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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

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
)	
)	ASLBP No. 06-848-02-LR
(Pilgrim Nuclear Power Station))	

June 23, 2008

**PILGRIM WATCH REBUTTAL TO NRC STAFF PROPOSED FINDINGS OF FACT
CONCLUSIONS OF LAW, AND ORDER IN THE FORM OF AN INITIAL DECISION**

I. INTRODUCTION

Pilgrim Watch, by and through its pro se representative, Mary Lampert, herein answers and takes issue with certain statements of fact and conclusions of law in NRC's Proposed Findings of Fact and Conclusions of Law and Order In the Form of An Initial Decision. NRC Staff failed to show by a clear preponderance of the evidence that the Aging Management Program will ensure compliance with the CLB during license renewal, 2012-2032.

II. LEGAL STANDARDS

Entergy Failed to Satisfy Its Burden of Proving Reasonable Assurance

In an operating license proceeding, the licensee bears the ultimate burden of proof. *Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 1)*, ALAB-697, 16 NRC 1265, 1271 (1982) (citing 10 C.F.R. § 2.325). The Board cannot renew Pilgrim's license unless Entergy shows that its aging management program provides reasonable assurance that the Current Licensing Basis

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("CLB") will be maintained [10 C.F.R. § 54.29]. Entergy has failed to do so. Licensing boards and courts have defined "reasonable assurance" with a showing of "clear preponderance" [*North Anna Envtl. Coalition v. NRC*, 533 F.2d 655, 667-68 (D.C. Cir. 1976)].

Proving "Reasonable Assurance"

NRC Staff are not correct in finding that Entergy satisfied its burden of proving reasonable assurance. According to the Supreme Court and the NRC, a question of scientific fact – such as the technical design and the engineering protections and inspections will prevent failure of the buried pipes in a design base event – must be based on a 95% level of certainty¹

No Entergy or NRC expert testified that the engineering design, etc. of Pilgrim's buried pipes is such that there is 95% scientific/engineering certainty the pipes will not fail in such an event.

Had there been such testimony, the question then would be whether Entergy, assisted by the NRC, had presented sufficient evidence – i.e., did it carry its burden of proving that there is a 95% engineering/scientific certainty that there will be no failure.

The required burden is, as the NRC says, a "substantial preponderance;" a "substantial

¹ The U.S. Supreme Court [*Daubert v. Merrell Dow Pharms.* 509 U.S. 579, 592 (1993)] held that scientific evidence must conform to the accepted convention of 95 percent probability to be admissible. This 95% standard of proof was followed in state courts - for example, in the Texas Supreme Court in *Merrell Dow Pharms., Inc., v. Havner*, 953 S.W.2d 706, 723-24 (Tex. Sup. Ct 1997). Further, federal government scientists supported it as the minimum that is acceptable to prove each scientific fact in a case. [See, e.g., *U.S. v. Chase*, 2005 WL 757259, (Jan. 10, 2005 D.C. Super); See generally, Frederika A. Kaestle, et al., *Database Limitations on the Evidentiary Value of Forensic Mitochondrial DNA Evidence*, 43 Am. Crim. L. Rev. 53 (2006)]. Probably most important, the 95% confidence standard had been accepted and applied by the NRC as the measure of "reasonable assurance" [Tr., Exh., 17, Transcript of ACRS Meeting (Sept. 6, 2001)]

preponderance” of the evidence must support the conclusion that there is 95% engineering/scientific certainty that that the pipes will not fail.

The reason that determining “reasonable assurance” requires a two step analysis – an initial determination of what facts must be proved and then weighing the evidence offered to prove them - is clear.

For example, did those living in Iowa and New Orleans have “reasonable assurance” that their levees would stand in the face of a period of extremely heavy rain or a hurricane? If all the levee designers said was that there is a fifty-one percent level of scientific/ engineering certainty of no failure that would not meet the Supreme Court (or NRC standard). And no matter how strong the evidence, the resulting “assurance” of no failure could not be more than 51% - hopefully not enough for even Brownie and FEMA to consider “reasonable assurance.”

If, on the other hand, the levee designers said they had a 95% level of engineering/scientific certainty that the levees would not fail, and a “substantial preponderance” (perhaps 70%) of the evidence supported this, then those living in New Orleans and Iowa would have 65.6% assurance that the levees would hold in a “design base” accident.

In sum – there are two reasons Entergy has not met its burden:

1. They provided no testimony that there is 95% engineering/scientific certainty of no failure. Only vague statements that there is some undefined level of certainty.
2. No matter what level of certainty they talked about, there is no clear preponderance of the evidence. In fact, there is very little evidence.

Scope of License Renewal

NRC Staff, Entergy and the Board majority incorrectly view the scope of license renewal proceedings to be too limited. Pilgrim Watch finds that the scope is broader and that license

renewal rules properly read allow a larger range of both components and functions to come under review in this adjudication process.

The Board narrowed our original contention² down to 460 feet of piping in the SSW Discharge system; and to only whether or not the AMPs will provide assurance that there is redundancy in both “Loops” so that there is assurance that the system will perform its safety function specified in 10 CFR § 54.4, (i) –(iii). To put it another way, that in a design basis event, such as an earthquake, both SSW Discharge Loops, will not fail so that the discharge water becomes backed up and interferes with the heat exchanger.

10 CFR § 54.4 simply says how components are to be determined to be within scope. It is not a restriction on what can be looked at once they are determined to be within scope. 10 CFR § 54.21 [Contents of application--technical information] explains what has to be looked at in an aging management review of the components once they are determined to be within scope by 10 CFR § 54.4 (3).

It says, (3) “For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.”

The CLB (Current Licensing Basis) means that Entergy is required fully to comply with its license and all NRC regulations; not simply to show that the AMP assures that PNPS will perform the functions outlined in 54.4(a)(1)-(3). It does not exclude, as Entergy, NRC and the Board’s majority claim, all other issues addressed by NRC regulations. This means compliance

² Pilgrim Watch’s original contention, filed May 25, 2006, said that, “The Aging Management program proposed in the Pilgrim application for license renewal is inadequate because (1) it does not provide for adequate inspection of all systems and components that may contain radioactively contaminated water and (2) there is no adequate monitoring to determine if and when leakage from these areas occurs. Some of these systems include underground pipes and tanks which the current aging management and inspection programs do not effectively inspect and monitor.”

not simply with some of NRC's regulations but all of NRC's regulations that pertain to these important safety components. If NRC Staff or Entergy wish to change the license renewal rules the proper way to do is through the rule making process.

Pertinent regulations in the CLB for the buried components include, for example: 10 CFR 50 Appendix B. According to 10 CFR 50 Appendix B leaks are required to be repaired and Entergy must look for leaks and fix them when found in order to comply with its CLB during the relicensed period. This regulation makes absolute sense because if there are any unidentified leaks in the aforementioned pipes, such leaks may jeopardize the design and intended function of safety related systems and components at the Pilgrim Nuclear Power Station. Corrosion cannot be assumed gradual; in fact, Dr. Davis, NRC Staff expert, said at the Hearing, "once corrosion starts it goes quickly" [Tr., page 729].

Also, current regulations require the Applicant to have in place an effective program for monitoring radiation on-site and off-site.³ Therefore, PW holds that the Board was incorrect to disallow adjudication on our original contention. Although on-site monitoring wells to detect radiation in groundwater are not specifically required in these regulations (unless the water on-site is used for drinking, which it is not at Pilgrim), recent events make such a scheme a natural addition to the Pilgrim Aging Management Plan. 10 CFR § 20.1302 and §50 Appendix A Criterion 60 require that NRC's licensees demonstrate that effluents, including those from

³ **10 CFR § 20.1302 Compliance with dose limits for individual members of the public:** (a) The licensee shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in § 20.1301.

10 CFR § 50 Appendix A: Criterion 60--Control of releases of radioactive materials to the environment. The nuclear power unit design shall include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences. Sufficient holdup capacity shall be provided for retention of gaseous and liquid effluents containing radioactive materials, particularly where unfavorable site environmental conditions can be expected to impose unusual operational limitations upon the release of such effluents to the environment.

Criterion 64--Monitoring radioactivity releases. Means shall be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of coolant accident fluids, effluent discharge paths, and the plant environs for radioactivity that maybe released from normal operations, including anticipated operational occurrences, and from postulated accidents.

'anticipated operational occurrences,' do not expose members of the public to excessive radiation doses.⁴ Effective monitoring systems are required in order comply with these regulations. While leaks of radioactively contaminated water into the ground for extended periods may not have been operational occurrences anticipated when the facilities were initially designed and licensed, they can scarcely be "unanticipated" following the series of occurrences around the country. As those events demonstrated, unless nuclear facilities aggressively monitor for leaks both off-site and on-site, a leak can go undetected for years, and potentially life-threatening releases of radiation can migrate off-site before any problem are detected. The public is not provided with assurance from a voluntary program such as the BPTIMP – voluntary programs are not enforceable. The new (4) well monitoring program installed at Pilgrim, November 2007, does not meet accepted design criteria; and four wells are suited for a corner service station, not a nuclear reactor on the shores of Cape Cod Bay. [Tr., Exh. 2, Dr. Ahlfeld].

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⁴ **10 CFR § 20.1302 Compliance with dose limits for individual members of the public:**(a) The licensee shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in § 20.1301. (b) A licensee shall show compliance with the annual dose limit in § 20.1301 by--(1) Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit; or (2) Demonstrating that--(i) The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in table 2 of appendix B to part 20; and (ii) If an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year.

10 CFR § 50 Appendix A: Criterion 60--Control of releases of radioactive materials to the environment. The nuclear power unit design shall include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences. Sufficient holdup capacity shall be provided for retention of gaseous and liquid effluents containing radioactive materials, particularly where unfavorable site environmental conditions can be expected to impose unusual operational limitations upon the release of such effluents to the environment. *Criterion 64--Monitoring radioactivity releases.* Means shall be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of coolant accident fluids, effluent discharge paths, and the plant environs for radioactivity that may be released from normal operations, including anticipated operational occurrences, and from postulated accidents.

show by a clear preponderance of the evidence that the Aging Management program will ensure compliance with the CLB during Pilgrim Station's license renewal, 2012-2032.

III. FINDINGS OF FACT

Each "Statement of Fact" assembled by NRC Staff is reproduced below in italics and followed by Pilgrim Watch's answer.

A. Statement of Issue

1. *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).*

PW Rebuttal: (a) We agree that this is a correct description of the Board's orders regarding Contention 1; we disagree that the Board was correct in narrowing the contention as they did. (b) Entergy is responsible to prove their case; Entergy did not satisfy its responsibility of proof.

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

I. 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.*

PW, no dispute

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 A36.⁵ 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.*

⁵ 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").

PW, no dispute

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 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.

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.

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.

PW Rebuttal: PW does not dispute NRC's characterization of what transpired at the hearing. PW does maintain that the CSS buried piping belongs in the license renewal process because we find that the Board's decision to rule out radioactive contamination incorrect.

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,⁶ 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).*

PW Rebuttal: PW does not dispute NRC's characterization of what transpired at the hearing. PW maintains that the Offgas buried piping, piping running to the charcoal filtration before being released by the stack, belongs in the license renewal process because we find the Board's decision to rule out radioactive contamination incorrect.

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. 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*

⁶ 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.

adequacy of any of Entergy's aging management plans insofar as they pertain to either of these two systems.

PW Rebuttal: Same response as to [36] directly above.

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.*

PW, no dispute

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.*

PW, no dispute

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.*

PW, no dispute

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.*

PW Rebuttal: PW holds that there is insufficient redundancy. The two Loops are not identical. SSW Discharge Piping had deteriorated in both Loop "A" and Loop "B", simultaneously. Therefore there is factual evidence of no redundancy with both trains degraded [Gundersen, Tr., 696-97]. The Loops were lined with a CIPP – Loop "A" in 2003 and Loop "B" in 2001. The liners age, installation history and material used in the CIPP in each loop are different.

The liner in Loop B was allowed to reach excessive temperatures during the steam cure of the epoxy resin that caused noted concern at the plant, and the liner split upon cool down at each of the bends. From errors in Loop "B" changes were made. In Loop A: polyester resin was used instead of epoxy resin and hardener; heated water was used to cure instead of a steam cure; and, a procedure was set to initiate cracks at each of the bends by cutting the liner to allow stress to be relieved and then initiate repairs at each crack.

Therefore, the two loops are not equivalent so that their performance and "life expectancy" cannot be assumed to be the same. The resins are dissimilar. This is important because installers say that "the resin is the pipe" - resin determines the new pipe's physical properties, corrosion resistance and ability to withstand effluent temperatures and other aggressive elements that are immediately introduced or introduced in future. Loop A has polyester resin and Loop B used epoxy resin. There is no evidence that the resins are equivalent in thickness and durability; nor is there evidence that they are equally compatible with rubber – the CIP was placed over the rubber liner.

Because of errors in field installation, it cannot be assumed that one inspection in 10 years is sufficient. Neither can it be assumed that the liners, or the repairs made to the splits in Loop "B" liner, are necessarily good for 35 years as claimed by the applicant at the hearing [Transcript at 681]. In the Vendor's own words, at 3, "[Pilgrim] had utilized trenchless technology with mixed results." PW documented the foregoing in *Pilgrim Watch Motion to Strike Incorrect and*

*Misleading Testimony from the Record (May 15, 2008).*⁷

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.

PW Rebuttal Entergy's witnesses did testify that it was "highly unlikely" that the SSW discharge would be radioactively contaminated; they did not provide a factual basis for that opinion. PW holds that it is likely the SSW Discharge can become radioactively contaminated based on the fact that PNPS says that they monitor the discharge for radioactive contamination.

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.

⁷ Pilgrim Watch Motion to Strike Incorrect and Misleading Testimony from the Record (May 15, 2008).⁷ The motion was filed before the Commission Clarification Order, issued on May 16, 2008, that directed the Board to close the evidentiary record for PW Contention 1; it was filed well before June 4, 2008 when the Board issued an Order that formally closed the evidentiary hearing for Contention 1 [NRC Facts page 9-10].

PW Rebuttal: NRC is correct in what they say; however they do not include pertinent information. The majority of the SSW Discharge piping is old. NRC is correct that two 40' sections of the SSW discharge were replaced in 1999 in both Loop A, that measures 240' overall and in loop B that measures 225' overall. The sections that were replaced were also made of carbon steel [Tr., 631, 637-9, Woods/Sullivan]. But they neglect to do the math that tells the whole story. (16.66%) of loop "A" and (17.77%) of loop "B" will be 13 years old in 2012; and (83% and 84%) respectively of the piping will be approximately 40-45 years old in 2012 and 60-65 years old at the end of the license extension. The "Bath-tub" curve informs us that all material degrades faster as it ages; the majority of the piping is in the "wear-out" phase. Therefore as components age they require more frequent inspections. Second, carbon steel corrodes.

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.

PW Rebuttal: NRC is factually correct but they fail to raise relevant and important points. The carbon steel pipe is the structural component of SSW Discharge piping system – not the coating or CIPP. Therefore it is the metal pipe that can/must provide assurance that the pipe will be able to perform its function in a design basis event – not the coating, rubber liner or CIPP. The liner is there to keep the water inside under normal service, as long as it maintains its integrity. It is not ductile, nor earthquake proof. It is not seismically qualified [Tr., 618]. The CIPP has no warranty; it is not qualified to provide the QA for the component.

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.

PW Rebuttal: NRC is factually correct; however they do not give pertinent information or ask pertinent questions. The resins are not the same in each Loop. Therefore, the two loops are not

equivalent so that their performance and “life expectancy” cannot be assumed to be the same. This is important because installers say that “the resin is the pipe” - resin determines the new pipe’s physical properties, corrosion resistance and ability to withstand effluent temperatures and other aggressive elements that are immediately introduced or introduced in the future. Loop “A” has polyester resin and Loop “B” used epoxy resin. There is no evidence that the resins are equivalent in thickness and durability; nor is there evidence that they are equally compatible with rubber – the CIP was placed over the rubber liner. Neither Entergy nor NRC provided factual answers regarding this issue. Relevant information upon which to reach assurance is missing.

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.

PW Rebuttal: NRC relied on what Entergy said at the Hearing not upon what actually happened. Because of the “lessons Learned” from failures in Loop “B” installation, Loop “A” used a different process. Loop “A” used a steam cure and Loop “B” a hot water cure [PW Motion to Strike, May 15, 2008]. The loops are not equivalent undermining claims as to their redundancy. Therefore NRC’s opinion is not based upon fact; it is simply Entergy’s opinion not based upon fact, either.

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

PW Rebuttal: The CIPP vendor fixed the rips in the liner that occurred in the installation process. The repairs were “mounded.” Therefore there is an unanalyzed factor of the potential corrosive effect of increased turbulence at the mounded repairs that were made at the elbows. The elbows themselves are areas of increased turbulence, too. Corrosion occurs more rapidly at areas of turbulence.

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].

PW Rebuttal: NRC explains their rationale [Exh. 39, A9]. However when you read the basis for their opinion, the facts do not provide requisite support. The answer describes the intended mitigation framework and inspection schedule – the recommended actions. PW finds no assurance therein. (1) For example, [at page 6] it says, "The coatings were found to be in good condition and no external corrosion was noted" when the external surfaces of the two 40-foot sections were removed. However the vast majority of the piping was never look at, 83% of one Loop and 84% of the other. The coating on the majority is original and will be > 40 years old at the time of the license extension - beginning an accelerated and unknown rate of corrosion. The margin of safety will be decreased. Therefore NRC's stated confidence in the coatings lacks a factual basis. (2) NRC describes the "Open-Cycle Cooling Water AMP" that is based on Generic Letter 89-13, pages 6-8. It described the "five specific *recommended* actions in GL 89-13." The key word is that the program "*recommends*" actions - it is not a specified requirement. This is the equivalent to all parents recommending chastity to their daughters.

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.

PW Rebuttal: PW provides the same comment as directly above. The key is that the program's specific provisions are recommendations. Throughout the text, paragraph 2 in Exhibit 39 ii says that the Applicant "*should*" apply the "*recommendations*" not that the Applicant *shall* follow specified *requirements*. Absent NRC being able to point to actual requirements, there is no basis for opining that there is "reasonable assurance." There is no clear preponderance of evidence.

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.

PW Rebuttal: PW read the text in both Exhibits; they do not provide a factual basis for NRC's opinions – no clear evidence. To explain: (1) Exhibit 39, A-10: (a) UT inspections approved in lieu of visual. The staff says, "This kind of inspection can be performed from the inside of the piping." At the Hearing, it was established that a UT inspection could not read through all the layers from the inside – CIPP, rubber, epoxy, and metal. It is the metal piping that forms the structural component of the pipe. (b) NRC approved not coating titanium because "Titanium and copper alloys are not susceptible to corrosion in salt water" [and] "in Pilgrim's environment." All metals corrode, including titanium [Brookhaven Report, PW Fact 15]. The rate of corrosion increases as materials age ["Bathtub Curve", PW Facts 24-31]. The fact that Entergy coated the piping indicates that they, too, are aware of the piping's susceptibility to corrosion and damage from manufacturing and handling. Coatings degrade and are not impenetrable [PW Facts 79-85].

Entergy's own documents shows that coatings have no specified life [PW Fact 80]. NRC Staff does not know what PNPS' soil corrosivity is; there are no current or complete soil tests (facts) to base that opinion upon [PW Findings facts, 48-52]. Further there is no indication that the NRC Staff did independent testing to prepare the SER; they simply parrot what Entergy said and did not preserve any documentation that they used to support this conclusions. (c) At Exh. 39, A10 NRC concludes that the recommended inspections schedule provides reasonable assurance because "adverse conditions caused by aging effects in the salt water system develop over a period of several years, the difference between a one-year and a two year interval for testing and inspection is insignificant." PW disagrees because the testing and inspections are simply a recommended framework to follow; and at the Hearing, it was established that a through hole developed in two years [PW Findings Fact, 11] and that was on piping that was considerably "younger" than the piping will be during license renewal. The piping during renewal will be in the "wear-out" stage described in the "bathtub curve" of material degradation [PW Findings Fact number 30]. (NRC Exh. 46 is Appendix B.1.28.)

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.

PW Rebuttal: The exhibits cited by NRC do not provide a basis for concluding that "Pilgrim's conformance was confirmed." A summary of those exhibits follows.

(a) Exh. 39, A9 described "The five specific recommended actions in GL 89-13" and NRC's Fact says that a recent NRC inspection of the SSW system completed in March 2006 confirmed PNPS' conformance to recommendations made in a general framework described in GL 89-13.

(b) Exh. 40 at A14b says that the "Inspector did not identify any findings of significance" and "that provides assurance that the heat sink is capable of meeting its safety function." Significance is not defined; we are not told what the inspector looked at, how comprehensive the inspection was, or what was found.

(c) Exh. 57 is a letter from NRC to the VP at PNPS, May 12, 2006 - the NRC Integrated Inspection Report 05000293/2006002. It says that there was an issue of "low safety significance and because the issue has been entered into (PNPS') corrective action program" it is treated as a non-cited violation. The letter contains no pertinent information; simply that "The Salt Service Water system...was also reviewed" and that "The inspector confirmed that the potential common cause heat sink performance problems that *had the potential to increase risk* were identified and corrected by Entergy." There is nothing in that report to find assurance. At best problems were found and dismissed because they were corrected and problems had the potential to increase risk. It is analogous to the teacher handing out good grades as long as the student reports that their self-graded paper had errors.

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.*

PW no dispute

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;⁸ and (3) during the first ten years of the proposed period of extended operation, either via focused inspection, opportunistic inspection, or an inspection method that does not require excavation. Exh. 1 at A75.

PW no dispute

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.

PW Rebuttal: The timing of the inspections does not properly coordinate with the Board's decision-making schedule; so that the Board's concluding opinion as to the adequacy of the AMP will not be based on all relevant facts. The pre-extended-operation inspection will occur at some point between the April 10, 2008 evidentiary hearing and the commencement of the proposed period of extended operation in 2012. It is likely that the Board will have made their decision without data from the inspection. The inspection methodology and results from the inspection should be weighed by the Board to determine whether or not the AMP is sufficient. This is discussed in PW Conclusions of law, Facts 28-31.

⁸ FN 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.*

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.

PW Rebuttal: We have no dispute that NRC describes what Entergy said. However a description of what is supposed to happen and what actually did happen in the field can be two different things. Errors in field application must always be factored. Entergy and NRC are too ready to accept the “plan.” If everything went according to design defense in depth and an aging management plan would be unnecessary.

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.

PW Rebuttal: Same as above at 55

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.

PW Rebuttal: NRC described accurately what Entergy said; but there is no indication of a factual basis for the opinion. NRC does not explain why rocks less than 6 inches or abrasion from sand particles will not damage coating. They say that the pipes were buried in a bed of sand. Entergy says in their discussion of corrosion of stainless steels, [BPTIMP, Trans. Exh. 27, at 27] that, "Oxygen takes part in the cathodic reaction and a supply of oxygen is therefore, in most circumstances, a prerequisite for corrosion in soil. Entergy's Prefiled Expert Testimony [A-63] explains that the "CSS and SSW system buried piping...is covered with sand..." Pilgrim Watch knows that the supply of oxygen is high in sand and would further the cathodic reaction. Entergy's BPTIMP [at 26] says, "...the supply of oxygen is comparatively large above the ground water table." Entergy says that groundwater is generally encountered 20 feet below ground level; the pipes buried at 7-10.' Entergy claims that, "The sand or fill is very porous and allows water to percolate through. Thus it does not retain moisture and generally has high resistivity to corrosion." However, sand retains moisture. For example: the "drywell shell" at Oyster Creek corroded quite badly in the sand bed area and, a more mundane example, children build sandcastles regularly on the beach. In addition, over the years sand washes down and silt and clay soils above wash down into the area surrounding the pipe. Moisture increases from rain and snow percolating downwards. Water in the soil travels both vertically and horizontally; and it is obvious that the adjacent ocean provides a very moist environment. Entergy did not say when they paved the surface. We do not know if they did so during the original construction in the late 1960's or many years later. We do know how extensive the area is that was paved. Moisture carrying corrosive components travels laterally in the ground from up-gradient, the land slopes downwards toward the Bay.

NRC states a "fact" – or conclusion from what Entergy says - but there is no basis to support the fact – no clear preponderance of the evidence.

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.

PW Rebuttal: What NRC says is true; but it does not follow that together they provide reasonable assurance. It is a statement not a fact.

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.

PW Rebuttal: PW pointed out in the foregoing that GL 89-13 was a recommendation and provided a general framework. NRC [at A 12] says that GL 89-13 says that applicants must meet the "minimum requirements for quality assurance in 10 CFR Part 50, Appendix B QA for nuclear power plants. In particular, Section XI "Test Control" requires that "a test program shall be established to assure that all testing required demonstrating that structures, systems, and components will perform satisfactorily..."

According to 10 CFR 50 Appendix B leaks are required to be repaired and Entergy must look for leaks and fix them- the issue is that the AMP is insufficient to detect the leaks in order for 10 CFR 50 Appendix B to come to play.

"Section XI Test Control requires that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents" [at page 6]. The key is that it does not require that the tests be done. NRC says [at

A13] that PNPS has established a test program. But there is no indication that any testing has been done or when any testing shall be done.

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.*

PW Rebuttal: (1) NRC says that, "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." The key phrase is "to the extent practicable;" it is this phrase that shows that there is no real basis for assurance.

(2) The SSW system will be pressure tested. Pressure testing is a strategy that only tells you if there is a hole (and of certain size) the time of the test. It provides no data about wall thinning. If the walls are below minimum wall thickness, the component may not be able to perform its safety function. Component failure can result from holes and/or minimum wall size.

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.

PW Rebuttal: The following facts provide a basis to PW's statement that there is no basis to assume (a) there is redundancy in the SSW Discharge and (b) a once-in-ten -year inspection is adequate.

Facts: Leaks can develop in the SSW Discharge within (2) years of loss of liner integrity. The through-wall hole [Tr. Exh., 66, photographs] developed in the SSW discharge pipe within 2 years. Mr. Woods, Entergy's expert, said that, "In 1995, an inspection was done and noted a little bit of degradation on the existing rubber lining. And then it was determined to go ahead and do another inspection in 1997 to monitor that area. And that was okay at the time. And then we looked at it again in 1999 and found that the rubber lining had actually -- a portion of the rubber had delaminated and actually torn away from it and, as a result, had the through-wall leak. So at that point in time, we replaced that section of pipe." [Tr., 638, lines 12-21]

The other SSW discharge pipe loop had wall thinning, deterioration. Specifically, Mr. Woods, Entergy's expert, said that, "We did find one area of degradation approximately eight foot from the very end of the discharge. UT readings were taken. And that was slightly below the min. wall." [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.

PW, no dispute

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.*

PW, no dispute

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.*

PW Rebuttal: The rubber liner had no warranty so that its' expected "20-year life" is mere unsubstantiated speculation- not a fact. NRC does not define what "expected life span means." If people my age are expected to live another 20 years that means half of that population will be dead in 20 years. Second, the fact that failure was discovered after 20 years (and the 20 years does not start after operation began as NRC says but when it was installed) does not mean degradation began after 20 years. It could have begun much earlier. Again a "truth" or "fact" was created for NRC simply because Entergy said so.

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.*

PW Rebuttal: This was the process described at the Hearing; however a "crawler" and camera has limited capability of detection.

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.*

PW Rebuttal: PW finds [PW Findings and Conclusions of Law, Fact 42] that the SSW Inlet piping should be in scope of the contention. In the alternative if the Board persists on regarding unmonitored radioactive leaks offsite as outside license renewal then it is clear, as argued previously by Pilgrim Watch, that all buried piping and tanks within scope should be on the table. It is not reasonable for the board to claim that radioactivity is not relevant and then to restrict the inquiry to simply those components that contain radioactive liquids. The absurdity of the Board's decision was touched upon at the hearing when Judge Abramson opined that the SSW inlet piping was a bigger problem than the discharge piping [Tr., Judge Abramson, page 720]. PW finds that the license renewal rules require that the CLB shall be maintained for all safety components within scope [Section II, pages 3-6]

(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.

PW Rebuttal: PW finds that there is no factual evidence for NRC to support the opinion that the CIPP has a 35 year life [PW Findings of Fact, Conclusions of Law, facts 98-104]. Entergy did not provide for the Board, nor did the Board request, Service Life Warranties. Entergy also did not provide for the Board, nor did the Board request, information about any CIPP liner testing results. The only information presented, and elicited from the Board, was simply an "infomercial" about CIPP liners in general, and this provided no particulars about Pilgrim's CIPP. [Tr., Gundersen, 700-701].

Entergy stated that the CIPP had an "approximate" 35 year life. It provided no evidence to support this contention. [Tr. 691] NRC has no basis for its findings of assurance.

Mr. Gundersen testified at the Hearing that, "We have an EQ program, equipment qualification. I have -- well, I heard an infomercial this morning on how wonderful the pipe is. I haven't seen a quality assurance document that says that this is a 35-year product. It's not on the record, Your Honor. We have got testimony based on a brackish water plant. And this is saltwater. That is a wonderful product. And, yet, in the nuclear industry on safety-related pipe, there is a procedure where one qualifies this stuff for the -- I've heard 35 years. I haven't seen either manufacturer's qualifications or the Pilgrim qualifications on a pipe that -- on an old pipe that had an old liner that then on that liner had applied this epoxy coating to give me any bases to say it had a 35-year life. This is testable. You can do this in a lab. You can pull it out. You can check it and then say, "Okay. It's got a 35-year life." But that's not on the record. I mean, we have heard individuals speak about experience at Indian Point but not in this environment. And it is a testable thing. To my knowledge, that document's not on the record. So we're hanging our hat on an infomercial" [Tr., Gundersen, 700-701].

Entergy has failed to carry its burden of establishing that the CIPP liner will remain effective for any period of time - certainly not for 10 years or 35 years. NRC provided no factual basis, either.

Regarding installation, Entergy did not provide (and the Board did not ask for) significant evidence. There was no evidence, for example:

Whether or not there were any errors in field application. If, for example, there were problems identified in either Loop with the project implementation process at PNPS, the level of knowledge of PNPS and vendor personnel directly and indirectly involved in the work and the handling of the aborted CIPP liner and materials; if there were problems with the epoxy perhaps due to high ambient temperature conditions during the epoxy batching and the wet out process.

Whether during installation the liner severed and separated in any locations during the cool-down; and if so, whether any severed locations were at an elbow – a more susceptible area in the pipe to corrosion.

Whether, if there were installation errors, how the two Loops could be considered to be truly redundant.

Regarding testing: Entergy did not discuss (and the Board did not ask for) any evidence concerning testing of the CIPP that was installed at Pilgrim. There is no evidence, for example:

Whether, if testing was done, what were the testing assumptions – did they assume, for example that the SSW discharge pipe was in either a “partially deteriorated condition” or “fully deteriorated condition” or “where the existing pipe is in a partially deteriorated condition, providing support but has a hole.” If that assumption was made then the partially deteriorated pipe steel pipe condition would have been an admission that PNPS plant experience, inspection results, and observation of the intact condition of the pipe and external pipe wrap on previously excavated spools indicated degradation. If it was not so assumed, then the testing results would be totally bogus.

Whether, if testing were performed, was it meant to imply that the CIPP liner is designed in accordance with the totality of the ASME Code Section III criteria?

Whether, if testing was performed, how many samples were taken; were they sufficient in number and taken from representative sections along the entire piping; and were specimens left in place to re-test as the material aged.

Whether, if tests were performed, did they evaluate flexural modulus, flexural strength and tensile strengths and, if so, did any results fall below accepted values.

Consistent with the Board's responsibilities to assure that its decision protects public health and safety, any information the Board has concerning any of the above must be considered, whether or not formally in evidence.

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.*

PW, no dispute

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.⁹

PW Rebuttal: There is very little experience with CIPPs in nuclear plants. Dr. Davis explained that NRC knew of no experience with CIPP liners in the nuclear industry. He said, "There are a number of different kinds used in service water. This particular one I'm not aware if it's used anywhere" [Tr., 668]. Mr. Cox said there was one at Arkansas I; but no evidence was provided as to its particulars [Tr., 691]; and Mr. Spataro said that one was used at Indian Point, again with no evidence as to its condition [Tr., 692]. Neither Arkansas nor Indian Point NPS are located on the ocean, and Entergy provided no evidence that the sites and liners at Arkansas I or Indian Point were comparable to PNPS. Mr. Spataro testified that the liners are resistant to all waters; however he provided no proof. Entergy is required to prove their case; their own experts could not provide a factual basis to draw any conclusions about PNPS' CIPP.

⁹ 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.

The real point is not Arkansas I or Indian Point's CIPP; rather it is the installation history of PNPS' CIPP.

It is important to focus on the elbows; a subject ignored by Entergy and NRC.

(a) The piping contains (3) 45-degree elbows, (1) 90-degree long radius elbow, and an elevation change of over 22 feet. Straight piping is less susceptible to failure than elbows. [Tr. Exh., 13, Gundersen, A-13]

(b) The CIPP in Loop "B" tore at the elbows during installation; and the installer cut the CIPP liner at the first elbow when Loop "A" CIPP was installed.

(c) The SSW discharge pipe is subject to thermal growth and shrinkage that result in stress, particularly in the pipe elbows. Outside soil temperature in winter conservatively can be estimated at 32 degrees, whereas the inside water discharge temperature ranges from 32 degrees F when the water is shut down to up to around 100 degrees F.¹⁰ Therefore the pipe wall will contract and expand as the water within it cools and warms. The coefficient of lineal expansion for carbon steel is (0.00001) inches per degree centigrade so that 100 feet of pipe has 1200 inches in temperature changes about 38 degrees Centigrade. Multiplying $0.00001 \times 1200 \times 38 \text{ c}$ = almost half an inch of growth in the overall length of the pipe as it warms and cools. Since the pipe is not free to move at its ends, this growth induces stress at the elbows and fittings which are fixed in the soil in relation to the straight pipe. Overtime the metal pipe would move, since it is ductile, but the CIPP liner is rigid and tightly adhered to the pipe. The liner will crack as the pipe expands and contracts due to its dramatically different structural characteristics between the ductile steel and the rigid CIPP. The most likely place for cracks in the CIPP also is at the elbows where pipe changes direction. The elbow restrains movement in pipe along the axis; the pipe wants to grow due to thermal growth, but the elbow turns the other way. This creates stress at elbow.

¹⁰ Peak discharge temperatures in excess of 38 EC (100.4EF), NRC NUREG-1437, Sup. 29, July 2007, 4-36

Conclusion: based on the above facts, the CIPP cannot be relied upon for 35 years of service and a more robust AMP is required. NRC Staff simply base opinion on what Entergy says never demanding that Entergy provides clear preponderance of evidence to support their assurances; nor does NRC come forth with clear evidence themselves.

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.*

PW Rebuttal: PW provided evidence above at 69. Entergy is required to prove their case; they failed. NRC relies simply on Entergy's unsubstantiated statements.

(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 piping 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.*

PW, no dispute

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.*

PW Rebuttal: There are several problems with NRC's statement.

(1) NRC says, *"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."* PW finds this pointless because to the best of our knowledge there has not been a design basis event since the reactor was built. No analysis is provided.

(2) NRC says, *"...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."* PW explained that just because that was when they decided to replace the pipe sections, it does not provide evidence showing that was when the degradation first occurred.

(3) There is no proof that the CIPP liner will last for 35 years; and the CIPP is only "designed" to protect from internal corrosion – not external corrosion. The metal pipe, not the CIPP or rubber liner, is the structural component in the SSW Discharge and is the only one seismically qualified.

(4) There is nothing ambiguous about the lack of completeness or capability of the internal inspection. The visual inspection can "eyeball" large bubbles, but not small ones and cannot "see" beyond the liners to the interior surface of the metal pipe [TR., page 708].

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

PW Rebuttal: We cannot dispute that is NRC's opinion recognizing that the adjudication concerns not NRC's opinion but Entergy's ability to prove that the AMP is sufficient. PW does not agree with NRC's assessment.

(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.*

PW Rebuttal: There are multiple parts to this statement.

(a) NRC fails to mention that although the piping is coated, piping fails. NRC provides no convincing evidence, otherwise. Coating failure will result in exposure of the metal pipe to the corrosive elements in the soil, if left unchecked, leading to external corrosion – wall thinning and/or a hole. As the evidence presented by Pilgrim Watch shows, coatings eventually deteriorate, especially in moist soils such as Pilgrim's. Additionally there is a significant risk of coatings being improperly applied to the pipe and/or damaged during installation; or damaged later from other work in the field.

Mr. Davis, the NRC Staff's expert, in NRC Staff Response to Entergy's Motion of Summary Disposition, June 28, 2007, admitted, at 16 [Tr., Exh. 34] that, "...industry practice has shown that properly applied coatings will prevent corrosion *as long as* the soil is not extremely aggressive or *unless there is damage during application of the coating and handling of the pipe.*" [Emphasis added] Mr. Davis wrote GALL XI M28 Buried Piping and Tanks Surveillance Program: The Gall Report speaks directly to coating failure in the section Preventive Actions. It says, "A cathodic protection system is used to mitigate corrosion where pinholes in the coating allow the piping or components to be in contact with the aggressive soil environment. The cathodic protection imposes a current from an anode onto the pipe or tank to stop from corrosion from occurring at defects of the coating." Based on the evidence presented, this Board cannot conclude that the coatings were always properly applied. PNPS' QA programs may minimize the problem, but Entergy has not shown that such a program will eliminate it.

(b) Installation of the piping on a bed of sand has been previously discussed – sand retains moisture; the sand will eventually work down and the silty-clay soil from above [FEIS, Exh. 26] mix in with the sand; water travels vertically as well as horizontally; rocks less than 6 inches can damage the piping along with years of abrasion from the sand particles.

(c) Storm drainage system: Neither NRC or the Board saw a diagram showing where the storm drain system is installed and the hydro-geological studies that justified its original placement and placement today.

(d) Blacktopping ground above: There are no facts stating when the area was blacktopped. It could have been paved immediately after installing the original piping or much later. There are no facts to establish how large an area is blacktopped. It is a fact that water travels vertically in the ground from up-gradient; the pipes are located between the reactor and Bay; and PNPS' property slopes downward towards the Bay. There is an elevation change of over 22 feet in the SSW Discharge piping itself [PW fact 3]. Therefore there is basis to conclude water will flow from up-gradient to down-gradient and saturate the area beneath the pavement.

(e) Although not mentioned by NRC, Entergy says that the piping is buried 7-10' below ground surface and the water table is 17 below ground surface. This cannot be the true relation to the SSW Discharge piping.

The most likely scenario is that the average water table starts at some elevation away from the shoreline and then slopes downward so that it is approximately equal to mean sea level. As the seasons change the water table will fluctuate up and down. A few feet in each direction is typical. So, the "17 feet to the water table" has several problems. (1) It is a depth from some location on the ground surface, not an elevation above sea level; (2) It is at just one location (presumably) so does not account for the slope of the water table.

NRC again relies upon for their conclusions, Entergy's statements that have no basis in fact.

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.

PW Rebuttal: NRC did not show that they performed independent soil tests. Therefore they are relying on Entergy's conclusory remarks about two tests without showing the analysis. Entergy provided no documents showing evidence that a recent analysis of the soils surrounding the specific pipes had occurred. Entergy mentioned, but failed to provide documentation for, simply two tests: A 1992 soil analysis taken *near* the SSW system loop "A" and loop "B," a limited sample taken 16 years ago; and an October 2005 analysis of groundwater – "claimed" to be a good indicator of soil [Entergy Prefiled Testimony at A87]. There is no rationale why an analysis

of groundwater would provide sufficient information. Where is the factual basis, preponderance of evidence?

Entergy understands the importance of regular soil testing. Entergy's *Buried Piping and Tanks Inspection and Monitoring Program* framework calls for "soil resistivity measurements...must be taken at least once per 10 years unless areas are excavated and backfilled or if the soil conditions are known to have changed for any reason." The program is voluntary and not yet put in place. [Tr. Exh., 8, at 11].

Mr. Gundersen correctly stated that the 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. PW provided ample rationale [PW facts 32-47] with references to Brookhaven Report, the FEIS, and testimony provided at the public hearing regarding high and increased acidity in our soils.

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.

PW Rebuttal: True Pilgrim Watch did not provide any evidence that the coatings had been damaged because there was no evidence provided for PW, NRC or the Board to examine. We

were able to piece together enough evidence from site specific historical experience and our understanding of manufacturing and installation error to show that Entergy's verbal assertions are bogus. NRC forgets the burden of proof is Entergy's.

Entergy claimed that piping structures are, "excavated and handled in a manner that does not damage the coating." The statement is overboard - human and mechanical error has occurred and is likely to occur again. For example, the SER, at 3-37 described a leak in the fire water underground distribution system and that the probable cause was induced, "most likely by fabrication anomalies compounded by marginal installation leaks." Although this example is not from the SSW Discharge system, the same PNPS QA personnel were involved.

Operating experience, as the SER explains, is limited. Based on operating experience, there is no basis for this Board to conclude that fabrication anomalies compounded by marginal installation leaks have not and will not occur. There was no factual evidence provided by Entergy that such similar mishaps could not occur with the SSW Discharge. If we stop to think, products on the market from toasters to automobiles have warranties for this very reason. This is not a new and unfounded idea.

There is little site specific experience examining the condition of the coating and external surfaces of the piping in the SSW Discharge System. The only "evidence" provided by Entergy [Tr., Mr. Woods, at 637] is that they looked at the two 40' sections of the SSW discharge that were replaced in 1999 in both Loop "A", that measures 240' overall and in Loop "B" that measures 225' overall. Entergy did not examine the exterior coating and piping exterior surface of (83% and 84%) respectively of the piping. The coating on all but two 40' sections will be approximately 40-45 years old in 2012 and 60-65 years old at the end of the license extension; its' condition rests on a sample of <20% of the piping. Hence there are 385 feet of unexamined SSW discharge pipe coating and pipe external surfaces. Dr. Davis rests his assurance and reputation on 16.66% of loop "A" and (17.77%) of Loop "B" looked at in 1999 and hearsay. There was no factual evidence provided by Entergy - such as inspection reports - describing an

analysis of the actual condition of the coating and piping of the 40 foot sections examined. Therefore any opinion expressed about their condition is unsupported by facts.

NRC apparently finds no problem with the fact that on what appears to have been its best, and only, opportunity to examine the exterior coatings and surface of the original SSW inlet piping, Entergy did not do so. Cox in Entergy's Motion for Summary Disposition at FN 6 [Tr. Exh., 24] said that, "The inlet SSW carbon steel piping that was replaced with titanium piping in order to prevent corrosion *was never removed from the ground so that the exterior coatings and surface of the original carbon steel SSW inlet piping were not examined*" [Emphasis added]. Since the piping was not removed from the ground or analyzed, there is no site specific historical experience upon which either NRC or Entergy can rely.

Again NRC jumps to conclusions on Entergy's word, without a factual basis.

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.*

PW Rebuttal: Basic geometry: We simply ask, and should expect NRC to be able to do simple math. There is no way that the piping is 7-10 feet above the water table at all locations. It simply cannot be true.

The piping runs from the east or bay-side of the reactor building to the Bay. There is an elevation change of 22 feet. The piping is buried "between 7 and 10' below the surface;" and NRC/Entergy says that the water table is approximately 17 feet below grade.

The most likely scenario is that the average water table starts at some elevation away from the shoreline and then slopes downward so that it is approximately equal to mean sea level. As the seasons change the water table will fluctuate up and down. A few feet in each direction is typical.

Therefore, the "17 feet to the water table" has several problems.

- 1) It is a depth from some location on the ground surface, not an elevation above sea level.
- 2) It is at just one location (presumably) so does not account for the slope of 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.*

PW Rebuttal: NRC fully understands that PW defines baseline inspection to mean an inspection prior to license renewal to assess the present condition of the components, not the as-installed condition that for most of the SSW Discharge pipe (83% of one Loop and 84% of the other Loop) will be more than 40 years ago when license renewal begins.

PW asks the Board to supplement the AMP with a requirement for a baseline inspection prior to license approval; or alternatively absent a required inspection, the AMP is insufficient.

PW rationale: (a) So that the Board can have facts upon which to assess the AMP; and (b) to establish corrosion rate (base-line) so that the Applicant can make sense of future inspections. The Commission recognized that safety margins shrink over time and that the rate is not known. The 'Bath-Tub' curve of degradation explains the importance of this procedure as the components age and corrosion accelerates.

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.

PW Rebuttal: NRC comment is without merit. (a) PW has reviewed manufacturing, installation, and accidental damage to the piping from other work done in the field [above and PW Facts 68-78]. (b) PW did not point out any regulatory provision for the requested inspection; because there is not such a requirement and that is precisely the problem. Therefore we ask the Board to so require; or alternatively not approve the license renewal application with a finding that the AMP is insufficient.

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.

PW Rebuttal: NRC joins Entergy by confusing what Mr. Gundersen said about the BPTIP with what he said about the BPTIMP. Mr. Gundersen's above remarks referred to the BPTIMP.

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. Gundersen'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.*

PW Rebuttal: PW is fully aware of 10 C.F.R. Part 50, Appendix B corrective action program. We specifically stated that in order to "fix" a problem, Entergy must first be required to "look" with sufficient frequency [Section II, Legal and Regulatory Requirement, 3-6, above].

The AMP fails to provide sufficient inspections in either frequency or specified sampling. License renewal requires that they comply with the CLB.

10 C.F.R. Part 50, Appendix B is one program that they must comply with from 2012-2032. To satisfy 10 C.F.R. Part 50, Appendix B means that they cannot simply fix a problem if they just happen to fall upon a problem in either their one-time in ten year sample or by happenstance from another inspection that may or may not occur.

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.

PW Rebuttal: Same as to (81) directly above.

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.

PW Rebuttal: NRC here summarizes all points raised heretofore; PW has already explained the reasons why they are without merit. NRC makes conclusions without a basis in a showing of a clear preponderance of the evidence.

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.

PW Rebuttal: (a) The question is whether the buried pipes and tanks AMPs, as Entergy has formulated them, will adequately manage the aging of the buried pipes and tanks within scope, inclusive of SSW buried discharge piping. The October 17, 2007 said "Do the AMPs for buried pipes and tanks, by themselves, ensure that such safety-function-challenging leaks will not occur, or must some sort of leak detection devices such as monitoring wells proposed by the Intervenors be installed to meet the obligation." The words "by themselves" and "such as" made it clear that discussion of potential *supplements* is properly part of the adjudication, not simply monitoring wells as NRC suggests.

(b) PW finds that the AMPs are insufficient; and in order to make them "sufficient" they must be supplemented with the following: baseline data to assess the condition of the components now; cathodic protection; more frequent and robust inspections over a 10-year span, 1/6th at each refueling outage; monitoring wells of sufficient number and installed according to accepted design criteria, as outlined by Dr. Ahlfeld. These requirements are what is necessary to adequately manage aging effects. They go beyond simply monitoring wells.

(c) PW finds further that the Board incorrectly narrowed the contention from Pilgrim Watch's original contention, filed May 25, 2006, said that, "The Aging Management program proposed in the Pilgrim application for license renewal is inadequate because (1) it does not provide for adequate inspection of all systems and components that may contain radioactively contaminated water and (2) there is no adequate monitoring to determine if and when leakage from these areas occurs. Some of these systems include underground pipes and tanks which the current aging management and inspection programs do not effectively inspect and monitor."

Subsequent orders issued over the past two years narrowed Pilgrim Watch's contention to simply 460 feet of piping in the SSW Discharge system; and to only whether or not the AMPs will provide assurance that there is redundancy in both "Loops" so that there is assurance that the system will perform its safety function specified in 10 CFR § 54.4, (i) –(iii); or to put it another way that in a design basis event, such as an earthquake, both loops will not fail so that the discharge water is backed up interfering with the heat exchanger.

Pilgrim Watch holds that the license renewal rules can be properly interpreted to allow a larger range of components and functions to come under review.

10 CFR § 54.4 Scope: The board's majority chose a narrow interpretation of license review regulations. This interpretation was based upon an overly narrow reading of 10 CFR § 54.4.¹¹ That CFR simply says how components are to be determined to be within scope. It is not a restriction on what can be looked at once they are determined to be within scope.

¹¹ 10 CFR § 54.4 reads: (a) Plant systems, structures, and components within the scope of this part are--(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--(i) The integrity of the reactor coolant pressure boundary;(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or (iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable.

10 CFR § 54.21 [Contents of application--technical information] explains what has to be looked at in an aging management review of the components once they are determined to be within scope by 10 CFR § 54.4 (3). It says, (3) For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The CLB (Current Licensing Basis) means that Entergy is required to fully comply with its license and all NRC regulations.

This means compliance not simply with some of NRC's regulations but all of NRC's regulations that pertain to these important safety components. Pertinent regulations in the CLB for the buried components include, for example, 10 CFR 50 Appendix B and current NRC Regulations that require Pilgrim to improve its current inspection and monitoring programs and prohibit unmonitored releases of radioactivity to be released offsite.

Therefore the board was simply wrong when it removed this aspect of Pilgrim Watch's original contention from the license review process. [PW Conclusions of Law, Facts 32-41]. All buried components within scope should be part of this adjudication; and the SSW discharge treated as an example of why the AMPs are not sufficient for all the buried pipes and tanks within scope.

(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.

PW Rebuttal: PW supported their conclusion with the following factual basis.

(a) Mr. Gundersen said, "let me address the core question of whether or not the existence of holes will appreciably increase the likelihood of failure? That answer depends upon the cause and nature of the holes. A thousand pinhole leaks distributed uniformly over the length of a 1,000-foot buried piping run is unlikely to cause its failure rate to rise. But the same area of

through-wall leakage concentrated in one region - such as in a circumferential weld - might create an entirely different outcome.” [Tr. Ex. 3, Gundersen, A11] Further at the hearing Mr. Gundersen explained that, “it is not about a single hole. It is about numerous small holes, maybe through-wall, but, as that picture indicates, too, where there are through-wall small holes, there is -- also between them the wall becomes much, much thinner. So that essentially while it may not be leaking that much water, in fact, there is no pipe there” [Tr., page 731]. Further, he said that, “You could probably take a drill and put a three-quarter- inch hole in this pipe, and it would be just fine. My concern is that when smaller holes gang up in a more diffuse pattern, as indicated in that picture, that there is a broader area of wall thickening that can lead to stress risers in the event of a design basis event as that pipe flexes. So it is not about a single hole. It is about numerous small holes, maybe through-wall, but, as that picture indicates, too, where there are through-wall small holes, there is -- also between them the wall becomes much, much thinner. So that essentially while it may not be leaking that much water, in fact, there is no pipe there” [Tr., page 729].

(b) Further it is important to appreciate that when holes start they become larger very quickly. Mr. Gundersen [Exh. 14, at 16.1.2.] explained that, “After the initial pinhole, water begins to exit the tank or pipe, at an ever-accelerating rate as the hole expands. In fact, mathematically speaking, the leak rate growth is proportional to the square of the hole’s radius.” Corrosion is not gradual or linear as the 10-year inspection assumes.

(c) The aging process is composed of a spectrum of rates because the materials that the pipes are made of are composites. For example, steel is composed of crystals and thereby has a multitude of crystal boundaries. Steel is not uniform on either the micro or macro level. Steel has been “worked” to become the final product and therefore has internal stresses. These stresses represent areas of high internal energy and will deteriorate faster than the stress free areas. Hence there is a spectrum of aging rates within the component to deal with and the term “gradual” may not apply to all areas within the component, at least not in the extreme. And we have to look at the extremes not the “average” rate because the average does not fail, the extremes do.

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.*

PW clarification: Mr. Gundersen says at Exh. 13 at 6.16, “The basic function of a pipe is to carry or transmit the contents inside the pipe to another location while also protecting the environment by keeping its contents from seeping out into the environment, or in other words, pipes must not leak contents into the environment. Pipes must also keep the liquid inside the pipe, and not let it travel into the ground. A pipe cannot deliver water as designed if it has holes or cracks. Leaks or breaks are not part of the design. At a nuclear power plant like Entergy Nuclear Pilgrim, pipe leakage is especially critical given that many pipes are contaminated with radioactivity that might leach into water tables and Pilgrim’s surrounding fragile estuaries.” His comments appreciate that there are multiple functions. The Board chose to focus solely on the ability of the SSW discharge to release water so that the flow does not backup and interfere with the heat exchange. The CLB does not make that restriction. Components within scope must adhere to the CLB.

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.*

PW Rebuttal: PW demonstrated that it is not improbable to postulate that in a design basis event, such as a seismic event; and both trains of the SSW discharge collapse and then block the

flow path of the discharge piping so that the piping could not remove heat from the heat exchanger. We have demonstrated that the metal pipe, not the liner or coating is seismically qualified – provides the structure for the component. We have shown that both Loops degraded simultaneously. We have shown that both Loops are not exact copies of one another; there was a failure in the CIPP installation. We have shown that carbon steel corrodes; coatings and liners have no warranties – QA. We have shown that components corrode as they age and that > 80% of the piping is in the wear-out phase and its exterior not looked at. We have shown that internal exams proposed by crawlers cannot see through to the metal piping etc.

Therefore, on the basis of the above, we conclude that defense in depth demands that more precautionary measures be taken than provided in the AMP. These measures are not expensive or burdensome. They make sense. There is no industry experience for reactors 40-60 years old; no operating experience for the AMP. PNPS, an aging reactor, is located on the shores of Cape Cod Bay, in a now densely packed population. Public safety should take priority over Entergy's desire to avoid what they refer to as a "burden."

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.

PW Rebuttal: NRC is intentionally misconstruing PW's argument. PW found that Entergy must be required to have sufficient means to identify pipe degradation so that Entergy stays a step ahead of failure so that the systems can perform their safety functions. In laymen's terms, it is the equivalent of fixing the barn door before the horse escapes. This requires placing a protective coating or oil on the hinges (the equivalent of cathodic protection); frequent inspections of the barn door (the equivalent of a robust inspection program); a fence around the property just in case (the equivalent of monitoring wells); and a thorough look around the barn to assess its present condition (a baseline inspection).

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.*¹² 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.*

PW, clarification: Dr. Davis, NRC expert, said at the Hearing that, "Once the corrosion starts, it grows fairly quickly" [Trans. at 729, line 7]. NRC and PW are in agreement. The importance of small leaks is fully discussed above [at 85].

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.*

PW Rebuttal: (a) Their comments presupposed that the coating and linings were intact; it cannot be assumed that they will remain intact because of the absence of warranties; their age; installation history; the potential of manufacturing and installation errors; and the fact that the majority of the exterior coating has not been "eyeballed" since it was installed.

¹² *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).

(b) Corrosion can travel laterally, resulting in wall thinning/holes - a weakened component. (c) NRC quotes Entergy's witness saying that, "It did not *appear* to be substantial lateral expansion of the holes" based on the exhibit showing a small photograph that Entergy said was not a good reproduction¹³; the important point is that there was no analysis (facts) to support the statement. No evidence was provided as to any examination of that section of the pipe's hole after it was removed to indicate any lateral corrosion.

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 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.

PW Rebuttal: Mr. Gundersen has vast and pertinent experience inside and outside the nuclear industry. Mr. Gundersen, for example, has a bachelor's and a Master's Degree in Nuclear Engineering from Rensselaer Polytechnic Institute (RPI) cum laude; and began his career as a reactor operator and instructor in 1971 and progressed to the position of Senior Vice President for a nuclear licensee. His more than 35 years of professional nuclear experience include, but is not limited to the following. Nuclear Plant Operation, Nuclear Management, Nuclear Safety Assessments, Reliability Engineering, In-service Inspection, Criticality Analysis, Licensing, Engineering Management, Thermo hydraulics, Radioactive Waste Processes, Decommissioning, Waste Disposal, Structural Engineering Assessments, Nuclear Equipment Design and Manufacturing, Prudency Defense, Employee Awareness Programs, Contract Administration, and Document Control. His decommissioning work – analysis and clean up provided many

¹³ Mr. Lewis: I know the photograph -- yes, we produced our documents in disclosure on CDs. I know the document that we produced was a color photograph that had much better clarity than this.

CHAIR YOUNG: If you want to substitute that, you can do that. We will go ahead and introduce it now. And if you want to substitute the actual photograph or a better printout of what is on the CD, I think that would be appropriate [Transcript 645-6]. Entergy did not provide another copy to PW.

years of hands-on experience with degraded components at nuclear facilities.

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.*

PW, no dispute.

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.*

PW Rebuttal: (a) The discussion of blockage focused on the CSS piping. Blockage of the SSW Discharge piping focused on piping collapse. PW established that because both Loops had simultaneous degradation, site specific experience already demonstrated that there was no redundancy. Further because the Loops are not identical, it cannot be assumed that in a design basis event there would be redundancy. NRC appears to be relying on the CIPP a non-QA product to perform a QA function.

(b) Pressure testing tells whether there is a certain sized hole or not at the time of the test. It provides no information about the condition after the test or about wall thinning. NRC ignores wall thinning as a means to cause failure in a design basis event.

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.*

PW Rebuttal: PW does not know what NRC is trying to do here; however the important point about "small leaks" is the number and location of the holes [fully discussed above, at 85].

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.*

PW clarification: The significance of holes is covered in PW's response to 85. The importance of the photograph was not that that particular hole may cause failure in a design basis event; but that hole and revelation of wall thinning in the other Loop indicate the lack of redundancy and provide indication of degradation in both loops.

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.

PW Rebuttal: NRC seems to be leading to a suggestion that it is PW's job to prove that the AMP is not sufficient. In an operating license proceeding, the licensee bears the ultimate burden of proof. *Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 1)*, ALAB-697, 16 NRC 1265, 1271 (1982) (citing 10 C.F.R. § 2.325). The Board cannot renew Pilgrim's license unless Entergy shows that its aging management program provides reasonable assurance that the Current Licensing Basis ("CLB") will be maintained [10 C.F.R. § 54.29].

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.

PW Rebuttal: Mr. Spataro, Cox and Chan provided nothing more than opinion, unsubstantiated by the type of calculations that NRC now implies Mr. Gundersen failed to supply. Let us put the show on the right foot.

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.

PW Rebuttal: (a) NRC fails to point to any evidence provided by either Entergy or NRC. Entergy is required to prove their case that there is reasonable assurance that the AMP is sufficient. Reasonable assurance, by NRC's own definition, means by a "clear preponderance of the evidence" – that cannot mean "opinions" that do not add up even to 50%. (b) Pilgrim Watch filed a Motion to Strike on May 15, 2008; and it was timely. NRC's review of NRC orders attests to that fact [NRC facts, page 9]. The Commission Clarification Order was issued on May 16, 2008, directing the Board to close the evidentiary record for PW Contention 1. The Board's June 4, 2008 Order formally closed the evidentiary record for Contention 1. Therefore the content in PW's Motion to Strike is in play. NRC, the very agency responsible to protect public safety, cannot simply ignore the facts therein. Pilgrim Watch submitted that motion because some of the critical testimony presented by Entergy and NRC Staff at the April 10, 2008 Hearing regarding cured in place linings, coatings and cathodic protection/stray current interference was either inaccurate, incomplete or gave a misleading impression. The attachment, *Pilgrim Nuclear Power Station: Salt Water Discharge Piping Trenchless Rehabilitation Challenges*, Jonathan Raymer,

Miller Pipeline Corporation, Indianapolis, IN March 22-24, 2004, North American Society for Trenchless Technology (NASTT) No-Did 2004. The vendor explained that, "the liner in Loop B was allowed to reach excessive temperatures during the steam cure of the epoxy resin that caused noted concern at the plant, and the liner split upon cool down at each of the bends." PW explained further that elbows are precisely vulnerable locations-susceptible to stress. (c) NRC, like Entergy, seems to be placing "all their eggs in the CIPP liner basket." They forget that the CIPP is not seismically qualified; it has no warranty; it ripped at the elbows during installation in Loop B and was intentionally ripped at one elbow in Loop "A." (c) Entergy has failed to demonstrate that the AMPs for detecting and preventing degradation of the SSW buried piping from external sources will successfully ensure against the occurrence of significant external degradation; NRC, too, failed.

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.

PW Rebuttal: NRC reference to, *PW Statement at 19* is incomplete. PW assumes NRC refers to our reference to "leak before break" in terms of defense in depth. Entergy's logic that only the AMP is needed contradicts the fundamental approach to safety in the nuclear industry, defense-in-depth. Time and again, defense-in-depth is used to provide layers. The intent is to provide numerous, highly reliable layers. When multiple layers are provided with each layer having as few and as small holes as possible, the risk that all the holes line up to cause all layers to fail is minimized. But Entergy wants a single layer, the AMP. If the AMP were 100 percent reliable, a

single layer would suffice. But the record is abundantly clear that the AMP is not 100 percent reliable. The NRC's generic communications program is filled with reports of AMP failures.¹⁴ If the AMP were full-proof, the continual expansions and revisions to it would not be present. There have been continual revisions, so it is not full-proof. Dr. Davis' comments do not speak to the issue. Leaks are simply an indication of degradation, not to be simply ignored, resting on the false assumption that corrosion is gradual and that somehow the margin of safety for an aging reactor is predictable.

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.

PW Rebuttal: For all the Findings of Fact in *PW's Findings of Fact and Conclusions of Law*, June 9, 2008, PW finds that the AMP is not sufficient and that neither Entergy nor NRC has shown otherwise.

(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.

PW Rebuttal: PW says that cathodic protection is more than just a good idea. GALL XI, M28 is provided in Exh., 71. Relevant facts in PW's Findings of Fact follow:

¹⁴ See, for example: <http://www.nrc.gov/reading-rm/doc-collections/gen-comm/info-notices/2007/in200701.pdf>
<http://www.nrc.gov/reading-rm/doc-collections/gen-comm/info-notices/2004/in200409.pdf>
<http://www.nrc.gov/reading-rm/doc-collections/gen-comm/info-notices/2004/in200405.pdf>

Fact 231: The Applicant can and should implement a thorough Cathodic Protection Program (CPP) on all buried components [Tr. Exh.13, Gundersen, A-23].

Fact 232: Corrosion pits from the outside diameter have been discovered in buried piping with far less than 60 years of operation. Buried pipe that is coated and cathodically protected is unaffected after 60 years of service. Accordingly, operating experience from application of the NACE standards on non-nuclear systems demonstrates the effectiveness of this program. [GALL XI M-28, at 10, Operating Experience]. Cathodic Protection can be retrofitted [Tr., Gundersen, 722].

Fact 233: Retrofitting cathodic protection is not dangerous. It may introduce strays currents; however this is a design issue, not a design constraint. In order to retrofit cathodic protection requires a rectifier; if it malfunctions it does not necessarily require the reactor to automatically shut-down for repairs.¹⁵

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.”¹⁶ Tr. 771. Thus, adding a cathodic protection system at Pilgrim could carry risks of its own.

¹⁵ Affidavit of Dr. James A. Davis in Response to Pilgrim Watch Motion to Strike Testimony, May 23, 2008, at page 5 and 6.

¹⁶ 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 (continued. . .)

PW Rebuttal: PW explains that Gall XI M28 would provide assurance at PNPS' site that M34 does not. PW explained further that Dr. Davis misspoke at the Hearing. Retrofitting cathodic protection is not dangerous. It may introduce strays currents; however this is a design issue, not a design constraint. In order to retrofit cathodic protection requires a rectifier; if it malfunctions it does not necessarily require the reactor to automatically shut-down for repairs.¹⁷ Obviously any mitigation, program or activity at a reactor if improperly applied could carry risks; that certainly does not mean that is a valid excuse for failing to take action. If that were true, Entergy should simply turn off the key.

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,¹⁸ 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.

(. . .continued)

corrosion was "[p]erhaps...a bit strong." Affidavit of Dr. James A. Davis in Response to Pilgrim 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.

¹⁷ *Idid.*

¹⁸ June 4 Order at 9-10.

PW Rebuttal: Entergy has failed to meet its burden. PW's Motion to Strike properly corrected the record; and at the same time allowed Dr. Davis to correct his misstatement and preserve some professional credibility.

(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.

PW Rebuttal: It is clear that the tritium discovered in PNPS newly placed monitoring wells “did not fall from the sky,” as suggested by Entergy to the local press. Dr. Ahlfeld explains in his Declaration [Exh. 15], “ Presuming that the tritium detected originated at PNPS, the question arises as to the specific mechanism by which this tritium came to be at, for example, well MW 201. It has been suggested by PNPS personnel, as reported in the press, that this tritium is from rainfall sources. Presumably, the transport pathway for this would be airborne tritium captured by passing raindrops with rainfall subsequently infiltrating to the subsurface. But this transport pathway may be limited if, as is presumably the case, the monitoring wells are placed in a paved area of the site where rainfall cannot infiltrate. There are alternative theories for the source of tritium. A small pipe leak producing a transported plume of tritium that happens to travel near to monitoring well MW 201 might account for the observed levels of tritium. Alternately, a larger pipe leak producing a large plume of tritium with concentrations much larger than 3000 pCi/L might exist in the subsurface between wells MW 201 and MW 202. In this scenario, the diluted edge of the plume happens to travel near to monitoring wells MW 201 and MW 202. These alternate hypotheses highlight the fact that with so few monitoring wells, it is impossible to determine with any degree of certainty what contaminants may exist in the subsurface.”

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 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.

PW Rebuttal: The SSW Discharge water may become radioactively contaminated. If tubes were to leak inside the RBCCW or TBCCW heat exchangers, the SSW water is supposed to leak into the plant instead of the potentially radioactively contaminated RBCCW or TBCCW water leaking out, but that differential pressure is not always maintained and SSW might be radioactively contaminated. There is no real-time radiation monitor at the mouth of the discharge pipe. A leak anywhere in the SSW piping would impact the intended safety function of the reactor; and, although not of interest to the ASLB, a leak of contaminated water into the Bay would negatively impact public safety. The cooling water flow through the SSW piping ranged from 5.3 million gallons per day (MGD) to 15.6 MGD in 2006 depending on the season. The system is permitted for 19.4 MGD. No evidence has been provided that would show that such contamination has not occurred in this piping system.

The point is that there was no evidence provided by the Applicant or NRC that the SSW Discharge does NOT contain radioactive water; the Applicant is responsible to prove their case by providing evidence and they failed to provide evidence (facts) that it does NOT contain radioactive water.

The "facts" that they did provide, statements, clearly show that the SSW Discharge could contain radioactive water because that could be the only reason that they "regularly monitor for contamination."

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.

PW Rebuttal: Tritium was found in the recently placed monitoring wells – wells that are neither of sufficient number nor do the (4) wells meet design standards [Ahlfeld, Exh.15]. Neither NRC nor the Applicant deny that fact nor do they have any facts to indicate that it did not come from the SSW Discharge.

Reports of leaks at reactors around the country have been reported with increased frequency. As soon as PNPS put in wells, Tritium is discovered in the samples. It suggests that PNPS, like other aging reactors, is showing degradation as the reactor ages. A one-time-in-10 year inspection program is not sufficient to provide reasonable assurance. Business-as-usual, routine inspections/maintenance, has been shown to be inadequate around the country – NRC Lessons Learned Task Force Final Report. Industry [NEI] voluntary monitoring programs do not provide assurance; nor does Entergy's industry-wide voluntary program BPTIMP – a voluntary program in the planning stages at PNPS.

(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.

PW Rebuttal: The Oct 17, 2007 Board Order said, "...the only issue remaining before this licensing Board regarding Contention 1 is 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...”

The March 24, 2008 Order Ruling on Pending Matters and Addressing Preparation of Exhibits for Hearing said, (2) “We will not exclude the Ahlfeld Declaration because, as Pilgrim Watch suggests, issues of groundwater flow are relevant not only to contaminant transport, but also to detecting small leaks before they become large enough to compromise safety functions (Pilgrim Watch Reply to Entergy at 4). (How small of a leak would need to be detected in order to prevent compromising of such functions is a factual matter of our ultimate determination).”

The Order went on to say, “Also, regarding tritium, although Entergy argues, “tritium contamination by itself does not indicate any deficiency in the [Pilgrim aging management programs [“it may arguably be relevant to the issue of detecting leaks themselves, when considered in combination with other evidence.”

And, “(3) We will also not exclude testimony relating to monitoring wells and how effective they may be in detecting leaks that might become large enough to compromise safety functions suggested by Pilgrim Watch, Entergy opened the door to litigation of such issues in its prefiled direct testimony, by arguing and submitting testimony to the effect that “monitoring wells are not necessary to ensure that the CSS and SSW system do not develop leaks that would impair the performance of their intended functions,” and that using “monitoring wells to detect leakage would not be nearly as effective as the AMPs.” This clearly opens the door to evidence relevant to the relative effectiveness of monitoring wells to “ensure that the CSS and SSW system do not develop leaks that would impair the performance of their intended functions.” With regard to various other categories of evidence asserted to merit exclusion, *e.g.*, evidence regarding matters of expertise, vagueness and “unhelpfulness”, leakage at other plants (which we have noted is “not directly relevant to the issue at hand,” but still might “provide relevant information regarding the potential usefulness of monitoring wells in detecting leaks”), and others, we also deny the motions of Entergy and the Staff. In making our ultimate determinations, we will give all evidence before us the weight we find to be appropriate (from none to significant), and will consider all parties’ arguments in the current pleadings in reaching these determinations.”

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.*

PW Rebuttal: PW finds that one reason that the AMP is not sufficient [definition is that it is not enough] is that a well-designed monitoring well program of sufficient number is not a part of the AMP.

(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.*

PW Rebuttal: NRC Staff here refers only to Mr. Gundersen's written testimony; not other documents submitted and statements made at the Hearing.

PW expects NRC to be able to perform simply math. The age of the components was established. The CIPP liner was installed 2001 and 2003; two forty foot sections of the SSW Discharge pipes were replaced in 1999. The >80% of the piping is original, installed in the late 1960's; the rubber liner is original on > 80% of the SSW piping, excepting an unknown quantity that may have rotted away from the piping. Therefore over 80% of the component will be > 40 years old at license renewal, well within the "wear-out" phase and well within the time frame of uncertainty. No reactors have operated this long and the AMP is untested.

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.

PW Rebuttal: NRC's statement at 110 is totally without merit. Mr. Gundersen was obviously providing testimony to the piping at issue.

(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.

PW Rebuttal: PW's discussion of FAC is under the heading of "Degradation Mechanisms specific to Pilgrim NPS." The discussion said that, "According to NRC guidelines in NUREG 1800, A.1.2.3.4, the detection of wall thinning due to FAC should occur *before* there is a loss of the structure and the components intended function(s). Wall thinning must be monitored or inspected to ensure that the structure and component's intended function(s) will be adequately maintained during license renewal. Sample size and frequency of wall thinning measurements must be conducted in a timely manner so as not to exceed the minimum design thickness of the component. The licensee must provide information that links the parameters to be monitored or inspected to wall thinning. The Applicant's Prefiled Testimony is silent on this subject. Without evidence explaining how they are dealing with it, we add one more brick to our case that assurance is not provided by the applicant."

PW explained that "FAC includes wall thinning by electrochemical corrosion, erosion-corrosion and cavitation-corrosion. All three are affected by flow velocities. Although the main causes of FAC (turbulence intensity, material compositions, oxygen content and pH) have been identified, the behavior of FAC is not completely understood. Wall thinning is a local phenomenon. Local geometry, local metal composition and local turbulence affect FAC rates."

The interior of each SSW Discharge Loop contains (3) 45 degree elbows and (1) 90-degree long-radius elbow. Turbulence is increased at elbows. The rips in the CIPP liner at the elbows were patched, and although smoothed, the patch protrudes higher than the liner's surface, increasing turbulence.

Again Entergy failed to analyze-provide a factual basis. Therefore there is no preponderance of evidence established by the Applicant. NRC fails to explain their rationale for their statement that, "FAC is a concern only in "high-energy piping systems," and the SSW buried discharge

piping does not qualify as such.” No evidence is placed on the table.

(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”),¹⁹ justify putting the Pilgrim license renewal application “on hold.” PW Statement at 80.*

PW, no dispute: This is correct and is being litigated.

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.*

PW, no dispute.

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 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.*

PW Rebuttal: PW funds that the SER is material. Pilgrim’s Final Safety Evaluation Report was issued in November 2007. According to the NRC,

¹⁹ Office of Inspector General Report, *Audit of NRC’s License Renewal Program* (OIG-07-A-15) (Sept. 6, 2007).

The primary objectives of license renewal inspection activities are to review the documentation, implementation, and effectiveness of the programs and activities associated with an applicant's license renewal program *to verify that there is reasonable assurance that the effects of aging will be adequately managed* such that the intended function of components and structures within the scope of license renewal will be maintained consistent with the current licensing basis during the period of extended operation.²⁰ [Emphasis added]

We understand that technically Entergy's License Application is at issue here, and not the quality of the NRC Staff's review and Final Report. However, the report is important because it cannot help but influence the ASLB's and public's deliberations on the assurance provided by the AMP; and the Staff Report is undeniably an important component of the licensing process.

Therefore it is important to look at the quality of NRC's License Renewal Program. A recent report by the NRC Office of Inspector General (OIG), *Office of Inspector General's Audit of NRC's License Renewal Program*²¹ made clear that we cannot rely on the SER's conclusion that aging will be adequately managed so that the intended functions will be maintained consistent with the CLB over the extended period. Further, information that NRC did not keep the documents that they relied upon in making their reports adds weight to the petitioner's case.

(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

²⁰ <http://www.nrc.gov/reactors/operating/licensing/renewal/process.html#inspect-prog>

²¹ Office of Inspector General's Audit of NRC's License Renewal Program, OIG-07-A-15, September 6, 2007. Exhibit 22. ADAMS ML072490486

Nuclear Power Station as well as discoveries of radioactivity in the groundwater at additional plant sites.

PW clarification: Pilgrim Watch claims that several occurrences at other nuclear plants adds support to its claims that the Pilgrim buried pipe and tank AMPs are insufficient

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.

PW Rebuttal: (a) The March 24, 2008 Order Ruling on Pending Matters and Addressing Preparation of Exhibits for Hearing said [at 4], “leakage at other plants (which we have noted is “not directly relevant to the issue at hand,” but still might “provide relevant information regarding the potential usefulness of monitoring wells in detecting leaks.”

(b) Byron was brought forward by PW under the sub-heading “The epidemic of reported leak events recently demonstrates the correlation between aging and corrosion; and that industry practices such as chemistry control, salt water service programs, wraps and coating do not prevent leaks.”

(c) The context in which it was discussed by Mr. Gundersen was that even what appears to be a small leak can be determined to be of major safety significance “the Byron Station Nuclear Power Plant in Illinois recently detected what appeared to be a very small weeping pipe. However, upon closer inspection, the integrity of the pipe was grossly undermined and was in imminent danger of a catastrophic failure.” Exelon declared the ESW systems inoperable and had to shut down both reactors as a result because If the ESW system cannot function during an accident, the ability for the plant to avoid a reactor core meltdown with concurrent loss of containment is severely impaired if not entirely prevented.

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.

PW Rebuttal: (a) As the Board stated in their March 24, 2008 order, "leakage at other plants ...still might provide relevant information regarding the potential usefulness of monitoring wells in detecting leaks." (b) Monitoring wells, as the Board recognized, could serve to indicate the presence of small leaks that could grow so that the component was unable to perform its safety function. (c) Entergy provided no facts to show at any level of certainty that SSW Discharge piping would not 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.

PW Rebuttal: PW holds that the license renewal rules allow for a broader range of buried pipes to be adjudicated and we dispute the Board's decision to restrict our inquiry to the SSW discharge piping.

Six systems at PNPS that have buried piping or tanks meet the scoping criteria of 10 C.F.R. § 54.4: (1) standby gas treatment; (2) salt service water ("SSW"); (3) fuel oil; (4) station blackout diesel generator; (5) fire protection; and (6) condensate storage. [Entergy's Motion for Summary Disposition, June 8, 2007, Cox Decl. at ¶ 10].

10 CFR § 54.4 simply says how components are to be determined to be within scope. It is not a restriction on what can be looked at once they are determined to be within scope.

10 CFR § 54.21 [Contents of application--technical information] explains what has to be looked at in an aging management review of the components once they are determined to be within scope by 10 CFR § 54.4 (3). It says, (3) For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

It does not exclude everything, as Entergy and NRC hold, except the safety functions set forth in 10 CFR 54.4(a)(1)-(3). If that were the case the rule would say so. Therefore if NRC does not like it then they should proceed with the rule change process.

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.

PW Rebuttal: As discussed the Board accepted testimony and heard evidence only on a small portion of the components within scope and only on limited functions of those components.

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.

PW Rebuttal: PW holds that Entergy must demonstrate that the aging management program provides reasonable assurance that the buried pipes and tanks within scope perform consistent with the CLB for the period of extended operation by a showing of a clear preponderance of the evidence.

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.

PW Rebuttal: A renewed license may not be issued unless actions have been identified or have been taken with respect to the buried pipes and tanks within scope such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB. Whether there is reasonable assurance depends on the answer to two separate questions. (1) Did Entergy show with a certain level of certainty that the components will continue in accordance with the CLB? (2) Did Entergy put forward enough facts, not unsubstantiated opinion, to prove it? The product of the two better be over 50%. Entergy failed; and NRC failed to add anything substantive to what Entergy had to say.

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.

PW Rebuttal: Saying it is so, does not make it so. Entergy did not claim that at a certain amount of certainty that the AMPs were sufficient. Entergy did not show by a clear preponderance of the evidence –facts - to prove any claim to certainty. There were insufficient facts to base a conclusion of reasonable assurance.

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.

PW Rebuttal: PW finds for reasons stated that the license application must be denied.

IV. WITNESSES

Pilgrim Watch finds that Dr. David Ahlfeld, a hydrologist, and Arnold Gundersen, a nuclear engineer, are both fully qualified as evidenced by their CVs. NRC Staff do not provide dispute. Pilgrim Watch's witnesses are not employees of Entergy or the Nuclear Regulatory Commission, and neither job security nor economic reward influenced their testimony. During the proceeding, Citizen's experts provided correct and straight-forward information to the Board. Their testimony was carefully considered, scrupulously implemented, and rigorously correct. In contrast Entergy's and NRC's were at times inconsistent, at variance with the record, and misleading and may have misled members of the Board and public at the hearing.

V. CONCLUSION

For the foregoing reasons, Entergy's application to relicense the Pilgrim Nuclear Power Station should be denied. Entergy did not prove their case; much less by a "clear preponderance of the evidence. It does not meet the "not inimical" to public safety mandate of the AEA.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Mary Lampert". The signature is fluid and cursive, with a large loop at the end of the last name.

Mary Lampert

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June 9, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

Docket # 50-293-LR

Entergy Corporation

Pilgrim Nuclear Power Station

License Renewal Application

June 23, 2008

CERTIFICATE OF SERVICE

I hereby certify that the following was served on June 23, 2008, Pilgrim Watch Rebuttal to NRC Staff Proposed Findings of Fact, Conclusions of law, and Order in The Form of An Initial Decision.

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