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April 24, 2012
Daniel S. Morris
Acting Regional Administrator
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
55 Great Republic Drive
Gloucester, MA 01930-2276
April 3, 2012

Re: ESA § 7 Consultation with Nuclear Regulatory Commission:

Entergy's Pilgrim Nuclear Power Station, Plymouth, Massachusetts

Dear Mr. Morris,

This is to request that National Marine Fisheries Services (NMFS) consider the following information in connection with its consultation under the Endangered Species Act (ESA), 16 U.S C. §§ 1531-1544, with the Nuclear Regulatory Commission (NRC) regarding the NRC Staff 2006 Biological Assessment (2006 BA) and 2012 supplemental Biological Assessment (2012 BA) for the relicensing of Entergy Corporation's Pilgrim Nuclear Power Station (PNPS). These comments relate to all species and critical habitat identified in the 2006 BA and the 2012 BA, the petition to expand the critical habitat for North Atlantic right whales (*Eubalaena glacialis*),[1] and species protected under the Marine Mammal Protection Act, 16 U.S.C. §§ 1371-1421h. These comments are submitted on behalf of Pilgrim Watch and a network of other environmental and citizen action groups.

These comments show that there is inadequate ***data about pollution impacts on ESA-listed species and critical habitat from PNPS operations over a 60-year period.*** As shown below, for 40 years, PNPS has been discharging chemical pollutants, including chlorine, corrosion inhibitors, and potentially metals from corroding pipes and infrastructure into Cape Cod Bay. There is a startling lack of data about the quantities and identity of pollutants released and to be released, how these chemicals reformulate once they are released, and how their toxicity may be affected by Entergy's thermal plume. The NRC staff admits that there has been no testing for water quality, and only four samples taken of sediments. Regulatory oversight of the discharge of toxic chemicals to the environment from PNPS over the past 40 years has been lax or non-existent. There is no way to assess the baseline to determine the effects of these toxic discharges during the future relicensing period. Essentially, the NRC

[1] 75 Fed. Reg. 61690, 61691 (Oct. 6, 2010)(Notice of 90-day petition finding that the petition presents substantial information indicating that the revision of the critical habitat is timely and appropriate.)

staff and Entergy assert that because there no data showing harm, there is any harm, and "no effects" ESA-listed species and critical habitat. However, an absence of data does not prove there are "no effects." We request that NMFS address and respond to each of the issues here in its ESA § 7 determination for PNPS relicensing.[2]

PNPS Water Pollution

For the past 40 years, PNPS has discharged pollutants, at least including chlorine and metals, from PNPS to Cape Cod Bay. Neither the 2006 and 2012 biological assessments nor the PNPS EIS[3] address the effect of these contaminants on the water quality and sediments in Cape Cod Bay. For example, there is no indication of whether 40 years worth of chlorine/biocides, metals, and by-products of corrosion inhibitors have bio-accumulated in the ambient environment or reformulated, nor is there any description of the potential cumulative and synergistic effects of 60 years (40 years of operations plus 20 more years) of these discharges combined with the thermal plume. Neither the PNPS EIS nor the biological assessments identify the total volume of chemicals discharged to Cape Cod Bay over the past 40 years, or the total volume to be discharged over the next 20 years. Instead, Entergy and the NRC staff hide behind controversial impingement and entrainment "body counts" of fish, larvae, fish eggs, etc. and attempt to pass this off as an analysis of the "effects of the action" for ESA § 7 purposes.

The PNPS EIS states that there are no water quality samples to document the ambient water quality: "At the site audit of May 2006, the NRC staff was informed that analytical data for surface water and sediment have not been collected regularly by Entergy or its predecessor, Boston Edison, at the PNPS facility." PNPS EIS, 2.2.5.2, Chemical Contaminants near PNPS, p. 2-30. To reach conclusions about the impacts of 40 years of chlorine, metal, and other pollutant discharges on Cape Code Bay sediments and water quality, the NRC staff relies primarily on ***four soil sediments taken at the intake channel, not the discharge channel or the surrounding area, that are about 20 years old. These glaring data gaps render the PNPS EIS wholly inadequate for ESA purposes.***

The NRC staff supplements this miniscule amount of data with a 11 months of NPDES discharge monitoring reports – out of the 480 months that PNPS has been operating - to conclude that Entergy's pollutant discharges have no effect, or no significant effect, on the environment. Eleven months of DMRs for pollutants collected at the discharge point cannot

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2 We note that many of these issues were raised in comments on the draft PNPS EIS, and that the NRC staff response consisted merely of references to the NRC's generic EIS for power stations, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (NUREG-1437 Vol. 1), Part 4, Environmental Impacts of Operation
http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1437/v1/part04.html.

[3] "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, Supplement 29, Regarding Pilgrim Nuclear Power Station, Final Report, July 2007," NUREG-1437, and its Appendices. (NUREG-1437). Available on line: http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1437/supplement29/index.html; Vol. 1 ML 071990020; Vol. 2 Appendices ML 071990027.

be used as evidence that PNPS pollutant discharges "are not likely to effect" ESA-listed species and critical habitat. The absence of data does not prove that there is, has been, and will be, no adverse effects on the marine aquatic environment.[4] Further, 11 months of DMRs do not show levels of pollutants in the ambient sediment and water quality, but only sample the pollution as it is coming out of the pipes into Cape Cod Bay.

This lack of data on ambient pollution levels raises serious concerns about the ability of NMFS to adequately determine the "effects of the action", as defined by 50 C.F.R. 402.02, on ESA-listed species and critical habitat, absent credible, scientific data about the nature and extent of PNPS chemical discharges, current conditions in Cape Cod Bay, and the future effects of these discharges.

The complete inadequacy of the PNPS EIS is further exposed by the fact that under the NRC's NEPA regulations, the NRC staff can avoid assessing site specific impacts of 60 years of discharges of chlorine, metals, corrosion inhibitors, etc., because the discharge of "chlorine or other biocides", and "other metals" is a "Category 1 Issue." 10 CFR Part 51, Subpart A, Appendix B, Table 1-B; PNPS EIS, p. 4-2, Table 4-1. This means unless ***the NRC staff decides*** the there is "new and significant information" about these topics, it can rely solely on the NRC's "generic EIS" for an evaluation of the impacts to draw conclusions about PNPS impacts on Cape Cod Bay. Not surprisingly, the NRC staff and Entergy together decided there was "no new and significant information" warranting further inquiry into the effects of 60 years of chlorine, biocides, and metal discharges. This allows PNPS relicensing to avoid a site-specific inquiry into the effects of chlorine, biocides, and metal discharges on ESA-listed species and critical habitat. [5] This conclusion is entirely devoid of any factual basis: as the NRC admits in the PNPS EIS, there has been no water quality sampling and only four sediment samples for pollutants covered under the Clean Water Act, and these were from the *intake* embayment.

The NRC generic EIS for nuclear plant relicensing describes in general the potential negative environmental impacts of discharges of chlorine and other biocides, metals such as copper, zinc, chromium from corroding pipes and tubes. (Since PNPS uses a corrosion inhibitor, and had to almost entirely replace corroded pipes in about 1984, corrosion of metal piping is obviously an issue at the facility). The relevant portion of the NRC's generic EIS is recited here:

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[4] The NRC reviewed less than a year of monthly DMRs, April 2005 to March 2006, which are not publicly available on line and not in the NRC electronic database, and found three violations in the 11-month period (thus, over 25% of the time Entergy was in noncompliance). Two violations were for chlorine.

[5] The NRC staff concluded there would be "no significant impacts of discharge of chlorine or other biocides, and "no impacts of "other metals" during the renewal term "beyond those discussed in the GEIS." PNPS EIS, Section 4.0, p. 4-5, and that impacts from continued discharge of chlorine and other metals over the next 20 years would be "SMALL" and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted. PNPS EIS p. 4-2.The NRC's regulations assign three "significance" levels to environmental impacts. SMALL" is defined as environmental effects that are "not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource." PNPS EIS, iviii. Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

4.2.1.2.4 Chemical Effects

Some of the water quality issues that have been raised are ***potential chemical effects resulting from discharges of chlorine or other biocides,*** small-volume discharges of sanitary and other liquid wastes (Chapter 2), chemical spills, and ***heavy metals leached from cooling system piping and condenser tubing.*** Impacts of chemical discharges to water quality are considered ***to be of small significance if discharges are within effluent limitations designed to ensure protection of water quality and if ongoing discharges have not resulted in adverse effects on aquatic biota.*** The discharged chemicals, including chlorine and other biocides, are regulated by the NPDES permit of each nuclear power plant. Regulatory concern about ***toxic effects of chlorine and its combination products, as well as operating experience with control of biofouling, has led many plants to eliminate the use of chlorine or reduce the amount used below those levels that were originally anticipated in the environmental statements associated with issuing the construction permit and operating license.*** Some power plants use mechanical cleaning methods or, because of the abrasive properties of particulates in the intake water, do not have to clean the condenser cooling system at all. Other plants chlorinate the condenser cooling or service water systems but can isolate certain portions for treatment (e.g., a single unit of a multi-unit plant), thereby allowing dilution to reduce the concentration of chlorine in the discharge. Because of these refinements and the process for modifying NPDES permit conditions as needed, water quality degradation from existing biocide usage at once-through nuclear power plants is not a concern among the regulatory and resource agencies consulted for this GEIS. ***Based on review of literature and operational monitoring reports, consultations with utilities and regulatory agencies, and comments on the draft GEIS, water quality effects of discharge of chlorine and other biocides are considered to be of small significance for all plants.*** Small quantities of biocides are readily dissipated and/or chemically altered in the receiving water body so that significant cumulative impacts to water quality would not be expected. No change in operation of the cooling system is expected during the license renewal term, so no change in the effects of biocide discharges on receiving water quality is anticipated. Effects of biocide discharges could be reduced by increasing the degree of discharge water treatment, reducing the concentration of biocides, or by treating only a portion of the plants' cooling and service water systems at one time. However, because the effects of biocide discharges on water quality are considered to be impacts of small significance, the staff does not consider the implementation of these potential mitigation measures to be warranted. Discharge of chlorine and other biocides is a Category 1 issue. Discharges of sanitary wastes are regulated by NPDES permit, and discharges that do not violate the permit limits are of small significance.

Minor chemical spills or temporary off-specification discharges from sanitary waste treatment systems and other low-volume effluents (e.g., excessive coliform counts or total suspended solids levels, pH outside of permitted range) were cited as common NPDES permit violations in the utility responses to the NUMARC survey (NUMARC 1990). Such NPDES noncompliances have been variable, random in occurrence, and readily amenable to correction. These minor discharges or spills do not constitute widespread, consistent water quality impacts. Water quality effects of minor chemical discharges and spills are of small significance and do not have significant effects on aquatic biota for all plants and have been mitigated as needed. ***Significant cumulative impacts to water quality would not be expected because the small amounts of chemicals released by these minor discharges or spills are readily dissipated in the receiving water body.*** Spills and off-specification discharges occur seldom enough that regulatory agencies express no concern about them for operating nuclear power plants. While there may be additional management practices or discharge control devices that could further reduce the frequency of accidental spills and off-specification discharges, they are not warranted because impacts are already small and occur at low frequency and because such mitigation would be costly. The water quality impacts of permitted sanitary waste water and minor, nonradiological chemical discharges and spills are a Category 1 issue.

Heavy metals (e.g., copper, zinc, chromium) may be leached from condenser tubing and other heat exchangers and discharged by power plants as small-volume waste streams or corrosion products. Although all are found in small quantities in natural waters (and many are essential micronutrients), ***concentrations in the power plant discharge are controlled in the NPDES permit because excessive concentrations of heavy metals can be toxic to aquatic organisms.*** Discharge of metals and other toxic contaminants ***may*** also be subject to individual control strategies developed by the states to control toxic pollutants under the 1987 Amendments to the CWA. These strategies for point source discharges of toxic pollutants are implemented through the NPDES permit program. Langford reviewed the literature concerning heavy metal discharges from power plants and concluded that, during normal operations, concentrations ***generally*** are below the levels of detection. However, plant shutdowns for testing and refueling keep stagnant water in contact with condenser tubes and other metal structures for extended periods and could allow abnormally large amounts of metals to be leached. For example, Harrison et al. (DOE/ER-0317) detected elevated copper concentrations in the discharge during startup of Diablo Canyon Nuclear Power Station. Abalone deaths in the discharge area of the Diablo Canyon were attributed to high copper concentrations in the effluent following a shutdown period (Martin et al. 1977).

The ability of aquatic organisms to bioaccumulate heavy metals even ***at low concentrations has led to concerns about toxicity both to the biota and to humans that consume contaminated fish and shellfish.*** For example, bioconcentration of copper discharged from the Chalk Point Plant (a fossil-fuel power plant on Chesapeake Bay) resulted in oyster "greening" (Roosenburg 1969). Bioaccumulation of copper released from the H. B. Robinson Plant resulted in malformations and decreased reproductive capacity among bluegill in the cooling reservoir (ASTM STP 854); see Section 4.4.3. In all three of these examples of excessive accumulation of copper (Diablo Canyon, Chalk Point, and H. B. Robinson), replacement of the copper alloy condenser tubes with another material (e.g., titanium) eliminated the problem.

Concentrations of heavy metals in the discharges of once-through nuclear power plants are normally within NPDES permit limits and are quickly diluted or flushed from the area by the large volumes of the receiving water. Discharge of metals and other toxic contaminants may also be subject to individual control strategies developed by the states to control toxic pollutants under the 1987 Amendments to the CWA. These strategies for point source discharges of toxic pollutants are implemented through the NPDES permit program. Excessive discharges of metals have been corrected at the two nuclear power plants (Diablo Canyon and H. B. Robinson) that experienced problems during the original license period.

Impacts of heavy metal discharges are considered to be of small significance if water quality criteria (e.g., NPDES permits) are not violated and if aquatic organisms in the vicinity of the plant are not bioaccumulating the metals. Based on review of literature and operational monitoring reports, consultations with utilities and regulatory agencies, and comments on the draft GEIS, discharge of heavy metals leached from the condenser cooling system has been a problem at only Diablo Canyon and H. B.Robinson nuclear power plants, and mitigation was effective in both cases. ***Although cumulative impacts could result from the long-term accumulation and bioaccumulation of heavy metals, mitigation for individual plant effects has also reduced the potential for contributions to cumulative effects. Monitoring has not revealed a continuing problem with accumulation of heavy metals.*** No change in operation of the cooling system is expected during the license renewal term, so no change in metal concentrations in the cooling water discharge is anticipated. Effects of elevated metal concentrations could be reduced by replacing condenser tubes with alloys that are less likely to corrode. However, because the effects of metal concentrations on cooling water discharges are considered to be impacts of small significance and because the potential mitigation measures would be costly, the staff does not consider the implementation of these potential mitigation measures to be warranted. Elevated heavy metal concentrations in the condenser cooling water discharge is a Category 1 issue. (emphasis supplied)

Chemical pollution of the environment from nuclear station effluent discharges to water bodies is also discussed in EPA's "§309 Reviewers Guidance for Nuclear Power Plant Environmental Impact Statements," Sept. 2008, EPA Publication No. 316-X-08-001. Among other things, this Guidance document explicitly states that nuclear power plant effluent usually contains chromium. P.6-30. There is no analysis in the PNPS EIS of whether chromium is discharged from PNPS.

Against this description of potential for environmental contamination, and sightings of North Atlantic right whales swimming within one-half mile of PNPS, the NRC staff and Entergy continue to claim that there will be "no effects" to ESA-listed species and critical habitat from PNPS relicensing. We note further that there two big "ifs" identified in the GEIS regarding impacts of metals: **if** NPDES permits are not violated, and **if** aquatic organisms are not bio-accumulating the metals, the impacts are "small." Here, no testing for metals is documented in the PNPS to show concentrations in the effluent, and there is no data to show whether or not there has been bioaccumulation of metals in the aquatic organisms. Moreover, as shown below, Entergy regularly violates its' NPDES permit.

The scale of this issue is reflected by an industry source, which puts it this way: "The typical multi-plant utility spends millions of dollars a year on bleach, bromide, and other biocides to keep heat-exchange surfaces clean and to control biofouling in cooling systems. Proper use of this ***style of chemical warfare*** begins with understanding the enemy "Biofouling control for cooling systems," Daniels, D. and Selby, T., Sept. 15, 2007, *Power: Business and Technology for the Global Generation Industry.*

Point source pollutant discharges at PNPS

PNPS has 7-point source discharge locations. PNPS EIS, Table 2-2, page 2-24. The key chemical discharges of concern for purposes of this letter are biocides, metals, and corrosion inhibitors. (In addition, we are concerned about metals leaching from aging pipes into Cape Cod Bay, both at the direct discharge points and indirectly through groundwater transport from buried pipes, and radionuclides as discussed in our earlier letter to NMFS.) These are addressed below.

The Entergy NPDES permit allows the use of **chlorine as a biocide**. It states that use of any molluscide is subject to pre-approval by EPA and the state. 1994 modified permit, A.1.a.1-3. Chlorine is discharged at least two locations at PNPS. Outfall 001 (condenser cooling water) discharges 510 million gallons per day (maximum daily) contaminated with chlorine discharges 2 hours per day, unless regulators specify otherwise. Outfall 010 (service cooling water) is continuously chlorinated, and has a discharge limit of .50 mg/l average monthly, or 1.0 mg/l daily maximum. The permit limit is 19.4 million gallons average monthly discharge, no daily maximum. See, e.g. PNPS EIS, Table 2-2.

It is unclear what type of chlorine product Entergy is using and has been using over the 40 year period, or what it plans to use during relicensing. A May 24, 2002 letter from EPA to Entergy allows the use of sodium hypochlorite, but permit says sodium pentaborate. NPDES permit, p. 6.

Sodium nitrate used for dechlorination is discharged from 011 (makeup water and demineralizer waste discharge).

Entergy apparently uses **tolyltriazole as a corrosion inhibitor**. By letter dated June 30, 1995, EPA approved its use.[6] There is no specific information in the PNPS EIS regarding the frequency, concentrations, or environmental impacts of the use of this chemical. Instead, the PNPS merely refers back to the NRC's GEIS, *Section* 4.2.1.2.4.

Metals

As noted above, the NRC GEIS states, "Heavy metals (e.g., copper, zinc, chromium) may be leached from condenser tubing and other heat exchangers and discharged by power plants as small-volume waste streams or corrosion products." However, the PNPS NPDES permit contains no specific effluent limits for these or any other metals. PNPS EIS does not require regular testing for metals in the effluent. Page 3, Permit 1991 p. 3 contains the boilerplate statement, there "shall be no discharge of treated or untreated chemicals which result from cleaning or washing of condensers or equipment wherein heavy metals may be discharged." There are other general, boilerplate reporting provisions for metals and other toxics on page 4 of the NPDES permit, but the PNPS EIS does not indicate that the effluent was ever tested for metals.

Violations of NPDES Discharge Limits

The PNPS EIS and the 2006 and 2012 biological assessments rely on the erroneous assumption that Entergy is in compliance with its NPDES permit. New and significant information shows that this is not the case, and that state and federal regulators have failed to address these violations. Moreover, it is clear that the NPDES permit fails to require testing of a significant number of parameters, and cannot be relied upon to give an accurate picture of what chemical pollutants may be in the water and sediments at the PNPS site.

The PNPS EIS looked only at NPDES discharge violations from April 2005 to March 2006, and found 3 violations, one for total suspended solids and two for chlorine at the screenwash dechlorination system at Outfall 003. PNPS EIS, 2.2.3. More recent data from EPA's website indicates that for **5 of the last 12 quarters** Entergy has been out of compliance its NPDES permit.

There have been 5 violations of the chlorine limit, in the last 12 quarters:

Chlorine violations at Outfall 010:
Jan.-March 2010-exeeded by 3%
Oct.-Dec. 2012-exceeded by 140%

[6]Apparently there is a typo in the EPA letter, because it is spelled tolytriazole, not toly**l**triazole; the former is a well-known corrosion inhibitor.

April-June 2011-exceeded by 3%
July-Sept. 2011-exceeded by 15%

Chlorine violations at Outfall 001:
Oct. to Dec. 2011-exceeded by 40%

Thus, the record shows a pattern of non-compliance, not compliance as the PNPS EIS claims. Information from EPA website:

http://www.epa-echo.gov/cgi-bin/get1cReport.cgi?tool=echo&IDNumber=110000736810

Research to be considered regarding effects of PNPS pollutant discharges on ESA-listed species and critical habitat

Research has been done on the impacts of metals on calanoid copepods, the main food supply for North Atlantic right whales. See, e.g., "Relating the reproductive toxicity of five ingested metals in calanoid copepods with sulfur affinity," Hook, S., et al., *Marine Environmental Research*, Vol. 53, Issue 2, March 2002, pp. 161-174.

At least one study on the impacts of copper on copepods and other zooplankton shows reduced activity. "Experimental Observations on the Effects of Copper on Copepods and Other Zooplankton: Controlled Ecosystem Pollution Experiment," Reeve, M.R., Gamble, J.C., and Walter, M.A. *Bulletin of Marine Science*, Vol. 27, No. 1, Jan. 1977, U of Miami.

The introduction of low levels of copper, chlorine, and thermal elevation causes significant changes and species composition of natural phytoplankton. Sanders, J, et al., Woods Hole Oceangraphic Institution, 2003, *Journal of Experimental Marine Biology and Ecology*, Vol. 49, Issue 1, pp 81-102. "Effects of copper, chlorine, and thermal addition on the species composition of marine phytoplankton."

The corrosion inhibitor used by Entergy at PNPS, tolyltriazole, can be considered a ubiquitous contaminant in the aquatic environment. *Marine Pollution and Human Health*, Issues in Environmental Science and Technology, Environ Sci Technol 2011 May 1; 45(9): 3858-61 21524137, Royal Society of Chemistry publishing., ed. By RE Hester, RM Harrison. These authors conclude that due to their physiochemical properties (i.e. low biodegradability and high hyrophobicity), they are not removed from sewage treatment plants, and coupled with their toxicity, pose a treat to estuarine and coastal environments.

Other articles relevant articles:

"Impacts of Copper on Aquatic Ecosystems and Human Health," (copper is one of the most toxic metals to aquatic organisms and ecosystems), Solomon, F, http://magazine.mining.com/Issues/0904/ImpactsCopperAquaticEcosystemsHumanHealth.pd

"Toxicity of a Mixture of Ten Metals to Phytoplankton, Thomas, W.H. et al. *Marine Ecology*, Vol. 2: 213-220, 1980, at http://www.int-res.com/articles/meps/2/m002p213.pdf

"Chlorination for power plant biofouling control: potential impact on entrained phytoplankton," *International Journal of Environmental Studies, Vol. 67, Issue 4, 2010,* http://www.tandfonline.com/doi/abs/10.1080/00207233.2010.495214?journalCode=genv20

"Cooling water chlorination and productivity of entrained phytoplankton," E. J. Carpenter, B. B. Peck et al., *Marine Biology*, Vol. 16, No. 1 (1972), pp 37-40, DOI: 10.1007/BF00347845 (With the addition of chlorine at 1.2 ppm at cooling water intake, there was an 83% decrease in productivity as compared with the productivity at the intake. Productivity measurements were made at 6 other continuously applied chlorine concentrations. At the lowest concentration tested, too low to measure with our analytical method (addition of chlorine at 0.1 ppm at the intake), we measured a production decrease of 79%.)

"Impacts of chlorination and heat shocks on growth, pigments and photosynthesis of *Phaeodactylum tricornutum* (Bacillariophyceae)" *Journal of Experimental Marine Biology and Ecology*, Vol. 397, Issue 2, Feb. 2011, pp. 214-219, Zengling, Ma, et al. (It indicated that both chlorination and heat shocks had negative impacts on the primary producers living in discharging coastal waters; furthermore, there were synergistic effects of heat shocks on chlorination toxicity.)

"Chlorinated cooling waters in the marine environment: Development of effluent guidelines," Capuzzo, J., *et al*, *Woods Hole Oceanographic Institution, Woods Hole,* MA 02543, U.S.A. (2003) (The effects of free chlorine and chloramine on stage I lobster larvae and juvenile killifish were investigated in continuous flow bioassay units. In comparing mortality and changes in standard respiration rates during and after exposure to either chlorine form, significant respiratory stress was observed with exposure to sublethal levels. Sublethal responses to free and combined chlorine should be considered when establishing regulations for chlorine residuals in cooling waters.)

"Reduction of marine phytoplankton reproduction rates by copper and cadmium," *Journal of Experimental Marine Biology and Ecology*, Vol. 96, Issue 3, 1986, pp 225-250, Brand. E, *et al*.; http://onlinelibrary.wiley.com/doi/10.1111/j.1529-8817.2012.01133.x/abstract-

"The Effects of Iron and Copper Availability on the Copper Stiochiometry of Marine Plankton," Jian Guo, et al., *Journal of Phycology,* Vol. 48, Issue 2, pp. 312–325, April 2012

For background on the range of behaviors and toxicity of biocides used in power plants see, the UK Marine SAC Project website, http://www.ukmarinesac.org.uk/activities/water-quality/wq8_28.htm.

There are studies showing the ecotoxicity in marine waters of the sodium hypochlorite that Entergy discharges to Cape Cod Bay at PNPS. "Degradation models and ecotoxicity in marine waters of two antifouling compounds: sodium hypochlorite and an alkylamine surfactant. Sci. Total Environ. 2010 Mar 15; 408(8):1779-85. Lopez-Galindo, C. et al., Department of Environmental Technologies, Centro Andaluz de Ciencia y Tecnología Marinas (CACYTMAR), Universidad de Cádiz, Campus Río San Pedro, Cádiz, Spain.

"Toxicity of Chlorine Dioxide to Early Life Stages of Marine Organisms, Hose, J., et al., *Bull.Environ.Contam.Toxicol*. (1989) 42:315-319.

"From dishwasher to tap? Xenobiotic substances benzotriazole and tolyltriazole in the environment." Hussein, J., et al., *Institute for the Environment*, Brunel University, Uxbridge, UK. (There is increasing evidence that the use of chemicals frequently results in widespread environmental contamination with little understanding of the toxicological implications. The lack of a complete set of good quality (eco)toxicological data on possible chronic effects of these high use chemicals should caution against using them in a manner which may have contributed to such widespread environmental contamination.)

"Benzotriazole and Tolyltriazole as Aquatic Contaminants: Input and Occurrence in Rivers and Lakes" W. Giger, C. Schaffner, HP. Kohler (2006): *Environ. Sci. Technol.* 40, 7186–7192. PMID 17180965

Environmental Baseline

Under the ESA, NMFS must look at the "environmental baseline" in determining the effects of the action. The lack of data on zooplankton and calunoid copepods is of concern.

The PNPS EIS relies on the ENSR 2000 report for a discussion of zooplankton baseline. This document was only released to the public by the NRC on April 17, 2012. This report shows zooplankton sampling results of densities for a period between 1973 and 1975, at several locations around the site and in Cape Cod Bay. There is no data after 1975 to show what the zooplankton densities are at these sampling sites currently, or were at the time the BAs were prepared.

PNPS water pollution impacts on ESA-listed species and critical habitat

ESA-listed species have the potential to be exposed to adverse effects from PNPS via direct exposure to the pollutants discharged from the facility, and via the uptake of these contaminants in their food supply. Water quality is important to right whales (See, April 12, 2012, memorandum from Stormy Mayo, PCCS to JRWA, previously submitted to NMFS).

Entergy's Stone & Webster report from NRC, fig. 2-25 shows the PNPS thermal plume extending about 1.25 nautical miles (about 1.4 miles) from the shoreline. On April 17, 2012, North Atlantic right whales were sighted within one-half mile of PNPS.

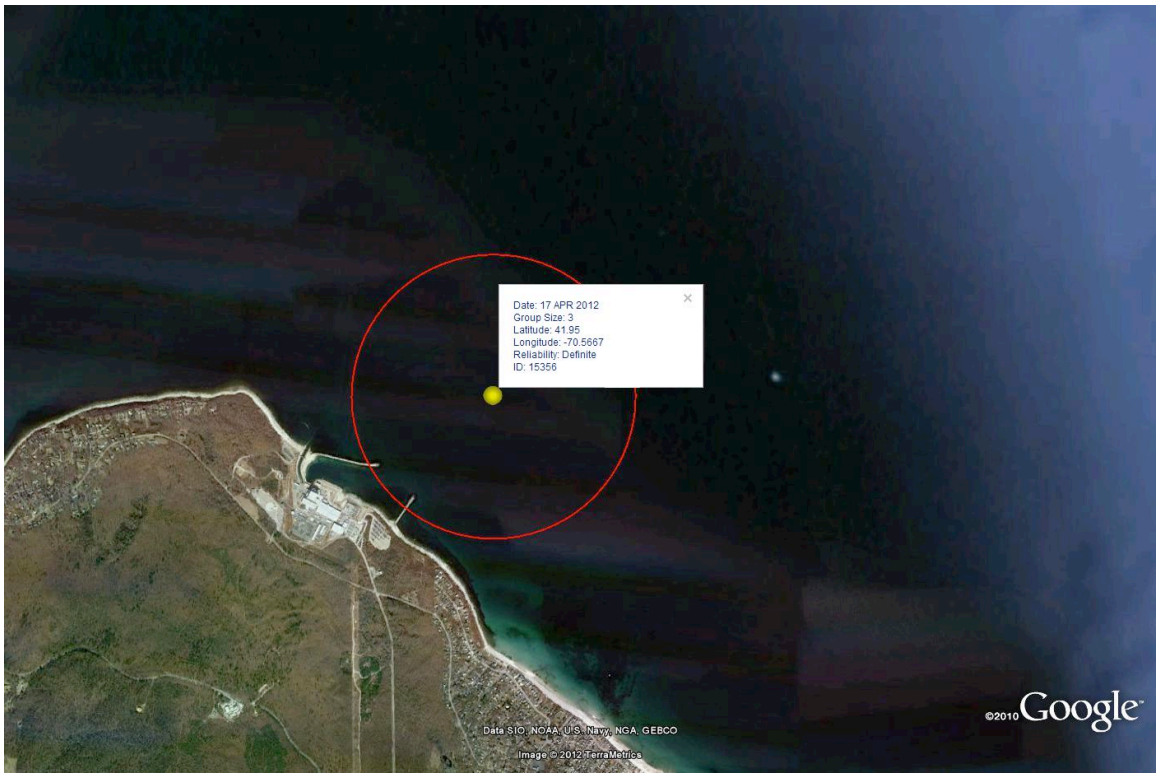

Figure 1. Sighting location of 3 North Atlantic Right Whales on 4/17/12. Red circle = 0.5 mile radius. Source: NOAA North Atlantic Right Whale Sighting Survey and Sighting Advisory System (http://www.nefsc.noaa.gov/psb/surveys/)

In a letter to the Town of Plymouth, NMFS indicated that compliance with water quality standards was important because sea turtles were found in the area. **Exhibit 1.**

In sum, we request that NMFS address whether the PNPS EIS contains adequate data to determine whether 60 years of chemical discharges from PNPS to Cape Cod Bay is likely to adversely effect all ESA-listed species, and critical habitat.

Thank you in advance for consideration of this information.

Very truly yours,

Signed Electronically

Margaret Sheehan, Esq.

Anne Bingham, Esq.

cc:

Governor Duval Patrick
Massachusetts Office of Coastal Zone Management
Whale and Dolphin Conservation Society
Provincetown Center for Coastal Studies
Mass DEP
U.S. EPA, Region 1
Conservation Law Foundation
Rep. Edward Markey
Rep. Keating
Rep. Dan Wolf
New England Aquarium
Jones River Watershed Association
Pilgrim Watch
Pilgrim Coalition
Cape Cod Bay Watch
Pew Herring Alliance
MassAudubon
Goldenrod Foundation