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FOR SIGNATURE OF : ** GRN ** CRC NO:

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DESC:

2.206 - Hydrogeologic Assessment at Pilgrim Nuclear Power Station (EDATS: OEDO-2010-0688)

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE EDO, U.S. NUCLEAR REGULATORY COMMISSION

August 13, 2010

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Washington, DC 20555-0001
Via Mail: Office of Secretary
Via Email hearingdocket@nrc.gov

PILGRIM WATCH - 2.206 PETITION REGARDING HYDROGEOLOGIC ASSESSMENT PILGRIM NPS

Pursuant to §2.206 of Title 10 in the Code of Federal Regulations, Pilgrim Watch requests that the Nuclear Regulatory Commission (NRC) initiate a proceeding pursuant to §2.202 of Title 10 in the Code of Federal Regulations.

The Petitioner requests the NRC to issue an order that requires Entergy to immediately perform an updated hydro-geologic analysis. This is necessary (1) to provide reasonable assurance that leaks are not occurring so that piping and other buried components are able to perform their intended safety function by supplying sufficient fluid flow and to maintain inadvertent releases below technical specifications or other applicable limits which apply at the site boundary; (2) for Entergy to in compliance with the Industry Ground Water Protection Initiative at Pilgrim Station that they agreed to follow; and (3) to determine where underground cable flooding may be occurring necessary to ensure that all submerged cables, splices, connectors and wiring at Pilgrim NPS are capable of performing their required function in compliance with regulation.

There is no regulatory requirement that explicitly mandates hydro-geological studies. This reflects that no one anticipated that buried pipes would leak water out or that water would leak into cable vaults; however, it is clear that Appendix B to 10 CFR Part 50 --- Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants[1] would implicitly require hydro-geological studies once leaks or

[1] http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/part050-appb.html)

flooding was discovered, as is the case at Pilgrim[2]. Specifically, Criterion 16 defines the regulatory requirements for corrective action once a problem is found.

It says:

> XVI. Corrective Action
>
> Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall *assure that the cause of the condition is determined and corrective action taken to preclude repetition.* The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management. [Emphasis added]

The requirement to "assure that the cause of the condition is determined and corrective action taken to preclude repetition" logically leads to including a hydro-geological study if water leaks out from underground piping/tanks or water leaks in to submerge underground cables.

For example: at Pilgrim and other sites when tritium leakage was discovered -- more monitoring wells were drilled and placed in service. If one knew with certainty where the underground pipes and tanks were located (i.e., the potential sources of leakage) and also knew with certainty the hydrogeology of the site (i.e., the paths leakage would take), one would know where to place the proper monitoring wells "to assure that the cause of the condition is determined and corrective action taken to preclude repetition."

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[2] Buried Piping/Tanks & Components: Since monitoring wells were first put in place and sampled, there has been persistent findings of tritium in samples in excess of what one would expect, topping out at 25,552 pCi/L, July 7, 2010. [Summary of Tritium Detected in Groundwater Monitoring Wells * Pilgrim NPS at http://www.mass.gov/Eeohhs2/docs/dph/environmental/exposure/tritium_pnpp.pdf] These findings must be seen in the context that there are an insufficient number of wells at Pilgrim and that they were not placed according to standard design. Therefore the leaks may be far more extensive; and the source of the tritium leaks remains unknown. Non-Environmentally Qualified Inaccessible Cables, Splices, Connectors & Wiring. NRC Integrated Inspection Report *05000293/2010003*, 1RO6 Flood Protection Measures, July 29, 2010 [See both Pilgrim Watch 2.206 Petition Regarding Inadequacy of Entergy's Management of Non-Environmentally Qualified Inaccessible Cables & Wiring at Pilgrim Station, July 19, 2010; and Supplement (1) to Pilgrim Watch 2.206 Petition Regarding Inadequacy of Entergy's Management of Non-Environmentally Qualified Inaccessible Cables & Wiring at Pilgrim Station, August 6, 2010

The fact that discoveries prompt a proliferation of additional monitoring wells suggests a lack of knowing where components are and where and how liquids flow. Pilgrim Watch's 2.206 Petition seeks to fill that knowledge gap required for regulations to be met and reasonable assurance provided for public safety.

INTRODUCTION

At Pilgrim Station, the 1967 Dames & Moore report is the only study to date that performed exploratory borings as part of its hydrologic analysis for the site. No subsurface investigations have been performed for over forty (40) years, as they clearly should have been, to determine flow over the property. It is necessary that such studies be required now for at least two reasons.

1. Buried Piping/Tanks & Components: Monitoring wells are needed to ensure that these components are not leaking. NRC recognizes that assuring capability to indentify leaks is important and has enacted regulations,[3]

> ...to ensure that the piping is able to perform its intended safety function by supplying sufficient fluid flow and to maintain inadvertent releases below technical specifications or other applicable limits which apply at the site boundary" [SECY-09-0174[4] *Staff Progress in Evaluation of Buried Piping at Nuclear Reactor Facilities*, December 2, 2009, pg., 7]

To properly place monitoring wells, updated hydro-geological studies are necessary. Without current knowledge of groundwater flow, monitoring well placement is hit or miss; and as a consequence NRC, Entergy and the public will not know whether radioactive, and other liquids, are leaking in violation of

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[3] NRC's Liquid Radioactive Release Lessons Learned Task Force, Final Report, September 1, 2006, Section 3.2.1.2, Existing Regulatory Framework
10 C.F.R. § 20.1302 Compliance with dose limits for individual members of the public: (a)(b)
10 C.F.R. § 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
[3] Massachusetts Department's of Public Health's *Report on the Status of Groundwater Monitoring Program at Pilgrim Nuclear Power Station*, June 25, 2010; Dr. David P. Ahlfeld's, PhD.PE., *Declaration for Pilgrim Watch*, January 28, 2008; *GZY Entergy's contractor, Report;* The *Industry Ground Water Protection Initiative – Final Guidance Document* August 2007; and Entergy's Buried Pipes and Tanks Monitoring Program (BPTIMP)

[4] NRC Electronic Library, ADAMS, Accession No. ML062260198

regulations or learn the source of leaks. Second, by letter dated November 20, 2009 (ADAMS Accession No. ML093350032), NEI indicated that the nuclear industry's chief nuclear officers, including Entergy, voted to approve a proposed "Buried Piping Integrity Initiative;" Entergy has failed to comply with Objective 1.1 Site Hydrology and Geology at Pilgrim Station and Objective 1.3 On-Site Groundwater Monitoring- discussed below.

2. Non-Environmentally Qualified Inaccessible Cables, Splices, Connectors & Wiring: In order to ensure that all submerged cables, splices, connectors and wiring at Pilgrim NPS are capable of performing their required function it is necessary to have, "Site hydrological data on water table depth and how the water table is affected by site precipitation or the water surface level in nearby bodies of water can also be used to determine where underground cable flooding may be occurring."[NUREG/CR7000, 4-18]

Almost every active safety and non safety system at Pilgrim Nuclear Power Station (PNPS) is dependent upon electrical power to perform its function to prevent major accidents. If an accident occurs, electrical power is required to prevent a reactor meltdown with major radioactive releases to the environment. Loss of electrical power increases the likelihood for a major release of radioactive material to the environment.

Monitoring Network Design: It is clear from a review of pertinent documents discussed below that the design of a monitoring network includes determination of plausible leak scenarios, determination of expected fate and transport of the leaking substances and then placement of the detection network so that these transporting substances will be detected. Entergy, at present is relying on old data and needs updated characterization of site-specific groundwater flow. In order for the public to feel confident that the study is credible, it must be made public- transparent so that it can be reviewed by independent analysts. If Entergy has nothing to hide and is doing what they should, there should be no objection. We expect NRC to insist on transparency.

BASIS- DOCUMENT REVIEW

- Industry Ground Water Protection Initiative – Final Guidance Document August 2007
- Declaration of David P. Ahlfeld, PhD, PE, Regarding Groundwater Monitoring Requirements for PNPS, January 28, 2008 (Docket # 50-293-LR)
- Massachusetts Department's of Public Health's *Report on the Status of Groundwater Monitoring Program at Pilgrim Nuclear Power Station*, June 25, 2010
- NRC Integrated Inspection Report *05000293/2010003* [ADAMS Accession No: ML102100150]

A. INDUSTRY GROUND WATER PROTECTION INITIATIVE – FINAL GUIDANCE DOCUMENT [August 2007]

By letter dated November 20, 2009 (ADAMS Accession No. ML093350032), NEI indicated that the nuclear industry's chief nuclear officers voted to approve a proposed "Buried Piping Integrity Initiative;" and that the stated goal of the initiative is to "provide reasonable assurance of structural and leakage integrity of all buried piping with special emphasis on piping that contains radioactive materials." [SECY-09-0174, pg., 4]

However, Entergy has failed to comply with Objective 1.1 Site Hydrology and Geology at Pilgrim Station and Objective 1.3 On-Site Groundwater Monitoring.

Objective 1.1 - Site Hydrology and Geology

Ensure that the site characterization of geology and hydrology provides an understanding of predominant ground water gradients based upon current site conditions.

Acceptance Criteria:

a. Perform hydrogeologic and geologic studies to determine predominant ground water flow characteristics and gradients.

b. As appropriate, review existing hydrogeologic and geologic studies, historical environmental studies, and permit or license related reports.

c. Identify potential pathways for ground water migration from on-site locations to off-site locations through ground water.

d. Establish the frequency for periodic reviews of site hydrogeologic studies. As a minimum, reviews should be performed whenever any of the following occurs:

Substantial on-site construction,

Substantial disturbance of site property,

Substantial changes in on-site or nearby off-site use of water, or

Substantial changes in on-site or nearby off-site pumping rates of ground water.

e. As appropriate, update the site's Final Safety Analysis Report with changes to the characterization of hydrology and/or geology.

Objective 1.3 - On-Site Groundwater Monitoring

Establish an on-site ground water monitoring program to ensure timely detection of inadvertent radiological releases to ground water.

Acceptance Criteria

a. Using the hydrology and geology studies developed under Objective 1.1, consider placement of ground water monitoring wells downgradient from the plant but within the boundary defined by the site license.

Attachment 2: Frequently Asked Questions [At 15]

3) What is meant by "substantial on-site construction" or "substantial disturbance of site property" in acceptance criterion d to Objective 1.1?

A: "Substantial" refers to the likelihood that the construction or disturbance has affected the subsurface flow of ground water. Licensees at new plants should, for example, review their pre-licensing characterization of hydrology and geology for changes that result from construction of buildings and structures or compaction of soil.

Appendix B: Self Assessment Checklist

Objective 3.1 at 17

1.1 Ensure that the site characterization of geology and hydrology provides an understanding of predominant ground water gradients based upon current site conditions.

1.1e. As appropriate, update the Final Safety Analysis Report with changes to the hydrology and/or geology.

1.3.a. Using the hydrology and geology studies developed under Objective 1.1, consider placement of ground water monitoring wells downgradient from the plant but within the boundary defined by the site license.

B. DECLARATION OF DAVID P. AHLFELD, PHD, PE, REGARDING GROUNDWATER MONITORING REQUIREMENTS FOR PNPS, JANUARY 28, 2008 (Docket # 50-293-LR)

Pilgrim Watch's expert witness in Pilgrim's License Renewal adjudication process, Dr. David P. Ahlfeld, PhD.PE, analyzed Entergy's monitoring well program and provided a declaration, January 28, 2008.[5] His testimony supports our request for updated analysis of groundwater flow on site. Pertinent sections of his testimony read,

[5] Testimony and CV available on Adams, Accession Number ML080740410, Exhibit 2, page 138

Groundwater Monitoring Requirements for PNPS To make the monitoring network an effective means of detecting leaks, the network should be designed so that a pollutant release under any plausible leak scenario will be detected, with high degree of certainty. The design of a monitoring network includes determination of plausible leak scenarios, **determination of expected fate and transport of the leaking substances** and then placement of the detection network so that these transporting substances will be detected.

Steps in Monitoring Network Design

1) Determination of all plausible leak locations. This would include consideration of all piping segments and tanks that are placed below the ground surface and are part of system components that are within scope. For purposes of monitoring network design, leaks from any of the plausible locations would be presumed to release water contaminated with radionuclides or oil. This step is similar those recommended in the NEI Guidance Document (Objective 1.2 Site Risk Assessment) where buried piping is described as being a credible mechanism for leaking materials to reach groundwater.

2) Identification of the specific contaminant species that would be present in the leaking water or oil from each of the system components. A set of indicator contaminants should be selected for each system component that can, if detected in groundwater, uniquely identify the component. Particular emphasis should be on those contaminants that are least likely to sorb and thus be most rapidly transported.

3) Consideration of the fate and transport of each indicator contaminant from each of the plausible leak locations.

a. This analysis would include prediction of subsurface transport pathways from all identified source locations. This prediction would consider vertical migration of leaking water through the unsaturated zone to the water table. It would also account for the direction and rate of groundwater flow. Such predictions must be based upon understanding of groundwater behavior at the site derived from a recently-conducted detailed site characterization as recommended in the NEI Guidance Document (Objective 1.1 Site Hydrology and Geology). This is particularly important at PNPS where building, paving and changes to storm drainage may significantly affect local flow behavior.

b. Transport of a particular contaminant along identified transport pathways must be analyzed. For each contaminant it is necessary to account for the initial concentration of the contaminant in the

leaking liquid and the effects of dispersion, sorption, radioactive decay or other processes that may affect concentrations of the contaminant at the monitoring well.

4) The NEI Guidance Document (Objective 1.3 On-Site Groundwater Monitoring) recommends a monitoring system that will "ensure timely detection" of leaks. This will be accomplished with placement of monitoring wells so that all predicted transport pathways are intercepted with a high degree of certainty. The placement of monitoring wells should consider both the areal (plan view) location and also the vertical location of the well screens. A complete monitoring system will also include upgradient control wells which are intended to provide ambient groundwater conditions and help to confirm groundwater flow directions. The PNPS is a particularly challenging site for placement of monitoring wells. Because of the short distance between possible leak sites and the coast line (assuming that groundwater flow is generally towards the sea), the potential is high for a narrow transport pathway to convey contaminants between monitoring wells unless they are closely spaced. This suggests that a high density of monitoring wells will be needed to detect leaks with adequate assurance.

5) Understanding of the fate and transport of indicator contaminants can be used to determine the appropriate frequency of water sample collection at the monitoring wells and the required detection limits for analysis. In particular, the dilution of contaminated water as it mixes with ambient water during transport must be considered. Detection limits for contaminant analysis should be as low as practical so that dilution of contaminants does not mask the presence of leaks.

(I am) not aware of any recent hydrogeologic studies that have been conducted to determine current groundwater flow directions and rates. Hence, the suitability of these wells to actually intercept plausible leakage transport pathways is unknown. [Emphasis added]

C. MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH *REPORT ON THE STATUS OF GROUNDWATER MONITORING PROGRAM AT PILGRIM NUCLEAR POWER STATION*, JUNE 25, 2010

Hydrogeologic Assessment: MDPH found that the Pilgrim's monitoring wells were not placed according to accepted design practices, agreeing with Dr. Ahlfeld's testimony on behalf of Pilgrim Watch, discussed below. Placement of the initial monitoring wells put in place in November 2007 and six (6) more wells added to the program in April 2010 were based on a pre-operational 1967 Dames & Moore report. This is the only study to date that performed exploratory borings as part of its analysis. No subsurface

investigations have been performed for over forty (40) years, as they clearly should have been. MDPH's report found this of special concern because,

> ...localized variations in groundwater flow beneath and around the footprint of the facility have not been well characterized. PNPS previous consultant noted that the additional data points would be needed to adequately assess horizontal and vertical gradients and flow direction across the site and in the vicinity of the structures (GZA 2009). Thus, further assessment of site specific hydrology would be required to rule out a possible cross – gradient groundwater pathway. In addition, much of the information on localized groundwater flow direction is based on information gathered prior to PNPP construction and subsurface conditions may have changed during construction and subsequent operations of the plant. Factors that could influence localized groundwater flow after construction of PNPP need to be further evaluated such as the impact of some facility structures reaching a depth below the water table and mounding of groundwater." (MDPH Report, pg. 9)

MDPH recommended, "...better characterization of site-specific groundwater flow gradients in and around PNPP subsurface structures and components." (MDPH Report, pg. 12) This is necessary because the suitability of these wells, and any subsequent wells, to actually intercept plausible leakage transport pathways is not known.

D. **NRC Integrated Inspection Report *05000293/2010003*, 1RO6 Flood Protection Measures**

Inspectors observed partially and fully submerged medium voltage cables" in the three cable vaults sampled. (Report, pg.7) The report made clear that flooding is a recurring issue.[6] The Report's main finding describes a sample taken on April 28, 2010, where the inspectors observed water in the three (3) manholes and vaults inspected. It says that,

> On April 28, 2010, the inspectors observed water in each of the manholes and vaults listed above. The inspectors noted that no dewatering or drainage systems existed in the manholes. Entergy procedure EN-DC-346, Revision 0, "Cable Reliability Program," was issued and effective on December 31, 2009. This procedure discusses manhole inspections and dewatering, and requires, in part, "If manual inspections and pumping are used to maintain a

[6] Discussed in Supplement (1) to Pilgrim Watch 2.206 Petition Regarding Inadequacy of Entergy's Management of Non-Environmentally Qualified Inaccessible Cables & Wiring at Pilgrim Station, August 6, 2010

cable system dry, the intervals must be sufficient to keep the cables dry. Adjust intervals as necessary, based on inspection results." Discussions with Entergy personnel involved with these inspections indicated that *cables in Manhole 2A were periodically found submerged or partially submerged, and that cables in Manholes 4 and 5 were always found submerged.* The cables that were submerged included cables that were installed from the 4160V, non-safety related startup transformer and connected to the A2 and A4 non-safety related busses. The inspectors identified that *Entergy had previously identified submerged cables in August and September of 2009, however, corrective actions were not sufficient to preclude these cables from being submerged.* The inspectors also determined that The inspectors identified that *Entergy had previously identified submerged cables in August and September of 2009, however, corrective actions were not sufficient to preclude these cables from being submerged* (Pg., 8, emphasis added)

NRC regulations[7] require that plant owners ensure that electrical wiring is qualified to perform in the environmental conditions experienced during normal operation and during accidents. At page 8 of the Report, it says that, "The inspectors noted that *no dewatering or drainage systems existed in the manholes"* (and) "These cables are *not rated for continuous submergence in water.*" (Emphasis added)

Specifically, the regulations require Entergy to qualify the electrical wires for "The environmental conditions, including....submergence at the location where the equipment must perform..." and that, "electrical wires be assured to function even if they are submerged during normal operations and/or under accident conditions."

There can be no assurance if the wires are "periodically found submerged or partially submerged" or "always found submerged" as was the case described in this inspection report. It is basic that water and moisture cause corrosion; neither the coating on the wires nor the conduits containing the wires are specified to operate in a moist and submerged environment.

[7] 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants," available online at http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/part050-0049.html; for a list of Guidance Documents see *NRC's Regulatory Issue Resolution Protocol, Inaccessible or Underground Cable Performance Issues at Nuclear Power Plants*, August 19, 2009 (Adams ML092460425), Appendix A

CONCLUSION

The Brattleboro Reformer, *Entergy Moves VY extraction well* published on August 5, 2010 reported that,

> The inspection at Vermont Yankee will allow the NRC to follow up on issues associated with groundwater protection. *A team of geologists and health physicists will be on hand to evaluate what progress Entergy has made on developing a site model of the hydrogeology in Vernon.* [Emphasis added]

It is clear that citizens impacted by Pilgrim deserve similar protection. Pilgrim is in violation of regulations. In order to ensure Entergy will comply with these regulations, NRC must enforce them and, in this instance, require Entergy to perform an updated hydro-geologic analysis at Pilgrim Station immediately in order to provide reasonable assurance that public safety and health are being protected. Last, it is important that NRC require that Entergy's hydro-geological contract and analysis is made available to the Massachusetts Department of Public Health and the general public; transparency is prerequisite to developing trust.

Respectfully submitted,

[original signed]

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