolute certainty. *Nader v. Ray*, 363 F. Supp. 946, 954 (D.D.C. 1973); *see also North Anna Env'tl. Coalition v. NRC*, 533 F.2d 655, 667 (D.C. Cir. 1975) (rejecting the argument that reasonable assurance requires proof beyond a reasonable doubt and noting that the licensing board equated "reasonable assurance" with "a clear preponderance of the evidence"). Courts have also stated that, with respect to reasonable assurance of adequate protection of public health and safety, it is a determination to be made on a case-by-case basis. *See Union of Concerned Scientists v. NRC*, 880 F.2d 552, 558 (D.C. Cir. 1989) (stating that "adequate protection" may be given content through case-by-case applications of technical judgment and that Congress neither defined nor commanded the Commission to define adequate protection); *see also* Revision of Backfitting Process for Power Reactors, 53 Fed. Reg. 20,603, 20,605 (June 6, 1988) (stating that like "adequate protection," "reasonable assurance" is a determination based upon full consideration of all relevant information).

26. Reasonable assurance is based upon technical judgment, not application of a mechanical verbal formula, a set of objective standards, or a specific confidence interval. *C.f.*

⁴⁹ Pilgrim's CLB cannot be challenged in this proceeding. In establishing its license renewal process, the Commission determined that it was neither necessary nor appropriate to reanalyze a plant's current licensing basis during a license renewal review. *See Turkey Point*, CLI-01-17, 54 NRC at 5 (citing 60 Fed. Reg. at 22,473). In addition, whether Pilgrim is presently in compliance with its CLB is not an issue in this proceeding. *See* 60 Fed. Reg. at 22,473 (stating that the Commission's on-going regulatory process, which includes inspection and enforcement activities, "provides reasonable assurance that there is compliance with the CLB").

Union of Concerned Scientists, 880 F.2d at 558. See also *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), LBP-07-17, 66 NRC 327, 340 (2007). The Commission has explicitly stated that reasonable assurance does not denote a specific statistical parameter.⁵⁰ See 66 Fed. Reg. at 55,739-40. The touchstone of reasonable assurance of adequate protection of public health and safety is compliance with the Commission's regulations. *Oyster Creek*, LBP-07-17, 66 NRC at 340 (citing *Maine Yankee Atomic Power Co.* (Maine Yankee Atomic Power Station), ALAB-161, 6 AEC 1003, 1009 (1973)).

27. In the context of license renewal, an adequate aging management plan is one that provides reasonable assurance. An adequate aging management program monitors the performance and condition of SCs subject to aging mechanisms in a manner that allows for the timely identification and correction of degraded conditions. See 60 Fed. Reg. at 22,469.

28. As the Commission has repeatedly made clear, with respect to safety issues, "[i]t is the license application, not the NRC staff review, that is at issue in our adjudications." *Duke Energy Corp.* (Oconee Nuclear Station Units 1, 2, & 3), CLI-99-11, 49 NRC 328, 338 (1999) (quoting *Baltimore Gas & Electric Co.* (Calvert Cliffs Nuclear Power Plant, Units 1 and 2), CLI-98-25, 48 NRC 325, 350 (1998)); see also *Changes to Adjudicatory Process*, Final Rule,

⁵⁰ Reasonable assurance is a flexible standard and does not require focus on extreme values or precise quantification of parameters to a high degree of confidence. See *Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada*, 66 Fed. Reg. 55,732, 55739-40 (Nov. 2, 2001). Pilgrim Watch, though, has argued that reasonable assurance is equivalent to "95% confidence." Pilgrim Watch Presents Statements of Position, Direct Testimony and Exhibits under 10 CFR 2.1207 [Modified Per Request ASLB Order of February 21, 2008, section c, page 2] (Mar. 3, 2008) ("PW Statement") at 4-9. It has not, however, supported this claim with citation to any Commission rules or case law, relying instead on case law regarding the admissibility of statistical evidence under federal and state evidence laws, *id.* at 5-6, and a stray comment by an NRC Staff member during a meeting of the Advisory Committee on Reactor Safeguards that appears to be the beginnings of a hypothetical, see *id.* at 7-8. We note further that another Board in another license renewal proceeding recently found similar arguments to be without merit and without any basis in Commission regulations or case law. See *Oyster Creek*, LBP-07-17, 66 NRC at 340 n.18. We therefore reject Pilgrim Watch's characterization of "reasonable assurance" as equating to 95% confidence.

69 Fed. Reg. 2,182, 2,202 (Jan. 14, 2004) (stating that the “adequacy of the applicant’s license application, not the NRC staff’s safety evaluation, is the safety issue in any licensing proceeding”). Questions regarding the adequacy of the Staff’s safety review are therefore immaterial to the instant license renewal adjudication. See *Curators of the Univ. of Missouri* (Byproduct License No. 24-00513-32; Special Nuclear Materials License No. SNM-247), CLI-95-1, 41 NRC 71, 121-22 (1995).

IV. FINDINGS OF FACT

A. Statement of Issue

29. The issue before the Board in this proceeding is “whether or not the Applicant has programs and procedures in place which enable it to determine whether buried pipes and tanks containing radioactive fluids are able to satisfy their intended safety functions despite leaks – i.e., to determine that there are not leaks at such great rates so as to cause those pipes or tanks to fail to satisfy those safety functions.” Reconsideration Order at 6; see *also* June 4 Order at 9 (“[O]ur responsibility is to determine whether the Applicant has proven by a preponderance of the evidence that its AMPs are adequate as they currently exist, without monitoring wells.”). The “intended safety functions” of concern are solely those functions, set forth at 10 C.F.R. § 54.4(a), that serve to bring each respective buried pipe or tank within the scope of license renewal. See 10 C.F.R. §§ 54.4(b), 54.21(a). The overall burden of persuasion in this proceeding is on Entergy to demonstrate that its AMPs for buried pipes and tanks within the scope of Contention 1 are adequate to manage the effects of aging upon those pipes and tanks such that their ability to perform their intended safety functions during the period of extended operations will be ensured. See 10 C.F.R. § 2.325. Pilgrim Watch, however, must come forward with evidence that Entergy’s AMPs for these buried pipes and tanks are inadequate. *Louisiana Power & Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1093 (1983).

B. Buried Pipes and Tanks Potentially within the Scope of the Admitted Contention

1. Condensate Storage System Buried Piping

30. The Condensate Storage (“CS”) system includes buried pipes that do, by design, contain radioactive liquid. Exh. 1 at A24; Exh. 40 at A6.

31. According to Entergy and the Staff, the buried piping portions of the CS system are not relied upon in Pilgrim’s safety analyses to perform any safety functions listed in 10 C.F.R. § 54.4(a). Tr. 780; Exh. 2 at A44; Exh. 40 at A7. The sole reason that Entergy deemed the CS system to fall within the scope of license renewal was because the system’s non-buried connections to the High Pressure Coolant Injection (“HPCI”) and Reactor Core Isolation Cooling (“RCIC”) systems “could be relied upon to provide seismic support” to systems that do perform license renewal safety functions. Tr. 779-80; *see also* Exh. 2 at A36.⁵¹ Entergy expert witness Alan Cox testified that there is no scenario in which the buried portions of the CS system piping would be needed for this seismic support purpose, and Pilgrim Watch witness Arnold Gundersen appeared to agree fully with that assessment. Tr. 794-95.

32. Mr. Gundersen speculated during his oral testimony that material from outside the pipes could potentially enter the CS system through a hole in the buried piping by virtue of the Venturi Effect and that this material, if subsequently injected into the HPCI or RCIC systems

⁵¹ Entergy initially indicated in its prefiled direct testimony that the CS system did perform intended functions within the scope of license renewal that did not involve mere seismic support. Exh. 1 at A27. But this early testimony did not specifically claim that the CS system is *relied upon* to perform these functions, *id.*, and, in fact, the testimony suggested that the opposite might be true. *See id.* at A28 (stating that if the CS system is not available, the torus will be available to perform the same functions). Entergy clarified this apparent discrepancy in its rebuttal testimony and at the evidentiary hearing, explaining that it had simply taken a conservative, system-based approach to determining what to include in its license renewal application. Exh. 2 at A36; Tr. 779-80. We also note that the Staff’s position on this issue at the outset was consistent with Entergy’s final (i.e. clarified) position on this matter. *See* Exh. 40 at A7 (stating that “[t]he CS system does not provide a credited safety function.”); *id.* at A8 (explaining that, because of the availability of water from the torus, the CS system “is not relied upon for accident mitigation”).

during a response to an event at the plant, could lead to problems with certain sensors at the plant that provide information regarding the status of the reactor. Tr. 795-825.

33. Mr. Gundersen conceded that he had not conducted any analysis to determine whether, given the pressure characteristics of the piping and other relevant factors, it was even possible for material to enter the Pilgrim CS piping through a hole. Tr. 809. Mr. Gundersen relied on an event at Millstone as the real-life basis for his postulated scenario, but admitted during the hearing that the Millstone plant was indeed able to achieve and maintain safe shutdown and was able to confirm that it had, in fact, achieved safe shutdown. Tr. 825. In addition, Mr. Gundersen testified that he would expect that the contaminants involved in the Millstone event would not be the same as the material that, in his postulated scenario, would potentially enter the CS system buried piping at Pilgrim. Tr. 811. Finally, when Entergy's experts testified that Pilgrim could still achieve and maintain safe shutdown if faced with Mr. Gundersen's postulated scenario, Mr. Gundersen agreed that their testimony was accurate. Tr. 825-27.

34. The Board therefore finds that, even though the CS system as a whole might fall within the scope of license renewal, the buried piping within the CS system does not perform any functions that would trigger the aging management requirements of 10 C.F.R. § 54.21(a)(1) and (a)(3). We further find that Mr. Gundersen's suggestion to the contrary is speculative and not credible. Even though there is no dispute that the CS system's buried piping contains radioactive water, Entergy's management of the aging of these buried pipes is outside the scope of these license renewal proceedings because these pipes do not perform any 10 C.F.R. § 54.4(a) "intended functions." Accordingly, the Board will make no findings regarding the adequacy of Entergy's AMPs in so far as they pertain to the buried CS system piping.

2. Offgas and Standby Gas Treatment Systems

35. Pilgrim Watch argued in its Initial Statement of Position that buried piping within the Standby Gas Treatment System (“SGTS”) also falls within the scope of the admitted contention,⁵² and Pilgrim Watch expert witness Arnold Gundersen made the same assertion in his prefiled rebuttal testimony. Exh. 13 at 4-6. Pilgrim Watch’s opening statement at the April 10, 2007 evidentiary hearing also claimed that the “standby offgas treatment system” was within the contention’s scope. Tr. 600. Entergy and the Staff did not view these systems as falling within the scope of the admitted contention. See Exh. 39 at A7, A16 (Staff’s discussion of in-scope buried piping); Exh. 1 at A24-A26 (Entergy’s discussion of in-scope buried piping).

36. Near the close of the evidentiary hearing, however, Pilgrim Watch announced that it would “drop” any claims regarding the SGTS or offgas system based on clarification provided at the hearing by the Board about the issues relevant to license renewal determinations. Tr. 835.

37. Given Pilgrim Watch’s decision to withdraw any claims it may have had regarding the SGTS and the offgas system, the Board need not make a determination whether either system falls within the scope of the admitted contention. Thus, the Board will make no findings regarding the adequacy of any of Entergy’s aging management plans insofar as they pertain to either of these two systems.

⁵² Pilgrim Watch Presents Statements of Position, Direct Testimony and Exhibits under 10 CFR 2.1207 [Modified Per Request ASLB Order of February 21, 2008, section c, page 2] (Mar. 3, 2008) at 14.

3. Salt Service Water System Buried Piping

38. The Salt Service Water (“SSW”) System draws cooling water from Plymouth Bay and transports it to the plant through buried intake piping, and then returns the water to the Bay through buried discharge piping. Exh. 1 at A31.

39. The SSW intake piping is made of titanium and is coated, while the discharge piping is made of carbon steel and is also coated. *Id.* at A33.

40. The SSW system is intended to serve as a heat sink for the Reactor Building Closed Cooling Water (“RBCCW”) system under both transient and accident conditions by providing a continuous supply of cooling water to the secondary sides of the RBCCW heat exchangers. Exh. 58 at 10.7-1. The SSW system also is credited for safe shutdown under 10 C.F.R. Part 50, Appendix R fire protection regulations, though the actual function it serves under Appendix R – removing heat from safety equipment – is effectively the same as its other safety function (i.e., serving as a heat sink for the RBCCW system). Tr. 739.

41. The SSW system is designed with sufficient redundancy so that no single active system component failure can prevent the system from performing its intended safety function. *Id.* Specifically, the SSW system consists of two redundant loops, with each designed to be capable on its own of performing the intended safety function of the SSW system. Tr. 616.

42. Entergy witnesses testified that, “although highly unlikely,” and although it would be contrary to the system’s design, it is possible that the Bay water being transported away from the plant in the SSW discharge piping could become radioactively contaminated. Exh. 1 at A32. The same cannot reasonably be said of the water in the SSW inlet piping, however, as that water is taken directly from the Bay. *Id.* at A33. Pilgrim Watch witness Arnold Gundersen also testified that the SSW discharge piping is the portion of the SSW system that falls within the scope of Contention 1. Exh. 13 at 4.

43. The SSW discharge piping consists of one 240-foot loop (Loop A) and a second 225-foot loop (Loop B). Exh. 1 at A42. The carbon steel base metal of the pipe is supplemented by (1) a rubber internal liner that was installed when the pipe was manufactured, (2) an additional Cured-In-Place-Pipe ("CIPP") liner that was installed throughout the entire length of Loops A and B in 2003 and 2001, respectively, and (3) an external coating process conforming to Pilgrim Specification No. 6498-M-306 (Exh. 6). Exh. 1 at A42-A52; Tr. 641, 652-53. In addition, prior to the CIPP installation, a forty-foot section of Loop A and a forty-foot section of Loop B were replaced in 1999 with new carbon steel pipe sections lined with rubber and coated both internally and externally with an aliphatic amine epoxy. Exh. 1 at A42, A53; Tr. 661-62.

44. The CIPP liner is, essentially, a pipe within a pipe, and is designed to be used in old piping as an alternative to replacing or repairing such piping. Exh. 1 at A43; Tr. 676, 741.

45. The CIPP liner in Loop A is a nonwoven polyester felt tube saturated with a resin and catalyst system, while the CIPP liner in Loop B involves the same type of tube saturated with an epoxy resin and hardener system. Exh. 1 at A43. There is also an inner membrane of either polyurethane or polyethylene. *Id.*

46. The CIPP liners were installed without excavating the SSW pipes, as the installation was accomplished by pulling the liner through the SSW piping and then filling the CIPP liner with hot water and pressurizing it so that it would cure, creating a tight seal between the CIPP and the existing SSW piping's rubber liner. Tr. 657-60.

47. The nominal thickness of these CIPP liners is one-half (1/2) inch. Exh. 1 at A43.

48. To address potential aging effects that could occur inside its SSW piping, Entergy will rely upon its "Service Water Integrity" program AMP, Exh. 46; Exh. 39 at A10, which is consistent with AMP XI.M20, "Open-Cycle Cooling Water System," in the NRC's Generic Aging Lessons Learned ("GALL") Report, NUREG-1801, Vol. 2, Rev. 1 (Sep. 2008) with two

exceptions. See Exh. 46 at 1-2; Exh. 39 at A9. According to NRC Staff expert Dr. Davis, this AMP was generated in response to NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Components" (July 18, 1989) (Exh. 44), Exh. 39 at A10. Dr. Davis testified that the AMP includes:

surveillance and control of biofouling; a test program to verify heat transfer capabilities; a routine inspection and maintenance program to ensure that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of safety-related systems serviced by the open-cycle cooling system; a system walk down inspection to ensure compliance with the licensing basis; and a review of maintenance, operating and training practices and procedures.

Exh. 39 at A9.

49. The AMP also contains specific provisions for marine-water systems, such as the SSW system at Pilgrim, which include: (1) visual inspection of the intake structure during each refueling cycle by either scuba divers, dewatering the intake structure, or other comparable method to look for macroscopic biological organisms, sediment, and corrosion and to remove any accumulated fouling; (2) continuous chlorination of, or injection of effective biocides into, the service water system whenever there is a potential for microscopic biofouling; and (3) periodic flushing and flow testing at maximum design flow to check for fouling or clogging. *Id.*

50. Entergy's AMP includes one exception from the GALL AMP that would permit Entergy not to coat those portions of the SSW system that are made of corrosion-resistant materials – in this case, titanium for the SSW intake piping and copper alloys for certain SSW system components. Exh. 46 at 1; Exh. 39 at A10. The second exception would permit inspections to take place every refueling outage (i.e. every two years at Pilgrim), rather than both annually *and* during every refueling outage. Exh. 46 at 1-2; Exh. 39 at A10.

51. A recent NRC inspection of the Pilgrim SSW system, which was completed in March of 2006 as part of an inspection to verify heat sink performance, confirmed Pilgrim's

conformance with the guidance found in Generic Letter 89-13 with respect to controls for selected components. Exh. 40 at A14b; Exh. 57 at 4. The inspection also found no significant problems with the system. Exh. 40 at A14b; Exh. 57 at 4.

52. Entergy proposes to address external corrosion of the SSW buried pipes via its Buried Pipes and Tanks Inspection Program (“BPTIP”). Exh. 39 at A10; Exh. 1 at A76. With one exception, the BPTIP is consistent with AMP XI.M34 (entitled “Buried Piping and Tanks Inspection”) in the GALL Report. See Exh. 39 at A10; Exh. 42 (XI.M34 section of GALL Report); Exh. 45 (description of BPTIP). The lone exception from this GALL Report AMP would permit Entergy, in situations where it would otherwise excavate buried piping solely for purposes of inspecting the piping, to instead use techniques, such as phased array ultrasonic testing (“UT”), that measure wall thickness without requiring excavation. Exh. 39 at A10; Exh. 45 at 1. This UT exception, which employs an approach commonly used in the oil and gas industry to inspect buried pipes, would allow Entergy to determine the thickness of buried pipe walls, and whether the pipes have developed any cracks or geometric discontinuities such as laps or delaminations, without subjecting the piping to the risks of damage from excavation. Exh. 39 at A10.

53. As part of the BPTIP, Entergy will inspect the external coatings on the buried SSW piping: (1) when the piping is excavated during maintenance; (2) during the ten year period prior to commencement of the proposed period of extended operation;⁵³ and (3) during the first ten years of the proposed period of extended operation, either via focused inspection,

⁵³ Entergy witness Alan Cox testified at the evidentiary hearing that Entergy would not be relying upon any previous inspection to satisfy this requirement. Tr. 777. Thus, this pre-extended-operation inspection would occur at some point between the April 10, 2008 evidentiary hearing and the commencement of the proposed period of extended operation in 2012. *Id.*

opportunistic inspection, or an inspection method that does not require excavation. Exh. 1 at A75.

54. The external coating process for the SSW discharge piping, as described in Specification No. 6498-M-306, involved each of the following eight steps for applying coatings in the shop (i.e. prior to installation and burial): (1) cleaning the pipe; (2) applying a layer of primer to the cleaned exterior; (3) applying a coal-tar enamel coating on top of the primer at a temperature such that the enamel bonds to the primer and cannot be peeled off from the pipe; (4) visually inspecting the enamel for uniformity; (5) applying a fiber-glass pipe wrapping in a uniform manner on top of the enamel before the enamel has a chance to cool so as to cover the entire outside surface of the enamel; (6) applying another layer of coal-tar enamel; (7) applying an outerwrap of insulation; and, finally, (8) applying a layer of heavy Kraft paper. Exh. 1 at A48; Exh. 6 at 2-3. These shop-applied coatings were then visually inspected and tested for voids with a high-voltage holiday detector. Exh. 1 at A51; Exh. 6 at 4.

55. For pipe joints (i.e., where sections of pipe are connected to one another), coatings were applied in the field after the pipe sections were joined together, rather than in the shop, using the following approach: (1) the pipe joints were cleaned; (2) primer was applied to the cleaned pipe; and (3) after the primer dried, coal tar tape was applied over top of the primer. Exh. 1 at A49; Exh. 6 at 3.

56. After these coating processes were complete, the entire pipe was tested in the field using a high-voltage holiday detector to ensure both that the field application of coatings to the joints was done properly and that installation of the pipes did not damage any of the shop-applied coatings. Exh. 1 at A51; Exh. 6 at 4. Specification No. 6498-M-306 also provides procedures for conducting field repairs on any shop-applied coatings that are found to be damaged during this field inspection. See Exh. 6 at 3-4.

57. Finally, when installing the SSW piping in the ground at the site, Entergy placed “sand or specially engineered fill” under the piping to encourage drainage. The piping was then covered with soil free from large objects such as “rocks over six inches, shrubs, or trees” to reduce the risk of physical damage to the coatings and to avoid biodegradation-induced increases to the soil pH. Exh. 1 at A83; see *also* Exh. 41 at A10. In addition, the ground above the entire length of the buried SSW piping is blacktopped. Tr. 768. As a final layer of protection against “the buildup of water,” Pilgrim installed a storm drain system during original construction of the plant. Exh. 1 at A84.

58. In addition to the two AMPs described above (i.e. the BPTIP and the Service Water Integrity program), there are also NRC regulatory requirements currently applicable to the SSW piping at Pilgrim that, barring alteration via regulatory or operating license amendment, will remain applicable during any extended period of operation. Exh. 40 at A16.

59. For example, as discussed in NRC Generic Letter (“GL”) 89-13, Exh. 44, Section XI (“Test Control”) of 10 C.F.R. Part 50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants requires that licensees establish test programs to ensure that all SSCs will function satisfactorily in accordance with their design requirements and acceptance limits. Exh. 40 at A12. Staff witness Andrea T. Keim testified that Entergy has established a test program to meet this requirement. *Id.* at A13.

60. In addition, because Pilgrim’s construction permit was issued prior to January 1, 1971, Pilgrim is required to implement an in-service inspection (“ISI”) program that complies with 10 C.F.R. §§ 50.55a(g)(4)-(5) to the extent practicable. *Id.* at A14a. Pilgrim’s fourth 10-year ISI program, which applies between July 1, 2005 and June 30, 2015, was submitted to the NRC by letter dated June 29, 2005. *Id.* Staff witness Terence L. Chan testified that, as part of Pilgrim’s ISI program plan, the SSW system will be pressure tested in accordance with the requirements of applicable American Society of Mechanical Engineers (“ASME”) Code

provisions, subject to certain limitations and modifications stated in 10 C.F.R. § 50.55a(b)(2).

Id. According to Mr. Chan's testimony, this ISI program "provides reasonable assurance of structural integrity and that significant degradation will be identified in a timely manner such that safety related systems will be able to perform their safety function." *Id.* Ms. Keim further testified that NRC inspectors have also recently reviewed various aspects of SSW performance, including performance testing results, and did not identify any findings of significance. *Id.* at A14b.

61. The only significant evidence of past aging-related degradation of the SSW system's buried discharge piping that has been presented to the Board relates to Entergy's replacement of two forty-foot SSW discharge pipe sections in 1999, which we mentioned above. This replacement was prompted by a series of refueling outage inspections of the original internal rubber liner that, beginning in 1995, revealed degradation of the liner. Exh. 1 at A98; Tr. 638. The first two of these inspections, in 1995 and 1997, were visual inspections that discovered degradation in the liner, and the 1999 inspection, which utilized both visual and ultrasonic inspection methods, found that a piece of the rubber liner in one of the loops had torn away from the carbon steel, leading to through-wall holes in the pipe. Exh. 1 at A98; Tr. 638.

62. The through-wall holes, which are depicted in a pair of photographs introduced at the hearing as Exhibit 67, covered a small portion of the pipe sample featured in the photographs. Exh. 67; Tr. 738. The pipe sample shown in the photograph was a four-to-six inch by four-to-six inch portion of one of the 40-foot removed sections of carbon steel discharge piping, with the rubber liner component removed. See Exh. 67; Tr. 637.

63. Following this discovery of degradation and a small area of through-wall holes in 1999, Entergy replaced two 40-foot pipe sections – one in each loop – and made other repairs. Exh. 1 at A98.

64. Prior to the 1999 replacement of the two 40-foot sections, the entire rubber liner in the SSW pipes had been in place since before Pilgrim first commenced operation in 1972. Tr. 754. The expected life span of the rubber liner was approximately twenty years. Tr. 655, 755. Thus, the actual life of the rubber liner in the SSW saltwater environment exceeded its expected life. The replacement of these two 40-foot pipe sections, again, predated the installation of the CIPP liner throughout the entire length of the discharge piping.

65. Prior to installation of the CIPP liner inside the rubber-lined SSW Loop B discharge piping in 2001 and Loop A discharge piping in 2003, the entire rubber lining of the piping loop in question was visually inspected to ensure that the rubber was still in good enough shape for the installation of the CIPP, and the rubber was scraped to remove any marine matter and to roughen the surface so that the rubber would bond properly with the CIPP liner. Tr. 673-76.

66. The Board finds the above facts regarding the history and current state of the SSW system buried piping. We further find that the buried discharge piping within the SSW system does fall within the scope of the admitted contention, because this piping is relied upon to perform safety functions described in 10 C.F.R. § 54.4(a) and because, as Entergy itself admits, there is a possibility that the water flowing through the buried discharge piping could become contaminated with radioactivity from the plant. The buried titanium intake piping, however, does not fall within the scope of the contention, because the water it takes directly from Plymouth Bay would not realistically be radioactively contaminated. Additional specific matters in dispute between the parties regarding Entergy's AMPs for this SSW buried discharge piping will be addressed below.

(i) Expected Life of CIPP Liner

67. Entergy expert witnesses testified that the expected life of the CIPP liner in the SSW buried pipes is approximately 35 years. Exh. 1 at A43. Accordingly, Entergy asserted that

its plan to inspect the liner every ten years is conservative. Tr. 656. Entergy further noted that the current ISI program for the SSW system requires a complete ultrasonic or visual examination of the CIPP when the CIPP liner reaches 20 years of service life. Exh. 1 at A98. A Staff witness added that this 35-year lifespan figure is consistent with his understanding of this type of coating, and that a ten-year inspection frequency “seems very reasonable.” Tr. 669.

68. Arnold Gundersen, Pilgrim Watch’s proffered expert on pipe degradation mechanisms, questioned the lack of “documentation” in the record supporting the 35-year expected life span figure. Tr. 703. Mr. Gundersen suggested that some formal documented qualification determination regarding the expected lifespan of CIPP liners in SSW piping would be required under NRC regulations in order for Entergy’s claim of a 35-year lifespan to serve as a reliable basis for determining that a 10-year inspection frequency would be adequate. Tr. 704-05. Mr. Gundersen claimed that this regulatory requirement is present in 10 C.F.R. Part 50, Appendix B, Section II. Tr. 749.

69. Mr. Gundersen also claimed that, based on his “experience on salt, brackish, and freshwater plants...in general saltwater is the worst for any component.” Tr. at 705. However, when questioned by the Board thereafter about whether he had any data regarding the impact of these various water environments upon liners like the ones being used in the Pilgrim SSW piping, Mr. Gundersen admitted to having no experience with these types of liners. Tr. 705-06. Entergy expert William H. Spataro testified that the specific types of liners being used in the SSW discharge piping are “resistant to...all waters.” Exh. 1 at A45. Further, Entergy witnesses did not claim to base their conclusions about the CIPP liner’s expected lifespan upon specific formal documentation, but rather upon experience with comparable liners at other plants, extensive history of use of comparable liners in other industries, information from the liner manufacturer regarding limitations on its usage, and an understanding of the chemical and mechanical properties of the liner and the factors that can cause it to degrade. See Tr. 655,

681-92. Mr. Gundersen also apparently could not identify any specific regulatory provision or provisions that would mandate determination of the liner's lifespan through the sort of formalized, application-specific process he claimed was absent.⁵⁴

70. Accordingly, the Board finds that Pilgrim Watch has provided no viable evidence that challenges the Applicant and Staff conclusions that 35 years is an appropriate life span for the CIPP liners in the SSW buried pipes. In light of this 35-year expected lifespan, and also in light of the evidence discussed earlier regarding the CIPP liner's expected resistance to degradation in the water environment found in the SSW buried discharge piping, the Board further finds that an inspection frequency of every ten years is adequate.

(ii) Internal Surface Aging Management for SSW Piping

71. Pilgrim Watch challenges Entergy's representations regarding the past history of the Service Water Integrity program that has been used at Pilgrim and that would continue to be used during the proposed period of extended operation. Exh. 13 at 37-38. Mr. Gundersen claims that "the problem is that the program's effectiveness is ascribed to the fact that there was serious corrosion, which was not identified until after 23 years of operations, and it was identified only as a result of prodding from NRC, Generic Letter 89-13." *Id.* at 37. According to Mr. Gundersen, "[t]his leads [him] to wonder how long there were significant corrosion problems and how long the licensee would have waited if it were not for the generic letter." *Id.* Mr. Gundersen also claims that the replacement of the two 40-foot sections of SSW discharge

⁵⁴ Although Mr. Gundersen, as noted above, did reference 10 C.F.R. Part 50, Appendix B, Section II as a source of this alleged regulatory requirement, NRC Staff expert Dr. Davis pointed out at the evidentiary hearing that he could not find any such requirement discussed in that regulatory provision, Tr. 753. The Board likewise cannot locate such a requirement in that regulatory provision. Faced with Dr. Davis's assertion at the hearing that Mr. Gundersen's cited regulatory provision did not say what Mr. Gundersen claimed it said, Mr. Gundersen indicated that he would investigate the matter "at a break or something." *Id.* Neither he nor Pilgrim Watch, however, has provided the Board with any subsequent clarifying information on this point.

pipings in 1999 provides “no indication of the condition of the remainder of these loops,” *id.*, and asserts that the AMP does not define inspection frequencies or other terms with sufficient specificity. *Id.* at 38.

72. Based upon the evidence discussed earlier regarding the replacement of the two 40-foot sections, there is no indication that the steps taken by Entergy were insufficient to ensure that the ability of the SSW buried discharge piping to perform its intended safety functions was not compromised. Further, by the time the degradation became significant enough to induce replacement, the rubber liner had already been in service for several years more than it was initially expected to last. Moreover, there is now a brand-new CIPP liner protecting the original rubber liner, and the carbon steel pipe, from the water flowing inside, and this liner, as discussed above, is expected to last 35 years. The inspection frequency for the CIPP liner has already been discussed above, both in terms of the inspections at 10-year intervals and internal inspections at every refueling outage per the Service Water Integrity program, and Mr. Gundersen adds nothing to this beyond claiming to find ambiguity in the word “complete.” *See id.*

73. The Board accordingly finds no merit to Pilgrim Watch’s challenges to the adequacy of the Service Water Integrity program.

(iii) External Surface Aging Management for SSW Piping

74. As discussed earlier, the Pilgrim buried SSW pipes were externally coated in accordance with a multi-step coating process that results in several external coating layers. Further, the piping was placed on top of sand or special fill, which was chosen to facilitate water drainage, and the coatings were inspected after installation to verify their integrity before the piping was buried. The burial was then accomplished using select fill that was cleared of large rocks and plant material to prevent damage to the coatings from physical impact and increased pH, respectively. Entergy also installed a storm drain system to improve drainage at the facility

when Pilgrim was initially constructed. Lastly, the ground above this buried piping has been blacktopped.

75. Mr. Gundersen claims that buried piping is “by definition” in a more corrosive environment than above-ground piping, because oxygen, moisture, chloride, acidity, or microbes found in the soil, in one degree or another, corrode all piping materials. Exh. 13 at 23. Mr. Gundersen also makes general observations about what he expects an environment in a seaside location in Plymouth, Massachusetts would be like, and suggests that vegetation removed from the soil in which Pilgrim’s buried pipes were buried would return “over a period of time.” *Id.* at 25-26. Entergy, however, provided specific testimony regarding the measured characteristics of the soil in which the SSW piping is buried, such as that soil’s pH (6.2-6.82), moisture content (5.5% to 8.1%), and chloride concentration (210-420 ppm). Exh. 1 at A88. These measurements indicate that the soil is not aggressively corrosive, and is, “at worst,” only “mildly corrosive.” *Id.* at A89. Pilgrim Watch provides no testimony or other evidence to specifically dispute these measurements or their significance.

76. Pilgrim Watch has also provided no evidence that the external coatings on the buried SSW discharge piping have been damaged. In the opinion of NRC expert Dr. Davis, there is no reason to believe external coatings have been damaged, in light of the various precautions and protective measures that Entergy has taken, including the extensive coating process and the use of select backfill to both avoid damage to the coatings during burial and facilitate drainage of water away from the piping once the pipes have been buried. Exh. 41 at A10. Furthermore, Dr. Davis testified that the external coatings and surfaces of the two 40-foot pipe sections that Entergy replaced in 1999 were examined at the time of this replacement and were found to be in good condition with no external corrosion noted. Exh. 39 at A9.

77. Entergy witnesses testified that the water table at the site is “approximately” 17 feet below the surface. Tr. 757, 839. The buried SSW discharge piping, meanwhile, is

buried at between 7 and 10 feet below the surface. *Id.* Pilgrim Watch witness Dr. David Ahlfeld testified that the water table “is not 17 feet everywhere, I’m sure” and that “[i]t varies from place to place, and I just think Entergy probably doesn’t know.” Tr. 857. Dr. Ahlfeld added that “[i]t’s probably an average of 17 feet,” *id.*, which is consistent with Entergy’s use of the word “approximately.” But Pilgrim Watch presented no evidence to suggest that the water table, with an average of 17 feet below grade, would realistically reach as high as 10 feet below grade in any of the areas where the SSW discharge piping is buried. Further, Pilgrim Watch provided no evidence of degradation to the SSW buried piping or its coatings that would indicate contact between that coated piping and the water table.

78. Mr. Gundersen contends that the BPTIP is inadequate because Entergy will not have “performed a thorough baseline examination of the pipes,” which he contends “should be a prerequisite to any license extension program.” Exh. 13 at 31; *see also* Exh. 14 at ¶12.4.1. As NRC Staff witness Dr. Davis testified, however, there has been the equivalent of a baseline inspection of the buried SSW piping in accordance with Entergy Specification No. 6498-M-306 (Exh. 6). This Specification, which governs the external coating process used by Entergy for the buried SSW piping, involves post-coating visual inspection of the piping for cracks, dents, and holidays in the coating using a high voltage holiday detector, and then reinspection in the field prior to burial of the pipes using a high voltage holiday detector after the pipe sections have been fitted together. Exh. 41 at A12. In addition, according to Dr. Davis, there is no regulatory requirement that a baseline inspection be conducted. *Id.*

79. Apart from Mr. Gundersen’s conclusory claims that no baseline inspection has been done, Pilgrim Watch provided no evidence to indicate that Entergy failed to adhere to Entergy Specification No. 6498-M-306 when it coated the buried SSW piping. Further, Pilgrim Watch failed to point to any regulatory provision that would require a baseline analysis for buried piping. Therefore, the Board finds that Pilgrim Watch’s claims regarding lack of a baseline

inspection of the buried SSW piping do not support a finding that Entergy's buried piping and tanks AMPs are inadequate with respect to the SSW piping.

80. Mr. Gundersen also contends that Entergy's plans for taking corrective action under its programs for external corrosion are too vague to ensure that sufficient corrective actions will indeed be taken should any problems with buried piping at Pilgrim be discovered. Exh. 14 at ¶¶12.4.8 – 12.4.9. Mr. Gundersen bases this criticism upon the language used in Entergy's Buried Piping and Tanks Inspection Program and Monitoring Program when discussing corrective actions. *Id.*

81. However, as Entergy witness Alan B. Cox testified, the Pilgrim application states that Pilgrim's 10 C.F.R. Part 50, Appendix B corrective action program will apply to all of Pilgrim's AMPs, including its BPTIP, and that this corrective action program expressly requires that any "[c]onditions adverse to quality [whether significant or not], such as failures, malfunctions, deviations, defective material and equipment, and non-conformances, are promptly identified and corrected." Exh. 2 at A24. Further, Pilgrim's corrective action program requires that any "significant" conditions adverse to quality be investigated to determine the root cause of the condition and that action be taken to prevent recurrence of these conditions. *Id.* Therefore, as Mr. Cox explains in his testimony, Mr. Gunderson's criticism lacks merit because it reflects "a fundamental misunderstanding of [Pilgrim's] corrective action program." *Id.* at A23. Indeed, Mr. Gundersen himself recognizes elsewhere in his testimony that "there is a federal regulation (10 CFR 50, Appendix B) that requires licensees to repair any degradation. Thus, by regulation, a licensee is not allowed to know about piping degradation and ignore it." Exh. 13 at 21.

82. Due to Mr. Gundersen's failure to challenge the applicability of Pilgrim's general corrective action program requirements to the specific AMPs in question or to explain why these AMPs would not fall under the umbrella of Pilgrim's 10 C.F.R. Part 50, Appendix B corrective

action requirements, we find no reason to dispute Entergy's testimonial assertion that its ordinary Appendix B corrective action requirements will apply to the BPTIP. Therefore, the Board finds that Pilgrim Watch's claims regarding Entergy's corrective action program for Pilgrim's buried pipes are not supported by the evidence.

83. In sum, the Pilgrim BPTIP program, which complies in all but one respect with a suggested AMP described in the NRC Staff's GALL Report, features a rigorous process for coating the buried SSW discharge piping, for testing the integrity of those coatings after installation, and for ensuring that the coatings are not damaged during the burial process or exposed to overly corrosive soil after burial. The properties of the soil have also been measured to confirm that the soil is not aggressively corrosive, and Pilgrim Watch, apart from providing generalized comments about what soil in comparable areas tends to be like, has not specifically challenged these findings or their significance. The BPTIP also includes commitments to inspect the piping opportunistically as well as specific commitments to inspect during the ten-year period prior to commencement of extended operation as well as during the first ten years of extended operation. Furthermore, no evidence has been presented to indicate that the Pilgrim SSW discharge piping has suffered any damage from external corrosion in the past. In addition, no evidence has been presented indicating that the environment in which this pipe will reside during the proposed extended operation period will be different in any material respect from the environment in which it has resided since it was first installed. Finally, Pilgrim Watch's witness Dr. Ahlfeld provided no basis for his suggestion that Entergy's figure for the location of the water table – 17 feet below grade – could be misleading in some material way.

84. The Board recognizes that Pilgrim Watch would like to see more frequent and more extensive inspections of this buried piping. But the question before us is simply whether the buried pipes and tanks AMPs, as Entergy has formulated them, will adequately manage the aging of the SSW buried discharge piping. See 10 C.F.R. § 54.21(a)(3). Once we have made

such a determination, our inquiry ends. See 60 Fed. Reg. at 22,490 (“The Commission does not intend to impose requirements on a licensee that go beyond what is necessary to adequately manage aging effects.”). Given the evidence discussed above, the Board finds that Entergy has met its burden for demonstrating the adequacy of its AMPs with respect to external corrosion risks to the buried SSW discharge piping.

(iv) Relevance of Small Leaks

85. Pilgrim Watch made a number of assertions aimed at convincing the Board that small holes in the buried SSW piping pose problems that fall within the scope of license renewal – namely, that they can lead to SSW discharge piping failure that would prevent the SSW discharge piping from performing its intended safety functions.

86. One such assertion appears to be that simply carrying its contents from one location to another without allowing those contents to leak into the environment could qualify as a license-renewal-relevant function of the buried SSW piping. See, e.g., Exh. 13 at 6, 16.

87. Pilgrim Watch, however, has not demonstrated that preventing such leakage of water from the SSW discharge pipes would play a necessary role in the performance of any license-renewal-relevant functions. Indeed, so long as cooling water is able to leave the plant and take safety-system heat with it, it seems immaterial, at least for license renewal purposes, whether all of that heated water subsequently makes it all the way to the Bay or whether some of it instead leaks into the ground once it has travelled part way down the pipe. To be sure, even minor leakage from the SSW buried discharge piping would presumably require correction under the NRC’s corrective action requirements, which apply to all operating reactors. See 10 C.F.R. Part 50, Appendix B, § XVI (“Corrective Action”). However, that is a current operating issue, not a license renewal issue, and so is not material to the instant license renewal proceedings.

88. Therefore, the Board finds that Pilgrim Watch's suggestion that total avoidance of leaks is a license-renewal-relevant function of the buried SSW discharge piping is without basis, and finds no reason to question Entergy's testimony regarding that system's intended safety functions that fall within the scope of license renewal.

89. Pilgrim Watch also asserts, via Mr. Gundersen's testimony, that small leaks in the buried SSW discharge piping are relevant to license renewal because they have the potential to grow into bigger leaks that could challenge the ability of the SSW discharge piping to perform its heat removal function. Exh. 13 at 16-17.⁵⁵ According to Mr. Gundersen's prefiled testimony, "[l]eaks not only increase in flow, but in fact the rate of expansion for leaks actually accelerates once a pinhole has been created in the pipe or tank wall." *Id.* at 16.

90. NRC Staff corrosion expert Dr. Davis testified, however, that leaks in coated buried pipes generally do not expand substantially beyond the portion of the pipe where the pipe's coating has failed. Tr. 729. Entergy witness William Spataro further testified that, in the case of the SSW buried piping degradation that had occurred in the past at Pilgrim and which was reflected in the photographs introduced at the evidentiary hearing, there did not appear to be substantial lateral expansion of the holes. Tr. 726.

91. On this topic, the Board finds the Entergy and Staff witnesses' testimony to be more credible than that of Mr. Gundersen, because the former testimony is based upon actual

⁵⁵ Pilgrim Watch also contends in its Initial Statement of Position that functions of all buried pipes include prevention of radioactive contamination of groundwater and protection against the site becoming a "legacy site" in the future due to such contamination. PW Statement at 90. While clearly these are legitimate functions of buried piping that contains, or may contain, radioactive water, this does not mean that these functions fall within the relatively narrow range of functions that are relevant for purposes of license renewal. Indeed, as this Board has already instructed the parties, radioactive contamination of groundwater *per se* is not material to the issues before us in this renewal proceeding. Such contamination will only potentially be material insofar as it relates to the ability of the buried pipes in question to perform the safety functions that *do* fall within the scope of license renewal proceedings (i.e. the ability of the SSW buried discharge piping to transport heat away from plant safety systems).

experience assessing degradation of buried piping in the field, whereas Mr. Gundersen did not explain the basis for his theory that holes will rapidly widen and did not provide any basis to challenge the factual accuracy of the corrosion history experience testified to by Entergy and Staff witnesses.

92. Pilgrim Watch puts forth another theory of how small leaks could cause license-renewal-relevant problems in the buried SSW piping. This theory proposes that a hole in buried piping would lead to matter *entering* the pipe and causing the piping to become blocked, thereby preventing the piping from performing its intended safety function. Exh. 14 at ¶17.2; Exh. 13 at 17-18.

93. However, Mr. Gundersen provided no explanation as to how such an effect, which he termed a “Venturi” effect, would realistically lead to major blockage of SSW buried piping, which is 22 inches in diameter. Tr. 610. It is also not clear that Mr. Gundersen had the SSW piping in mind when putting forth his Venturi effect blockage theory, given that his prefiled testimony regarding this effect did not specifically discuss the SSW piping, see Exh. 14 at ¶17.2; Exh. 13 at 17-18, and his testimony regarding the Venturi effect at the evidentiary hearing dealt solely with the CS System buried piping. Tr. 795-811. Mr. Gundersen also did not question the ability of SSW pipe pressure testing (which, as discussed above, is part of Pilgrim’s ISI program) to determine whether blockage was occurring in the SSW buried piping due to Venturi-effect-related material or otherwise. Finally, the Board notes that, because of the redundancy of the SSW system, blockage would need to occur in *both* SSW discharge loops at the same time – and go undetected in both despite any pressure testing and inspections – in order for the intended safety functions of the SSW system to be compromised. See Tr. 616.

94. Therefore, the Board does not find credible any suggestion by Pilgrim Watch that small leaks could lead to intended-safety-function-hindering blockage of the SSW piping due to the Venturi effect.

95. Another theory put forth by Pilgrim Watch to support the relevance of small leaks is that small leaks, even if they do not grow into large ones, could undermine the structural soundness of the SSW piping and thus lead to failure in a design basis earthquake. Exh. 14 at ¶17.3; Exh. 13 at 19-20. Mr. Gundersen testified that “[t]he hole or holes act as stress risers and increase the likelihood of gross failure under the stress of accident conditions,” Exh. 14 at ¶17.3.1, Exh. 13 at 19. According to Mr. Gundersen, the only design basis event of significant concern to him with respect to this “stress riser” theory would be a design basis earthquake. Tr. 718. Mr. Gundersen further testified that the photographs admitted at the evidentiary hearing showing holes in a removed portion of SSW buried piping raise concern that the SSW pipe could fail in the event of a design basis earthquake.

96. Mr. Gundersen, when questioned by the Board, conceded that he had not conducted any analysis to determine whether the holes depicted in the photographs would compromise the structural integrity of the SSW buried piping to the point where it could fail due to a design basis earthquake. Tr. 694-95. Mr. Gundersen claimed that his failure scenario was based upon analyses that people who have worked for him have done in the past, but he did not provide any specifics regarding this research, and indicated that this research would not have looked at holes of the size that are depicted in the photographs. Tr. 695-96.

97. Entergy witnesses William Spataro and Alan Cox testified that, in their experience, holes in buried piping have not led to overall structural weakness of the piping (e.g. due to thinning of areas of the piping that have not developed through-wall holes). See Tr. 727-28. NRC Staff Witness Terence L. Chan additionally testified that, in his experience, Staff analysis of degraded piping has not revealed an inability of the degraded piping to withstand design-basis seismic events. Tr. 730-31.

98. The Board notes that Pilgrim Watch’s only evidence showing that holes have formed in buried SSW piping comes from the photographs of SSW pipe sections that were

removed and replaced prior to installation of the CIPP liner, and that the holes were the apparent result of a tear in the rubber liner. No evidence of other tears or holes in the rubber liner which might lead to similar degradation of the buried SSW pipe walls has been presented. Further, especially in light of Mr. Gundersen's claimed lack of expertise regarding CIPP liners, no evidence has been presented indicating that there is any likelihood of holes similar to those in the photographs forming due to degradation of the CIPP liner, which Entergy witnesses have testified would not be expected to degrade in water environments. Therefore, even assuming that additional holes like those depicted in the photographs could cause SSW discharge pipe failure in response to a design basis earthquake, Pilgrim Watch has provided no credible basis to suspect that comparable holes have formed, or will form, in the SSW piping that is currently in operation, much less that such holes have formed, or will form, in *both* of the two redundant SSW discharge pipe trains so as to permit simultaneous failure of both trains. Furthermore, as discussed above, Pilgrim Watch has failed to demonstrate that Entergy's AMPs for detecting and preventing degradation of the SSW buried piping from external sources will not successfully ensure against the occurrence of significant external degradation. But even if holes did currently exist or were to form in the future, the Board does not find Mr. Gundersen's vague references to analyses conducted by persons working for him to be convincing evidence that small holes comparable to those in the photographs would actually render the SSW buried piping incapable of withstanding a design basis earthquake.

99. Finally, Pilgrim Watch contended in its Initial Statement of Position that a concept known as "leak before break" applies to the buried piping at Pilgrim. PW Statement at 19. Pilgrim Watch did not, however, provide any actual evidence to explain this "leak before break" concept, let alone to show that the concept applies to the buried SSW discharge piping at Pilgrim. NRC Staff expert Dr. Davis, meanwhile, testified that "leak before break" is not applicable to the SSW system, as it applies only to "high energy piping" in pressurized water

reactors. Exh. 41 at A6. We therefore find that the “leak before break” concern raised by Pilgrim Watch is inapplicable to SSW buried discharge piping.

100. Accordingly, the Board does not find credible Pilgrim Watch’s claim that the SSW buried piping could develop small holes that would undermine simultaneously the ability of both buried discharge pipe trains to withstand a design basis earthquake.

(v) Cathodic Protection

101. Mr. Gundersen testified that “[t]he Applicant can and should implement a thorough Cathodic Protection Program (CPP) on all underground pipes and tanks” and that “[a] CPP would reduce the likelihood of leaks.” Exh. 14 at ¶18.2; Exh. 13 at 53; see *also* Tr. 761-63. He also testified that the NRC’s GALL Report “suggests that cathodic protection is a good idea.” Tr. 762.

102. Entergy and NRC Staff experts testified, however, that the cathodic protection program contained in the GALL Report is simply one of two *alternative* methods that GALL recommends for protecting buried piping against external corrosion. Tr. 768-772. Entergy has chosen to utilize the other of the two alternative GALL AMPs – which relies upon visual inspections rather than cathodic protection – and so Pilgrim’s external corrosion management program complies with the GALL Report despite not utilizing cathodic protection. *Id.* Dr. Davis noted further that caution must be exercised when backfitting cathodic protection to an existing plant in order to avoid stray current corrosion – a process that, if not properly guarded against, could create a through-wall hole in a nearby pipe “in a matter of weeks.”⁵⁶ Tr. 771. Thus, adding a cathodic protection system at Pilgrim could carry risks of its own.

⁵⁶ In a post-hearing filing, Dr. Davis clarified that his original statement at the evidentiary hearing that adding a cathodic protection system to an existing plan would be “dangerous” due to the risk of stray current corrosion was “[p]erhaps...a bit strong.” Affidavit of Dr. James A. Davis in Response to Pilgrim (continued. . .)

103. In light of the above evidence, the Board finds that Pilgrim Watch has failed to demonstrate that Entergy cannot potentially utilize some method other than cathodic protection to guard against external corrosion of Pilgrim's buried SSW piping. Therefore, as we suggested in our June 4 Order when denying Pilgrim Watch's request to strike certain testimony and introduce additional exhibits regarding cathodic protection,⁵⁷ the issue at hand remains whether the AMPs that Entergy *has* proposed to utilize at Pilgrim for external corrosion management are adequate. As discussed above, Entergy has met its burden of demonstrating that its BPTIP program will adequately protect the SSW buried piping against external corrosion.

(vi) Tritium Discovery at Pilgrim

104. Pilgrim Watch asserts that tritium discovered in the groundwater at Pilgrim indicates the presence of leaks in Pilgrim's buried piping – or, at least, that this tritium discovery raises the possibility that such leaks are occurring. *See, e.g.*, Exh. 14 at 16-17.

105. The Board notes, however, that the SSW system buried discharge piping is only within the scope of the admitted contention because of the theoretical possibility that it could become contaminated with radioactivity. No evidence has been provided that would show that such contamination has actually occurred in this piping system. Therefore, while the presence of tritium in the groundwater could conceivably indicate leakage in a system such as the buried CS system piping, which contains radioactive water by design, it does not provide any credible

(. . .continued)

Watch Motion to Strike Testimony (May 23, 2008) (attached to NRC Staff Response in Opposition to (1) Pilgrim Watch Motion to Strike Testimony and (2) Motion to Include as Part of the Record Exhibits Attached to Pilgrim Watch Motion to Strike Testimony (May 23, 2008)) at ¶9. Dr. Davis stated that a better characterization would be that adding a cathodic protection system to an existing plant must be done with "caution" so as to avoid stray current corrosion, *id.*, and he further stated that proper bonding of pipes can avoid such corrosion, *id.* at ¶10.

⁵⁷ June 4 Order at 9-10.

indication of leakage in the SSW discharge piping, which presumably contains only non-radioactive sea water from Plymouth Bay. Moreover, we note Mr. Gundersen's admission that the precise source of the tritium is currently unknown. Exh. 14 at ¶16.

106. Therefore, the Board finds that Pilgrim Watch's suggestion that tritium discovered in the local groundwater could indicate leaks in buried piping is, as a practical matter, inapplicable to the SSW system buried discharge piping and would be highly unlikely to indicate the presence of leakage in that system. Thus, the discovery of tritium in the groundwater at Pilgrim does not serve to challenge the adequacy of Entergy's AMPs for the buried SSW discharge piping.

(vii) Monitoring Wells

107. The admitted contention claims that Entergy's failure to utilize monitoring wells as part of its buried pipes and tanks AMPs renders those AMPs inadequate. As stated above, however, the issue before the Board is whether the Pilgrim buried pipes and tanks AMPs that Entergy has actually committed to use are adequate on their own. Given our findings already discussed above, it is clear that Entergy has met its burden of demonstrating that its AMPs are adequate to manage both external and internal degradation of the lone buried piping system within the scope of the admitted contention: namely, the SSW buried discharge piping.

108. The Board does acknowledge Pilgrim Watch witness Dr. David P. Ahlfeld's testimony that even leakage of the likely non-radioactive contents of the SSW buried discharge piping could be detected via monitoring wells. Thus, the potential exists that Entergy could add to its AMPs with respect to the SSW buried discharge piping by utilizing monitoring wells to check for increased concentration of such things as chloride in the Pilgrim groundwater, the presence of which could indicate that the saltwater in the SSW piping may be leaking. Yet, as discussed above with respect to Pilgrim Watch's recommendation that Entergy conduct more frequent inspections of its buried piping, the sole issue before us is whether the AMPs as

Entergy has formulated them are adequate. Having found that the answer to the latter question is “yes,” we need not examine the merits of adding yet another layer of aging management protection in the form of Pilgrim Watch’s proposed monitoring well system.

(viii) Rates of Aging and Corrosion

109. Mr. Gundersen testified that the buried piping at Pilgrim, as well as that piping’s “wraps and coatings,” would exhibit so-called “bathtub curve” behavior, rather than linear aging behavior, and would fall within the “wear out phase” of the bathtub curve during the proposed period of extended operation. Exh. 13 at 22. Mr. Gundersen did not attempt to specifically explain why this would be true for any particular buried pipe or pipe coating, but rather suggested that “[t]his adjudication process must flush out the precise age of each part of the pipes, wraps and coatings and provide documents from the manufacturer certifying their life expectancy.” *Id.*

110. NRC Staff expert Dr. Davis testified that the very purpose of Pilgrim’s BPTIP “is to prevent [the wear out phase] of the bathtub curve from occurring.” Exh. 41 at A9.

111. As far as the Board can tell, Entergy has never claimed that aging of its SSW buried discharge piping would be “linear.” Further, Mr. Gundersen’s bathtub curve analysis is limited to generalizations about unspecified pipes and coatings, rather than specific analysis of the actual pipes and coatings being used at Pilgrim. Moreover, as discussed above, Mr. Gundersen admits having no experience with the CIPP liners that are the current interior coating mechanism for the SSW buried discharge piping. Absent more specific evidence regarding the specific types of pipes and coatings in question, the Board cannot view Mr. Gundersen’s testimony about the “bathtub curve” as legitimately calling into question the inspection frequencies proposed by Entergy for the buried SSW discharge piping at Pilgrim. We therefore find that this challenge by Pilgrim Watch lacks merit.

(ix) Flow Accelerated Corrosion (“FAC”)

112. Pilgrim Watch claims that failure to address flow-accelerated corrosion (“FAC”) is a deficiency in Entergy’s buried pipes and tanks AMPs. PW Statement at 32-33. NRC Staff witness Dr. Davis testified that FAC is a concern only in “high-energy piping systems,” and the SSW buried discharge piping does not qualify as such. Exh. 41 at A5. Pilgrim Watch, meanwhile, provides no evidence linking the FAC phenomenon specifically to the buried SSW discharge piping. Therefore, the Board finds the NRC Staff’s testimony regarding the inapplicability of FAC to the SSW buried discharge piping to be incontroverted.

(x) Office of the Inspector General (“OIG”) Report

113. Pilgrim Watch argues that alleged problems with the Staff’s license renewal reviews, which were discussed in an NRC Office of the Inspector General (“OIG”) audit report (“OIG Report”),⁵⁸ justify putting the Pilgrim license renewal application “on hold.” PW Statement at 80.

114. The Board notes that a petition to suspend four license renewal proceedings, including the instant Pilgrim proceeding, has been filed with the Commission by a group of intervenors and prospective intervenors that includes Pilgrim Watch. To the extent that Pilgrim Watch’s request that the instant proceedings be “put on hold” constitutes an equivalent request for a stay, we will await the Commission’s decision on the matter.

115. Insofar as Pilgrim Watch may have included this reference to the OIG Report in its Initial Statement of Position in order to support its challenge to the Pilgrim buried pipes and tanks AMPs, the Board finds that the OIG Report does not provide any such support. As we

⁵⁸ Office of Inspector General Report, *Audit of NRC’s License Renewal Program* (OIG-07-A-15) (Sept. 6, 2007).

noted above, Commission licensing proceedings look to the adequacy of applications, not to the adequacy of the Staff's review of applications. Therefore, the OIG Report's claims regarding the Staff's review of license renewal applications are immaterial to the questions before the Board.

(xi) Leakage Events at Other Plants

116. Pilgrim Watch claims that several occurrences at other nuclear plants support its claims that the Pilgrim buried pipe and tank AMPs are insufficient. See, e.g., PW Statement at 22-23, Exh. 14 at ¶¶15, Exh. 20, Exh. 25, Exh. 36. These include a reference to a pipe leak at the Byron Nuclear Power Station as well as discoveries of radioactivity in the groundwater at additional plant sites.

117. Pilgrim Watch did not, however, provide any evidence to show that the fact of a leak at Byron reveals any material information about the risk of leaks in the Pilgrim buried SSW discharge piping. Indeed, according to testimony from Entergy witnesses, "(1) the piping at Byron was not buried and (2) the piping was not wrapped." Exh. 2 at A34. Accordingly, the Board finds that Pilgrim Watch's reference to the Byron leak provides no material support to Pilgrim Watch's challenge to the Pilgrim buried pipe and tank AMPs applicable to the SSW buried discharge piping.

118. In addition, the Board finds that Pilgrim Watch's invocation of discoveries of radioactive groundwater at other plants does not support a challenge to the SSW buried discharge piping AMPs for the same reasons that discovery of tritium at Pilgrim does not support Pilgrim Watch's challenge: namely, that (1) groundwater contamination *per se* is not material to license renewal decisions, and (2) groundwater contamination likely reveals nothing about service water piping that would not ordinarily be expected to contain radioactively contaminated water.

4. Other Buried Piping and Tanks

119. It is undisputed that no other buried pipes or tanks at Pilgrim fall within the scope of the contention, given the contention's limitation to buried piping and tanks that do, or may, contain radioactive water. Exh. 1 at A18; Exh 40. at A6; Exh. 13 at 4. Therefore, the Board finds that no additional buried piping or tanks fall within the scope of the admitted contention.

III. CONCLUSIONS OF LAW

120. The Board has considered all of the evidence presented by the parties on the buried pipe and tank contention and the hearing record, consisting of the filings of the parties in this proceeding, the orders issued by this Board, the exhibits received in evidence and the transcript of the proceeding. Based on a review of the entire record in this proceeding, consideration of the proposed findings of fact and conclusions of law submitted by the parties, and based upon the findings of fact set forth above, which are supported by reliable, probative and substantial evidence in the record, the Board has decided all matters in controversy concerning this contention in favor of Entergy and reaches the following conclusions.

121. Pursuant to 10 C.F.R. § 54.21(a)(3), Entergy is required to demonstrate that the SSW buried discharge piping, a structure that performs a safety function within the scope of 10 C.F.R. Part 54, has an aging management program that demonstrates the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the period of extended operation.

122. Pursuant to 10 C.F.R. § 54.29, as pertinent here, a renewed license may not be issued unless actions have been identified or have been taken with respect to the SSW buried discharge piping such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB.

123. Entergy's processes for coating the SSW buried discharge piping both externally and internally, as well as its previous inspections and testing and its planned future inspections

and testing of this buried piping under its AMPs as well as its ISI program, are adequate to ensure that this piping will be able to perform its intended safety functions in accordance with 10 C.F.R. Part 54 requirements during the period of extended operation. Thus, the contention is resolved in favor of Entergy.

124. All issues, motions, arguments, or proposed findings presented by the parties regarding Pilgrim Watch Contention 1 but not addressed herein have been found to be without merit or unnecessary for this decision.

ORDER

125. For the foregoing reasons, it is hereby ordered that Pilgrim Watch's contention is resolved in favor of the Applicant, Entergy. This initial decision shall constitute the final decision of the Commission forty (40) days from the date of its issuance, unless, within fifteen (15) days of its service, a petition for review is filed in accordance with 10 C.F.R. § 2.341(b)(1).

It is so ORDERED.

Respectfully submitted,

/RA/

James E. Adler
Counsel for NRC Staff

/RA/

Marcia J. Simon
Counsel for NRC Staff

Dated at Rockville, Maryland
this 9th day of June, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
Entergy Nuclear Generation Co. and)	
Entergy Nuclear Operations, Inc.)	Docket No. 50-293-LR
)	
(Pilgrim Nuclear Power Station))	ASLBP No. 06-848-02-LR
)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW, AND ORDER IN THE FORM OF AN INITIAL DECISION" in the above-captioned proceeding have been served on the following by electronic mail and by deposit in the U.S. Nuclear Regulatory Commission's internal mail system, or, as indicated by an asterisk (*), by electronic mail and by deposit in the U.S. Mail system this 9th day of June, 2008.

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