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General Comment

Comments on Entergy PSDAR are attached.

Attachments

PILGRIM WATCH COMMENTS ENTERGY PSDAR 03.21

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

Pilgrim Nuclear Power Station

Entergy Nuclear Operations, Inc.

Docket No. NRC 2018-0279

Comments Relative to Entergy Nuclear Operations, Inc.
PSDAR Filed November 16, 2018

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These comments are directed to the Post-Shutdown Decommissioning Activities Report ("Entergy PSDAR") and Site-Specific Decommissioning Cost Estimate ("Entergy DCE"), both of which were filed on November 10, 2018 by Pilgrim's Operator, Entergy Nuclear Operations, Inc (ENO), on behalf of itself and Pilgrim's Owner, Entergy Nuclear Generation Company (ENGC). The Entergy PSDAR and DCE were prepared for ENO by yet another Entergy subsidiary, TLG Services, Inc. (TLG).

On November 18, 2018, ENO also filed, on behalf of itself, ENGC, Holtec International (Holtec) and Holtec Decommissioning International (HDI), an application (LTA) to transfer Pilgrim's licenses from Entergy to Holtec.

On February 10, 2019, Pilgrim Watch ("PW") and the Massachusetts Attorney General ("AGO") both filed petitions to intervene in the license transfer application proceeding and requesting a hearing. (Docket 50-293 & 72-1044 LT) on February 20, 2019. Those two petitions, and their bases and facts, are pertinent to these PSDAR comments. We encourage the PSDAR review staff to read them

Two major concerns addressed in the PW and AGO Petitions are particularly relevant here: (1) Pilgrim's Decommissioning Trust Fund (DTF) will not be sufficient to properly decommission and clean-up the Pilgrim site and (2) the extent of a funding shortfall is exacerbated by the fact that the PSDAR cost estimates are based on outdated and incomplete site assessments that do not either bound environmental impacts or provide a basis for making accurate cost estimates, particularly with respect to site restoration.

Our understanding is that ENGC has no significant asset except Pilgrim's DTF, and that no other Entergy entity, including ENO, plans to or is obligated to, pay any decommissioning

costs. As part of its review, we suggest that it is essential for the NRC PSDAR Review Staff to confirm exactly what assets the two Pilgrim licenses (EGC and ENO) have, and precisely what, if any, other funds either they or any other Entergy entity guarantee to make available if the DTF proves to be unable to cover all of the costs of decommissioning.

Based on our analysis, and that of the Massachusetts Attorney General, the DTF (including future potential growth) is not and will not be sufficient to pay all decommissioning costs. Does the NRC and the PSDAR Review Staff really expect Massachusetts taxpayers to pay any shortfall?[1] Why should the costs of decommissioning not borne by those that have profited and will profit from Pilgrim? In addition to unfairly forcing them to shoulder what should be Entergy's costs, why should Massachusetts residents be left with a shortfall in the DTF in all likelihood also will leave them with a contaminated site and, as the NRC has said, will "result in significant adverse health, safety and environmental impacts." (NRC Questions and Answers on Decommissioning Financial Assurance, ML 111950031)

Nothing in the PSDAR indicates that Entergy actually knows how much radiological and hazardous contamination now exists on the Pilgrim site. The PSDAR relies on, and its cost estimates are based on, old, outdated, and incomplete information. But the Entergy PSDAR seems to make clear that no one will perform a thorough site and environmental assessment for many years. Absent such an assessment, we suggest that it is simply not possible for Entergy to make an accurate cost estimate (particularly with respect to site restoration) or to perform

[1] Because Pilgrim is a merchant plant, it's owner(s) will not be able to collect funds through the rate-setting process. (ML1119/111950331):

> The NRC explained the need for full up-front assurance from merchant plants with the following statement: For licensees that will not be able to collect funds through such a process [through rates] after industry restructuring, up-front assurance is necessary to ensure that reasonable financial assurance is provided for

> all decommissioning obligations. In the more competitive environment that is likely to prevail after restructuring, some of these licensees may not remain financially viable for reasons not related to decommissioning financial assurance, further suggesting the need for up-front assurance. (63 FR 50465, 50469)

timely remediation, although both are essential to avoid negatively impacting public health and safety.[1]

Energy plans to use Safstor, and to postpone dismantlement and decontamination until 2074, and site restoration until 2079. This more than a half-century delay by itself means that cost estimates in the PSDAR can be nothing more than guesses. No one, including Entergy, can predict how much the DTF will grow over the next half-century; much less by how much the decommissioning, spent fuel management and site restoration costs will increase. Beyond that, Entergy's "hope" that DOE will remove all spent fuel from Pilgrim by the end of 2062 so that ENO and ENGC will have no spent fuel management costs after 2063 is again nothing more than a convenient guess.

Postponing decontamination for decades also will inevitably allow contaminants that are now on-site to migrate into, for example, Cape Cod Bay and the Plymouth Carver Aquifer negatively impacting local economies and public health and safety. Runoff will be exacerbated by flooding resulting from climate change.

Comments

Requirements for a PSDAR are set forth in Regulatory Guide 1.185 – Standard Format and Content for Post-Shutdown Decommissioning Activities Report (ML 13140A038, "Reg. Guide"), 10 CFR 50.82(a), and 10 CFR 72.30(b).

[1] The Entergy PSDAR similarly gives no indication that any Entergy entity intends to conduct the environmental review required by the National Environmental Policy Act (NEPA).

It seems clear that the NRC review of the PSDAR is intended not only to ensure that a PSDAR satisfies what the Regulatory Guide says are the purposes of a PSDAR, but also to ensure that both the letter and the intent of any specific requirements and regulations are satisfied also.

According to the Regulatory Guide:

> "The purposes of the PSDAR are to: … (3) ensure that the licensee has considered all the costs of the planned decommissioning activities and has considered the funding for the decommissioning process, and (4) ensure that the environmental impacts of the planned decommissioning activities are bounded by those considered in existing environmental impact statements." (Reg. Guide, pg. 5).

According to the Guide, one thing the Entergy PSDAR should do is describe planned activities including "Decontaminating radioactive components, including the use of chemical decontamination techniques" and "Removing hazardous radioactive (mixed) wastes." (Reg. Guide, pp 5, 8)

The Regulatory Guide also seems clear that the cost estimate presented in the PSDAR "should be based on the latest annual update and include the cost of any contamination identified during site surveys" (Reg. Guide, p. 9), and that

> "a licensee's PSDAR must include the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by previously issued environmental impact statements. <u>… Examples of potential impacts that should be examined</u> to ensure that they are within the envelope of impacts predicted in the GEISs on decommissioning or radiological criteria for license termination, FES, or site-specific analysis include: occupational dose; public dose; environmental releases to air, water, and soil and the resulting population doses; quantity of low-level radioactive waste generated; transportation impacts; and impacts from non-radiological hazards, such as dust, noise, water use, and hazardous (non-radiological) waste."

As discussed below, it seems clear that Entergy's PSDAR does not meet the purposes of a PSDAR, does not consider all of the costs of decommissioning, does not adequately consider funding, does

not adequately describe decontaminating radioactive components or removing hazardous materials, is not based on current conditions at the Pilgrim site, does not include the cost of removing contamination at the site, and incorrectly asserts that environmental impacts are "bounded" by incomplete and outdated environmental impact statements.

It also seems clear that Entergy's PSDAR fails to meet the requirements of 10 CFR 50.82(a)(4 and 6). It does not provide either defensible "reasons for concluding that the environmental impacts … will be bounded by appropriately previously issued environmental impact statements," or a reasonably accurate DCE, or "reasonable assurance that adequate funds will be available for decommissioning."

The failure of Entergy's PSDAR to satisfy the requirements of 10 CFR 72.30(b)(1 through 5) seems even clearer. The PSDAR's supposed "reasonable assurance that adequate funds will be available for decommissioning" in fact shows that there is no such assurance.

The failure of the Entergy PSDAR and DCE to provide an "identification and justification for using the key assumptions contained in the DCE" may well be the most egregious failure. The NRC PSDAR Review Staff cannot conduct a meaningful review without knowing what assumptions Entergy made, and whether those assumption can be justified. Many of Entergy's key assumptions, both stated and unstated, are simply wrong.

Regulatory Guide 1.185 and NUREG 1700 require the NRC PSDAR Review Staff to determine whether a licensee's PSDAR contains the information required by NRC; and, if the PSDAR Review Staff determines that the information provided by the licensee in the PSDAR does not comply with the requirements in 10 CFR 50.82(a)(4)(i), it will inform the licensee in writing of the additional information required by the regulations, and not accept the PSDAR until that information has been provided.

Based on the facts as we know them, it seems that the PSDAR Review Staff's review will inevitably lead to the conclusion that the NRC properly cannot accept Entergy's PSDAR as it now stands. Rather, the NRC PSDAR Review Staff should require Entergy to submit a revised PSDAR that, at the very least:

1. Provides real financial assurance.
2. Includes enforceable agreements with Entergy that it will pay any decommissioning cost shortfall, and that any recovery of spent fuel management costs from DOE will be paid into Pilgrim's Decommissioning Trust Fund (DTF) to replenish what was taken out of the DTF for spent fuel management.[2]
3. Provides a reasonable "rainy day fund" for unforeseen costs;
4. Recognizes that decommissioning costs will increase at a rate that is faster the general inflation, as the NRC says they will, and bases estimated decommissioning costs on this fact.
5. Explains and justifies Entergy's assumption that the Department of Entergy (DOE) will remove all spent fuel from Pilgrim by the end of 2062, and also explains how Entergy will pay the costs of spent fuel management if, as seems extremely likely, spent nuclear fuel remains at Pilgrim long after that date.
6. Explains how it will pay to replace the casks and pad every 100 years or earlier if needed, as required by NRC, and repackage the spent fuel, as required, to be accepted by DOE.
7. Bases the estimated costs of removing radioactive and hazardous waste on an up-to-date assessment of the actual current condition of the Pilgrim site; and to meet Massachusetts'

[2] The Entergy DCE says that "Collections of spent fuel damages from the DOE is expected to provide the majority of funds needed for spent fuel management following shutdown" (pg. viii, footnote 4), but this statement raises at least as many questions as it answers. For example: does it effectively admit that the $420 million in the DTF will not be enough for spent fuel management, and will any recovered funds be returned to the DTF?

radiological cleanup standard of less than 10 millirem/year and less than 4 millirem/year in drinking water sources of water; and commits to assessing dose using the resident farmer model, the basement inventory model, and not use fill to average dose.

8. Explains and justifies its incorrect assumption that "environmental impacts associated with decommissioning PNPS are bounded" by previous old, inaccurate and incomplete environmental impact statements. (PSDAR, Section 5.0)

1. Costs and Reasonable Assurance

Simply stated, it seems clear that Entergy's PSDAR and DCE do not provide the financial assurance required by the Regulatory Guide and 10 CFR 72.30(b)(1), or an accurate and realistic estimate of "all the costs of planned decommissioning activities" (Reg. Guide, p 5) as required by both the Regulatory Guide and 10 CFR 72.30(b)(2 through 5).

We recognize that NRC regulations say that a licensee must provide assurance that it has sufficient funds for decommissioning, but the regulation would have little or no effect on the real-world situation here.

What the NRC PSDAR Review Staff undoubtedly recognize, and that Entergy skirts, is that (1) NRC jurisdiction extends to, and NRC regulations cover, only licensees, and (2) the only Entergy licensees are Entergy Nuclear Operations Inc. (ENO) that owns the Pilgrim site and the Pilgrim Decommissioning Trust Fund (DTF), and Entergy Nuclear Generation Company (ENGC) that operates Pilgrim, both of which are limited liability companies. The NRC could ask that other Entergy entities agree to pay decommissioning costs that these prospective licensees are financially unable to pay, but our understanding is that the NRC has no authority to either force anyone except a licensee to do so. Entergy offers no Parent Company Guarantee ("PCG").

The PSDAR Review Staff, as part of its review, should require a sufficient PCG.

Similarly, as Mr. Bruce Watson and other NRC representatives made clear at recent NRC meetings in Plymouth, the NRC has no authority to require that spent fuel management funds recovered from the Department of Entergy be returned to the Decommissioning Trust Fund. Even though ENGC expects to spend almost half of the DTF ($420 million) for spent fuel management (Entergy DCE, Section 6, page 4, Table 6.1), and Entergy expects to recover all of that money from DOE, it has not agreed to pay back into the DTF what was spent for the very same spent fuel management costs that DOE might reimburse.

The PSDAR Review Staff, as part of its review, should require an enforceable agreement that Entergy will put any funds recovered from DOE back into the Pilgrim DTF.

Perhaps most important, as part of its review, the PSDAR Review Staff should determine that the PSDAR and DCE do not provide reasonable assurance that sufficient funds will be available, and do not provide any basis for concluding that Entergy will be financially responsible for the costs of decommissioning. There are no enforceable agreements that Entergy will pay any DOE recoveries into the DTF, or that any company will be responsible for any decommissioning cost shortfalls or future unforeseen costs and events.

The PSDAR Review Staff should not accept a PSDAR that does not include these commitments.

As for the PSDAR and DCE themselves, the NRC PSDAR Review Staff should conclude that neither identifies or justifies the key assumptions contained in the DCE, as required by 10 CFR 72.30(b)(3). To the contrary, both the PSDAR and DCE ignore significant facts and make incorrect assumptions, which will result in additional costs above and beyond any funds available for decommissioning. Although 10 CFR. §72.30 requires it to do so, Entergy has not justified and explained key assumptions on which its cost estimates rest. Some of Entergy's factual mistakes

and incorrect assumptions that the NRC PSDAR Review Staff should consider in its review include the following:

A. Even Entergy's cost estimates show that the Pilgrim Decommissioning Trust Fund will be essentially exhausted by the planned decommissioning activities; EMGC and ENO do not have the financial ability to deal with costs that cannot be paid out of the DTF or that result from unforeseen events.

B. Entergy's cost estimates do not include an adequate contingency allowance.

C. Entergy's cost estimates incorrectly assume that decommissioning costs will not rise faster than inflation.

D. Entergy's estimated spent fuel management costs are based on the unlikely and unexplained assumption that DOE will remove all spent fuel by 2063.

E. Entergy's cost estimates are based on the incorrect assumption that the Pilgrim site is essentially "clean." It is not. Neither the costs, nor the economic impacts, of decommissioning are "bounded" by previously issued environmental impact statements

F. Entergy's cost assumptions and cash flow analyses are unclear whether they include the cost of managing Low Level Radioactive Waste. The DCE says (Section 5, pg.,2) "disposal costs for the Class B and C material were based upon Entergy's current agreement with WCS for the Andrews County disposal facility." Not answered is whether this agreement is for disposal of Pilgrim's LLRW or for Vermont Yankee's. Vermont is part of the Texas Compact; Massachusetts is not.

G. Entergy's cost estimates unrealistically assume, among other things, that there will be no other significant potential costs, such as those that would result from fires in structures, systems and components containing radioactive and hazardous material, climate change impacts, repackaging of spent nuclear fuel into new containers approved by DOE for transportation, and mitigating radiological accidents.

1. Neither ENGC nor ENO licensee will have the financial ability to pay decommission costs or to deal with unforeseen events or expenses.

The Entergy PSDAR assumes that ENGC will own Pilgrim, and that ENO will be responsible for Pilgrim's operations, for at least the next 44 years. Reg. Guide 1.185 and 10 CFR 72.30(b) requires these Entergy licensees to show that they are financially responsible, i.e., not only that the DTF owned by ENGC has or will have not only enough money to decommission Pilgrim, but also to demonstrate how they will be financially capable of dealing with other costs that will almost certainly have to be paid between now and 2063.

ENGC's optimistic cost estimate scenarios conclude there will be $152,872,000 left over after decommissioning is complete (Request for Exemption from 10 CFR 50.82(a)(8)(i)((A), Attachment 1, Table 4, pp 7-9). But that is less than 10% of what the Entergy PSDAR and DCE predict decommissioning costs will be, and, as discussed below, the actual costs of decommissioning will require far more than the Entergy PSDAR and DCE estimate.

In addition, no one knows what will happen at Pilgrim between now and when Pilgrim's licenses are terminated; but both history and common sense teach us that something will, and that "something" is more than likely to result in damages and costs more than $152,872,000. The bottom line is simple: the facts show, and the NRC PSDAR Staff should conclude, that the DTF does not have and will not have sufficient funds to pay the actual costs of decommissioning, much

less any costs that ENGC might face between now and when the Pilgrim licenses are finally terminated.

2. Entergy's Contingency Allowance is Inadequate

Entergy's "Contingency Allowance" varies for individual activities contingencies (DCE, Section 3, pg. 4), but overall is about 14.4% of the total estimated $1.661 billion decommissioning costs (Entergy DCE, appendix C, p. 10); for the ISFSI, the contingency is 25% of the estimated $9.4 million cost.

These contingency allowances may be sufficient to cover some currently unknown costs of the specific decommissioning activities specified in the Entergy PSDAR, but it does not provide the "*adequate* contingency factor" (italics added) required by 10 CFR 72.30(b)(2)(ii). Entergy admits that the "Contingency funds are expected to be fully expended throughout the program." "Contingency Allowance is … <u>expected to be fully consumed</u> [and] <u>does not account for inflation or escalation of the price of goods and services</u> over the course of the project." (DCE, p. xii.)

In other words, ENGC does not expect that any of the "contingency allowance" will be available to cover (i) decommissioning costs that will increase faster than the rate of inflation, (ii) spent fuel management costs incurred after 2062, (iii) site restoration costs resulting from the fact that the Pilgrim site is not clean, or (iv) any of the other myriad costs that the Entergy DCE and PSDAR have essentially ignored. Much less is there is any suggestion that ENGC or ENO will have the "rainy-day fund" that a financially responsible company would find essential to deal with unforeseen events over the next almost half-century.

The PSDAR Review Staff should require Entergy to revise the LTA, PSDAR, and DCE to provide a contingency factor that is adequate not only to pay the actual costs of decommissioning,

and but also to provide assurance ENGC and ENO will have sufficient funds to deal with unforeseen events and costs between now and whenever Pilgrim's licenses are terminated, as required 10 CFR 72.30(b)(1, 2 and 4) and Regulatory Guide 1.185, p. 5.

Entergy incorrectly assumes that decommissioning costs will not rise faster than inflation.

In the PSDAR, DCE and LTA, Entergy assumed that the Decommissioning Trust Fund would grow at the rate of 2% more than inflation. However, it also assumed, incorrectly and with no apparent basis or justification as required by 10 CFR §72.30(b)(3), that there will be no "escalation of costs … over the safe-storage and decommissioning period," i.e. Entergy's PSDAR assumes that, over the next half century, there will be "0.0% Decom cost escalation."

> "[T]he estimate was developed and costs are presented in 2018 dollars. The estimate does not reflect the escalation of costs (due to inflationary and market forces) over the safe-storage and decommissioning period." (DCE, xix) * * *
>
> "It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station." (DCE, Section 3, pg. 4)
>
> * * *
>
> "Cost Escalation Rate Start of Decom to end of Decom - Assumes 0.0% Decom cost escalation rate" (Request for Exemption from 10 CFR 50.82(a)(8)(i)(A), Table 4, Annual Cash Flow Analysis" [3]

These assumptions are simply wrong. Both the history of decommissioning costs and the NRC's own statements show precisely the contrary – *decommissioning costs will increase, and the rate at which they increase will be greater than the rate of general inflation.*

[3] Despite these seeming clear statements, we are not certain that Entergy actually based its PSDAR cost estimates and cash flow analysis on an assumption that there will be no future increase in decommissioning costs. Entergy's

The NRC's own Questions and Answers on Decommissioning Financial Assurance (ML1119/ML1119050031) make clear that decommissioning costs *will* increase at a rate higher than the rate of general inflation:

> "The NRC formulas represent the cost to decommission today, not in the future. *Due to rising costs, the future value of decommissioning will be much larger than the NRC formula calculated today*. For example, using the range of cost escalation rates based on NUREG - 1307, the increase in cost over a 20-year license renewal period would range from 2.5 to 5.6 times today's estimated cost, not counting costs that are not included in the formula, such as soil contamination. *The rates of increase in decommissioning cost are higher than general inflation*."[5]

These NRC statements are confirmed by Callan Associates' annual analyses and reports of decommissioning funds and costs. Callan's 2015 Nuclear Decommissioning Funding Study[6] said that "Total decommissioning cost estimates have risen 60% since 2008," an annual rate of about 6%, and Callan's 2018 study reported that decommissioning costs increased by about 80% (from $55 billion to $89 billion, *an annual rate of about 5 percent)* from 2008 and 2017.[7] The average annual rate of inflation between 2008 and 2018 was 1.55%; total inflation over those years was 16.63%.

In short, both the NRC statements and Callan's historical analysis are clear that there is no rational support for Entergy's assumption that decommissioning costs will not increase faster than inflation.

repeated statement that all costs are in 2018 dollars could be interpreted to mean that what Entergy really has assumed is that costs will not rise faster than inflation.
The Staff should require Entergy to be clear. But in either event, Entergy's assumption is wrong. Costs will rise, and they will rise at rate that is greater than general inflation.

[5] A 2.5 to 5.6 times increase over 20 years corresponds to a 5% to 9% annual increase. The average rate of U.S. inflation over the past 60 years was 3.7%

[6] https://www.callan.com/library/2015

[7] https://www.callan.com/library/2018

But Entergy's assumption that there will be a "0.0% Decom cost escalation rate" is the keystone of Entergy's claim that the DTF has (or will have) enough money. For example, Entergy's estimated "License Termination Costs," just for the years after it starts demolition in about 2073, is about $486 million. If those license termination costs alone (forgetting for a moment about spent fuel management costs and site restoration costs) were to increase by even 1% more than inflation over the next 454 years, the $153 million that ENGC expects to have "left over" would be almost $700 million less than would be needed to pay them. The DTF could not pay them. If license termination and spent fuel management costs were to increase at an annual rate of 4% more than inflation, a fair assumption based on the NRC statements and Callan reports, the shortfall in the DTF would be more - almost $4 billion.

This one incorrect assumption shows that ENGC's cost estimates have not considered the real costs of decommissioning or what will actually be needed to provide sufficient funding for what will actually be required for decommissioning (See, Reg. Guide, 1.185 p. 5; 10 FR 72.30(b)(1 and 2). Neither does any Entergy entity appear to recognize that far more than the DTF is required to show that ENGC is financially responsible

As part of its review, the PSDAR Review Staff should require Entergy (presumably TLG) to prepare a revised PSDAR based on the rational and factually supportable assumption that decommissioning costs will increase faster than inflation, likely at an annual rate that is at least about 4% higher than the rate of annual inflation.[1]

3. Entergy's "hopeful" assumption that DOE will remove all spent fuel by 2063

The Entergy DCE admits that "Completion of the decommissioning process is highly dependent upon the DOE's ability to remove spent fuel from the site" (DCE, section 3, p. 6), that

"policy decisions altering national commitments (e.g., in the ability to accommodate certain waste form for disposition, or in the timetable for such, or the rate of acceptance of spent fuel by the DOE)" creates uncertain decommissioning costs and financial risk (DCE, Section 3, p 5), and that "Today, the country is at an impasse on high-level waste disposal, even with the License Application for a geologic repository submitted by the DOE to the NRC in 2008.) (DCE, Section 1, pg. 5)

Faced with these uncertainties, ENGC based its "spent fuel management plan for the PNPS spent fuel is based, in general, upon the following projections: 1) a 2030 start date for the DOE initiating transfer of commercial spent fuel to a federal facility, 2) a corresponding 2030 date for beginning to remove spent fuel from PNPS, and 3) a 2062 completion date for removal of all PNPS spent fuel." (DCE, pp. xvi-xvii)

These ENGC assumptions were in turn based on an Entergy Resources International, Inc. acceptance schedule that assumed DOE would begin to accept spent nuclear fuel in 2030 (DCE, section 3, p 21, footnote 1), and on DOE's January 2013 *Strategy for The Management and Disposal of Used Nuclear Fuel and High -Level Radioactive Waste*. ("DOE Strategy"),[8] which is simply "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel" (DOE Strategy, p. 1).

The DOE Strategy does not even try to guess by when an interim or geologic repository might actually exist and be ready to accept spent nuclear fuel. Entergy's assumption that a federal depository would start accepting PNPS's spent fuel in 2030 appears to rest on the DOE Strategy's

[8] https://www.energy.gov/sites/prod/files/Strategy%20for%20the%20Management%20and%20Disposal%20of%20Used%20Nuclear%20Fuel%20and%20High%20Level%20Radioactive%20Waste.pdf

2013 statement that "With *appropriate authorizations from Congress*," "The Administration currently *plans to implement a program over the next 10 years."* (italics added) The keys here are "With appropriate authorizations from Congress" and "plan to implement." Six of those years have already passed. To our knowledge there have been no such authorizations or implementations since the DOE Strategy was announced. The Entergy PSDAR refers to a bill relating to potential interim storage sites passed by the U.S. House of Representatives in May of 2018 but indicates that it has not been approved by the Senate or signed by the President.

The unavoidable fact is that no one knows when there will be an interim or permanent repository that is ready and willing to accept Pilgrim's spent nuclear fuel.

As part of its review, the PSDAR Review Staff should require Entergy to revise the LTA, PSDAR and DCE to explain and justify basing its cost estimates on the very uncertain assumption that no spent fuel will remain at Pilgrim after 2062.[4] The PSDAR Review Staff should recognize that if DOE does not remove all spent nuclear fuel by the end of 2062, ENGC's already questionable (largely in view of its assumption that costs will not increase) estimate of on-going annual spent fuel storage costs will go up every year thereafter.

The PSDAR Review Staff should also require Entergy to explain whether its assumptions and estimated costs take into consideration the NRC's Continued Storage Rule that envisioned 100 years of onsite storage or more. Even if Entergy's estimated about $4.5 million per year cost never increased by more than inflation, which is extremely unlikely, that many additional years of spent fuel storage would add more than $250 million to the DTF shortfall.

[4] The PSDAR Review Staff should also determine why Entergy's estimated $420 million spent fuel management costs are about $80 million less than what Holtec estimates it will cost to do the same thing.

In short, the NRC Regulatory Guide and Regulations seem clear that the PSDAR Review Staff should require Entergy to revise the LTA, PSDAR and DCE to recognize that there is a very substantial risk that spent fuel will be at Pilgrim after 2062, and to explain how it would pay for spent fuel management after 2062.

4. Pilgrim cannot be presumed "clean"

ENGC and TLG estimated that the cost of site restoration would be $53.014 million (DCE, Table 2.2), a mere 3.2% of the total estimated decommissioning costs. The principal reasons that the estimated cost is so small is that EGC limited "Site Restoration" costs to "costs associated with the dismantling and demolition of buildings and facilities demonstrated to be free from contamination." (PSDAR, p. xxii); and did not include the cost of removing contamination from, or remediating, the rest of the Pilgrim site.

We recognize that Entergy included "the discovery of unexpected levels of contaminants, contamination in places not previously expected, [and] contaminated soil previously undiscovered (either radioactive or hazardous material contamination)" in a list of "conceivable" … financial risk," (DCE, p 5), but that simply reinforces that the ENGC's entire decommissioning cost estimate is based on the unwarranted presumption everything except "buildings and facilities" is essentially free from contamination, and ignores that contamination that Entergy calls "unexpected" or "previously undiscovered" will significantly increase site restoration costs. The requirement in 10 CFR 72.30(b)(3) that the PSDAR include

(2) A detailed cost estimate for decommissioning, in an amount … [and]

(3) Identification of and justification for using the key assumptions contained in the DCE

cannot be met by a cost estimate that is based on incorrect and unjustifiable assumptions.

The fundamental problem the NRC PSDAR Review Staff must address is that there is no basis for Entergy's assumption. The fact of the matter is that, over the years, Pilgrim has buried contaminated materials on-site, has had many leaks and releases, and that "levels of contaminants, contamination … [and] contaminated soil" far greater than the PSDAR and DCE assume should have been expected. (See PW Petition, pp. 36-54, 97-104;[10] Commonwealth's Petition, pp. 13 -14 and attached declarations[11])

We expect that the PSDAR Review Staff will be able to obtain copies of, and will review, the PW Petition and the Commonwealth's Petition (including its attached Declarations). For that reason, we will not here repeat the extensive evidence that is part of the PW Petition and the Commonwealth Petition. Suffice it to say that the portions of the PW Petition referenced in footnote 1, and the portions of the Commonwealth Petition referenced in footnote 2 (including the Declarations of John Priest, Paul Locke and David Howland, extracts from which are included in

[10] The cited pages of the PW petition are attached as Appendix I. In summary, the PW petition shows:

1. Lethal radionuclides have been found in Pilgrim's surface water, ground water and soil (p. 36)
2. Pilgrim opened with bad fuel, had not off-gas system until 1977, and blew its filters in 1982 (pp. 38-39)
3. Radionuclide test results (pp. 39-40)
4. Contamination from buried pipes and tanks (pp. 42-44)
5. Tritium and other radionuclides in groundwater (pp. 44-47);
6. Radionuclides in manholes, junction boxes and electrical duct banks (p 49)
7. The admitted inadequacy of the NRC's radiological environmental monitoring program (pp. 5052)
8. Hazardous waste dumping (pp. 52-54)

[11] The cited pages of the Commonwealth Petition and extracts from the declarations of John Priest, Paul Locke and David Howland are attached as Appendix II

Appendix 2), set forth significant evidence and information showing that there is extensive contamination at the Pilgrim site that seems not to have been considered by TLG when it created the cost estimates set forth in its PSDAR and DCE. The information that Pilgrim Watch and the Commonwealth have provided similarly does not appear to have been considered in Entergy's previously issued environmental impact statements.

For example, the Declaration of John Priest, who is now the Director of the Radiation Control Program at the Massachusetts Department of Public Health, and who was employed at PNPS from 2008-2014 as Pilgrim's Radiation Protection Manager, Project Manager, and Emergency Preparedness Manager, describes his personal knowledge of contamination at the Pilgrim site:

> "Based on my site knowledge, contamination has previously been identified by the utilities in the soil in the vicinity of the condensate water storage tank, the reactor truck lock and radioactive waste building. Further, there were other releases into the environment associated with a former condenser tube refurbishment building east of the radioactive waste truck lock. Historically, contaminated soil from previous site remediation has been "stockpiled" on a small hill along the east protected area fence. DPH does not know whether these sites and others were captured as part of decommissioning records required by 10 C.F.R. § 50.75(g), communicated to Entergy and evaluated by Entergy in its decommissioning cost estimate. Based on my knowledge of this site and experience at other nuclear power plants, it is reasonable to assume based on this site's history that other contaminants will be identified once excavation and demolition begins."

In assuming that the Pilgrim site is "clean," ENGC seem largely to have relied on Entergy's 2002 GEIS and 2006 SEIS. As shown here and in the PW and Commonwealth Petitions, both are outdated, inadequate and incomplete. Neither the GEIS nor the SEIS appear to have considered, adequately if at all, the contaminations listed above and discussed in the PW and Commonwealth petitions.

Section 5 of ENGC's PSDAR says that decommissioning will not cause any new environmental impacts, but that is essentially irrelevant to whether ENGC and ENO have sufficient assets to clean up the contamination that is *now* on the Pilgrim site, and essentially ignores that decommissioning may well exacerbate what now exists.[5]

The PSDAR Review Staff undoubtedly knows that the "discovery" of previously "unexpected" waste at other sites has resulted in actual site restoration costs far exceeding what the licensee had earlier assumed. See PW Petition, pp. 34, 92; Commonwealth Petition, p. 19 and cited Declarations. Neither the residents of Massachusetts, nor we hope the NRC, wants a repeat here.

An up-to-date site assessment and analysis almost certainly would show that, as shown above and in the PW and Commonwealth Declarations, and contrary to what ENGC says in the PSDAR and DCE, *there is significant contamination on the Pilgrim site* (See, DCE, p. 2), and that *much more than a "relatively small amount of the decommissioning cost [will be required] for the demolition of uncontaminated structures and restoration of the site.* (PSDAR p. 62).

An estimate of decommissioning costs based on the actual condition of the Pilgrim site, would almost certainly further show yet more reasons that ENGC and ENO do not have enough financial assets.

NUREG-0586 required the Entergy PSDAR to provide

> "accurate decommissioning cost [that is] necessary for a safe and timely plant decommissioning." (NUREG-0586, supra.)

[5] As shown below, much of what ENGC says is wrong.

The Entergy PSDAR does not do so.

As part of its review, the PSDAR Review Staff should require ENGC to conduct and provide to the NRC an early up-to-date site assessment and analysis that shows the actual condition of the Pilgrim site, and also to submit a new estimate of decommissioning costs, particularly site restoration costs, based on that assessment and analysis.

5. Other unaccounted for costs

There are numerous other costs that will have to be paid, but for which there will be no available money is the Pilgrim Decommissioning Trust Fund. The Entergy PSDAR and DCE ignore the costs of, for example:

a. Potential fires in structures, systems and components containing radioactive and hazardous materials (see PW Petition, p. 59);
b. The impacts of climate change (See PW Petition, pp. 60-61; Commonwealth Petition, pp 38-39);
c. Mitigating radiological accidents, such as a spent fuel fire or dry cask rupture See PW Petition, pp. 66-71 and 78-80);
d. Repackaging dry casks for transportation (See PW Petition, pp 61-63, Commonwealth Petition, p 14)
e. ISFSI and fuel transfer accidents (see PW Petition, pp. 71-77);

With respect to the ISFSI, the PSDAR Review Staff should also note that Entergy estimated that costs of decommissioning it (in 2018 dollars and again based on Entergy's assumption that costs will not increase faster than inflation) will be about $9.4 million (DCE, Appendix D). Entergy's PSDAR and DCE do not appear to say where this money will come from.

The PSDAR Review Staff, as part of its review, should require Entergy to provide a cost estimate for each of these unaccounted costs, and to show how the ENGC and ENO will pay them.

148. ***The costs and the environmental impacts of decommissioning are not "bounded" by previously issued environmental impact statements.***

10 CFR 50.82(a)(4)(i) required the Entergy PSDAR to

> "include the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by previously issued environmental impact statements."

In response to that requirement, the Entergy PSDAR said that "has concluded that the environmental impacts associated with planned PNPS site specific decommissioning activities are less than and bounded by the previously issued environmental impact statements" (PSDAR, p. 20), and that no new or supplemental EIS is required.

Entergy's conclusion is wrong and is not supported by the "reasons" on which Entergy apparently relies. It seems axiomatic that "previously issued environmental impact statements cannot bound future potential environmental impacts resulting from events that were after the previous statements were issued; neither can they bound environmental impacts that the previous statements did not consider.

Some of the facts set forth, here and in the PW and Commonwealth's Petitions, are directed to contamination found after the previous environmental impact statements were issued, and to the potential environmental impacts resulting from that contamination or from likely future events. Others show potential environmental impacts resulting from contaminations should have been known earlier but were ignored.

In its review, the PSDAR Review Staff should conclude that these facts show, alone or cumulatively,[6] environmental impacts that are potentially significant, will affect decommissioning costs and were not, properly or in many instances at all, considered by previously issued environmental impact statements or the Entergy PSDAR.

Under these circumstances, we suggest that the PSDAR Review Staff could not properly conclude that the potential environmental impacts of what ENGC will do, and not do, between now and whenever Pilgrim's licenses are terminated, are "bounded" by old, and (as the Staff review should show) often incomplete and inaccurate "previously issued environmental statements."

ENGC spends several pages of the Entergy PSDAR on its "reasons for concluding that the environmental impacts … will be bounded," discussing what it says would be the effect of its planned site-specific decommissioning activities on such things as water use, endangered species, socioeconomics, and cultural, historic and archeological resources. But much of what Entergy says is incorrect or misleading.

For example, ENGC's radiological and public dose is based on risk coefficients recommended by the International Commission on Radiological Protection 28 years ago, rather than the far greater health impacts reported in the National Academies 2006 BEIR VII report. (See PW Motion, pp 54-55),

Entergy's discussion of socioeconomic costs was based on outdated 2002 GEIS findings rather than the University of Massachusetts 2015 Pilgrim Nuclear Power Station Study: A

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[6] "*Cumulative impact* is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 USC §1508.7)

SocioEconomic Analysis and Closure Transition Guide Book (See PW Motion, pp. 56-57, and the NRC's 2006 NRC's Groundwater Contamination (tritium) at Nuclear Plants Task Force Final Report found that the Radiological Environmental Monitoring Program with which Entergy says it will comply (LTA, 1.4 Additional Considerations) is badly flawed. (See PW Motion, pp. 5053).

Also, Entergy's discussion of environmental impacts did not consider the potential "cumulative effects" of potential environmental impacts. Neither did the Entergy PSDAR address the substantial, and often new, significant information that the previously issued impact statements did not consider.

The previously issued statements did not consider, either individually or cumulatively, the economic impacts of the contamination discussed above. ENGC's conclusion that environmental impacts are "bounded" by these statements apparently did not consider these either.

In addition to not considering the potential impact of the discovery of previously "unknown' contamination, it also seems clear that neither the Entergy PSDAR and DCE, nor the previously issued statements, considered: potential environmental impacts resulting from such things as future on-site radiological incidents (See PW Petition, pp. 68, 111-112, 127, and Commonwealth Petition, p. 13 and cited Declarations), including for example spent fuel fires and dry cask failures (See PW Petition, pp. 68, 77-80, 111-112, 113-114, 118-120, and Commonwealth Petition, p 14 and cited Declarations); climate change (See PW Petition, pp. 6061, 104-107, 127, and Commonwealth Petition, pp 38-40); compliance with Massachusetts requirements (See PW Petition, pp. 663-64, 129 and Commonwealth Petition, p. 13) and acts of malice (See PW Petition, pp. 72-77, 114-118)

Unless ENGC can show how the previously issued environmental statements consider and properly account for these many potential environmental impacts,

individually and cumulatively, the PSDAR Review Staff should conclude that "the environmental impacts associated with site-specific decommissioning activities" (PSDAR) cannot be "bounded" by those previous statements that do not do so.

Conclusion

We urge the PSDAR Review Staff to require ENGC to address all the shortcomings and questions in and raised by the Entergy PSDAR and DCE filed November 16, 2018, and not to accept any Entergy PSDAR until it has properly and satisfactorily done so.

Respectfully,

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March 21, 2019

Appendix I

Pertinent Pages from Pilgrim Watch Petition to Intervene and Hearing Request

(Docket No. 50-293 & 72-1044 LT), February 20, 2019

I-A Pages 36-54

I-B Pages 97-104

APPENDIX I-A (PW Motion, Pages 36-54)

Examples of Radiological/ Hazardous Contamination[7]

Pilgrim Watch will not speculate what Entergy "knows," and may have told Holtec, about radiological and hazardous contamination. What is not speculative, and would be confirmed by a new site assessment, is that there is significant contamination at Pilgrim, that Holtec's assumption that the site is "clean" is not justified, and that the estimated costs in its PSDAR and DCE are inaccurate.

The LTA, PSDAR, DCE and GEIS and SEIS ignore that, over the years, Pilgrim has buried contaminated materials on site and has had many leaks and releases. Pilgrim opened with bad fuel and no off-gas treatment system; later it blew its filters prompting Mass Dept. Public Health to do a case-control study of adult leukemia testing the hypothesis that the closer you lived or worked at Pilgrim there would be an increase in leukemia. The hypothesis was confirmed.[8] Due to these leaks, many lethal radionuclides, including for example tritium, manganese54, cesium-137, Sr-90, I-131, cobalt-60, and neptunium[9] were found in the surface water, groundwater, and soils at Pilgrim at levels exceeding "background" levels.

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[7] These examples are discussed in more detail in the following documents: Jones River Watershed Association's Entergy's Legacy of Contamination at Pilgrim Nuclear Power Station Draft 3, section vi-vii, Exhibit 3; and, Pilgrim Watch Intervention Pilgrim License Renewal Application, Contention 1 filings, NRC Adams Electronic Hearing Docket.

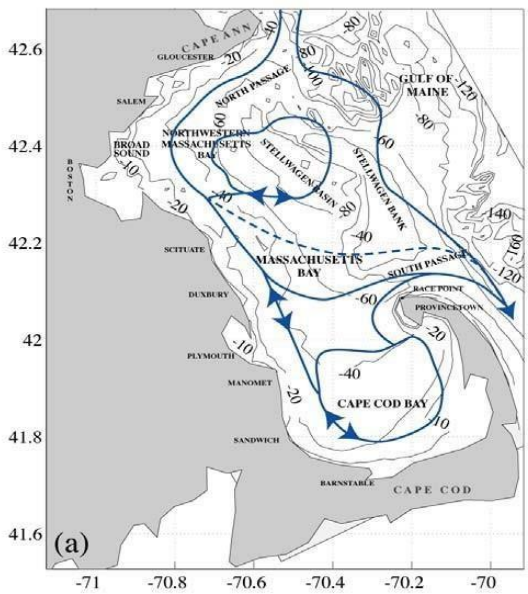
[8] *The Southeastern Massachusetts Health Study* [published in the *Archives of Environmental Health*, Vol. 51, p.266, July-August 1996 (Pilgrim Motion Request for Hearing and Motion to Intervene, May 2006, Exhibit F-2, NRC Adams, EHD, Pilgrim LR, Pleadings 2006)

[9] Neptunium releases into Cape Cod Bay reported by Stuart Shalat, who worked for the contractor doing the refueling in the 1980s. Stuart Shalat, Sc.D. Associate Professor Robert Wood Johnson Medical School, Exposure Science Division, Environmental and Occupational Health Sciences Institute

Holtec nowhere recognizes the existence of these contaminated materials, the costs of removing them, or the costs of remediating portions of the site that they have contaminated. None of the documents Holtec relied upon bound environmental impact.

Pilgrim is sited beside Cape Cod Bay. Due to the topography of the site, contaminants will leak into the Bay. Massachusetts and Cape Cod Bays are tidal. NUREG-1427, 2.2.5.1 Contaminants leaking into the bay during an incoming tide will be drawn into Plymouth, Duxbury and Kingston Bays, up the rivers, such as the Jones, Eel, and Bluefish Rivers and into estuaries; in the outgoing tide they will flow into and circulate around Cape Cod Bay and beyond.

Currents will move the contamination. The figure below, provided by the Massachusetts Water Resources Authority,[10] show circulation in Massachusetts and Cape Cod Bays.

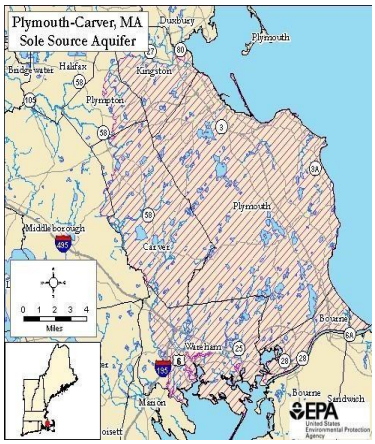


The dispersion of discharges also varies seasonally. From information available, it is reasonable to predict that currents, winds and tides would spread contaminants around Cape Cod

[10] Physical and Biological Oceanography of Massachusetts, Wendy Leo, Rocky Geyer, Mike Mickelson http://www.mwra.state.ma.us/harbor/enquad/pdf/ms-085_04.pdf

Bay, into Massachusetts Bay and eventually south down the outside arm of Cape Cod, impacting also rivers, streams, and other waterways that are connected to the larger bodies of water. The impact, actual or perceived, would significantly affect public safety, the marine ecology and economy.

Also, Pilgrim's site is above the Plymouth-Carver Aquifer, the second largest aquifer in the state that provides drinking water to several towns and supports many natural resources.



Historic poor management, releases and contamination ignored

As stated, Pilgrim opened in 1972 with bad fuel and no off-gas treatment system, a technology that attempts to reduce the radioactivity of gasses that are removed from the radioactive steam that turns the turbine in the condenser. It did not install the off-gas system until 1977. This prompted Mass Dept. Public Health (MDPH) to do a case-control study of adult leukemia testing the hypothesis that the closer you lived or worked at Pilgrim there would be an increase in leukemia. The hypothesis was confirmed.[11]

MDPH in its introduction to its study said that, "Pilgrim which began operations in 1972**,** had a history of emissions during the 1970's that were above EPA guidelines as a result of a fuel

[11] The Southeastern Massachusetts Health Study published in the Archives of Environmental Health, Vol. 51, p.266, July-August 1996

rod problem." [12] Due to the leaks, many lethal and long-lived radionuclides were identified. For example, neptunium (2.14 million years) was reported by Dr. Stuart Shalat who worked as a contractor at Pilgrim and now at Rutgers University.[20]

Subsequently Pilgrim blew its filters in 1982, prompting authorities to send suited personnel into neighboring communities to take samples. The Annual Radiological Environmental Reports indicate considerable offsite contamination. If there was offsite contamination, the only reasonable assumption is that there was contamination onsite also.

For example, the Pilgrim Nuclear Power Station Environmental Radiation Monitoring Program Report No. 15 January 1 through December 31, 1982 - Issued April 1983 Boston Edison Co. (Exhibit 3) shows the results from testing various media offsite for radionuclides. As an example, the milk sampling report on page 30. says that:

> Milk samples were collected at two locations during 1982- Kings Residence (Station 22-12 miles W), and Whitman (Station 21- 21 miles NW)
>
> Cs-137: Kings Residence in late June concentrations 1,000,000 times in excess of concentration expected (The contamination level of the June 11, 1982 spent resin incident was up to 100,000 dpm/100 cm2.)
>
> Gamma isotopic analysis identified primarily long-lived radionuclides including Cs 137 and the Whipple farm (1.5 mi -SSW); lettuce 31.9 pCi/kg and Cs-137 concentrations > 1,000,000 times what would be expected at both locations.

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[12] The Southeastern Massachusetts Health Study 1978-1986 Martha Morris, Robert Knorr Principal Investigators Exec Summary, Background, pg.,1

Boston Edison, Pilgrim's previous owner, attributed the high readings to the cow's pregnancy; Tufts University Veterinary School explained cows delivered calves not cesium.

Other media sampled show similarly high readings. NRC Inspection Reports from June-July 1982 document and confirm the releases of resin.[13]

Due to these and subsequent releases discussed below, many lethal radionuclides were found in the surface water, groundwater, and soils at Pilgrim at levels exceeding "background" levels. These releases prompted additional health studies that were published in the 1980's thru 2004 showing radiation linked diseases in communities near Pilgrim. (See Pilgrim Watch Motion to Intervene Pilgrim LRA, Contention 5, (5.3.3) and Exhibits F-2-F-4, Adams Library, Accession NO. ML061630125.)

All of this is "overlooked" in Holtec's LTA, PSDAR and DCE and in Entergy's old GEIS and SEIS. The LTA cannot properly be approved until Holtec has conducted a new site assessment "to further the identification, categorization, and quantification of radiological, regulated, and hazardous wastes" (PSDAR 2.4.2, p. 11), as included in its PSDAR and DCE the costs or removing all wastes and contamination on site and has provided assurance that it has the financial ability to do so.

Contamination onsite is exacerbated by Pilgrim's long history of mismanagement[14]

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[13] **NRC Inspection Reports June-July 1982:** June 11, 1982 Preliminary Notification of Event Or Unusual Occurrence -PNO-1-82-42 Subject: release of Resin; June 11, 1982: Licensee Event Report June 9, 1982;June 14, 1982: Preliminary Notification of Event or Unusual Occurrence-PNO-1-82-42A Subject: release of spent resin update; July 7, 1982: Inspection Report by NRC of PNPS dated July 7, 1982;July 8, 1982: NRC Memo: Generic Implications of the Release of Spent Resin (Available NRC Adams, microfische).

[14] Pilgrim Chronology 1967- 2015, https://jonesriver.org/legal/pilgrim-chronology-1967-2015/ Exhibit 4

From 1986- 1989, Pilgrim shut down due to a series of mechanical failures. (*US nuclear plants in the 21st century: The risk of a lifetime*. Report by the Union of Concerned Scientists, David Lochbaum, May 2004.) In May 1986, The NRC identified Pilgrim as one of the most unsafe facilities in the U.S. (*Pilgrim on list of worst -run nuclear plants*, Boston Globe, A Pertman, May 23, 1986.)

In January of 1988, a 5,000 cubic yard pile of dirt containing radioactive cesium-134, cesium-137, and cobalt-60 was found in a parking lot near the reactor. (*Radioactivity was detected in dirt pile near Pilgrim*, Boston Globe, L. Tye, January 21, 1988)

In February 2014, the NRC identified Pilgrim as one of the nine worst performing nuclear reactors in the U.S. In September 2015, Pilgrim was moved to NRC's lowest safety ranking (Category 4), joining 2 other Entergy reactors. (http://www.nrc.gov/infofinder/reactors/pilg/special-oversight.html) December 2016, Special Inspection: [15] NRC unintentionally "leaked" an email containing NRC report covering the November 28 - December

8 inspection. Written by Donald Jackson, the lead inspector, this report included a long list of flaws at the plant that were observed during the initial week of the inspection. In the email, Donald Jackson, said that, "***"The plant seems overwhelmed just trying to run the station."***

The list of Pilgrim failures mentioned in the email were:

- failure of plant workers to follow established industry procedures,
- broken equipment that never gets properly fixed,
- lack of required expertise among plant experts,

[15] http://www.capecodtimes.com/news/20161206/nrc-email-pilgrim-plant-overwhelmed

- failure of some staff to understand their roles and responsibilities, and
- a team of employees who appear to be struggling with keeping the nuclear plant running.
- We are observing current indications of a safety culture problem that a bunch of talking probably won't fix."

The report suggests that Pilgrim was a "plant (that) seems overwhelmed just trying to run the station," increasing the probability of leaks that will require cleanup and more money than anticipated. Pilgrim remains in the lowest safety ranking in 2019.

Contamination resulting from Buried Pipes and Tanks

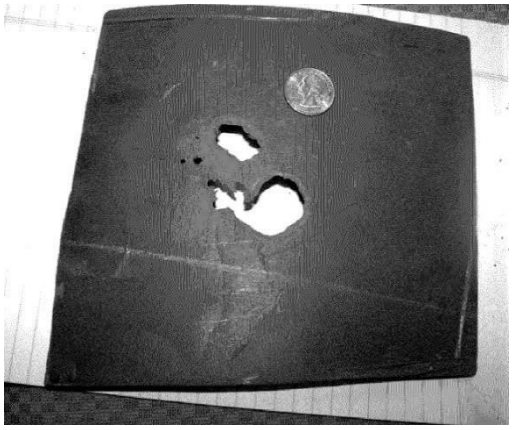
Pilgrim's buried pipes and tanks are made of materials that corrode - concrete, carbon steel, stainless steel, titanium and external coatings and wraps are susceptible to age-related and environmental degradation. [17] The pipes and tanks are old and subject to age-related degradation. [18] Some of the pipes and tanks contain industrial process, radionuclides in wastewater and embedded in the pipe/tank. Degradation of these components can lead to leaks of toxic materials into groundwater and soils.

According to Entergy during the LRA proceeding, all of Pilgrim's underground pipes are within 10 feet of the surface, which is well within reach of groundwater and salt water flooding.[19]

The photograph below shows a hole in one of Pilgrim's buried SSW discharge pipes.[20]

[17] See for full discussion buried pipes and tanks, Pilgrim Watch was admitted to Pilgrim's License Renewal Proceeding and filed Contention 1, *The Aging Management Plan Does Not Adequately Inspect and Monitor for Leaks in All Systems and Components That May Contain Radioactively Contaminated Water*. We refer the ASLB to the file, especially Pilgrim Watch Post Hearing

Findings of Fact and Conclusion of Law, June 9.2008, Docket 50-293
[18] Pilgrim Watch Post-Hearing Findings of Fact Conclusions of Law, June 9, 2008,11
[19] Ibid,
[20] Pilgrim License Renewal Application Proceeding, Entergy submissions, PillR0045779-Pill R00457
There is every reason to assume that it is not the only one.



There has been no adequate program for inspecting buried pipes and tanks. NEI's Buried Piping/Underground Piping and Tanks Integrity Initiative, that began in 2009, is voluntary. The NRC's monitoring programs are not only voluntary; they are also inadequate. They are based on inaccurate assumptions about corrosion and an insufficient inspection regime. Rather than requiring a comprehensive approach to deal with leaks of radioactive materials from buried pipes and tanks, the NRC has allowed Pilgrim to take piecemeal approach by conducting physical inspections only in those rare instances when pipes are dug out for other purposes and by only fixing sections of failed pipe.

These voluntary processes have allowed leaks and spills to go unnoticed, [16] and are incapable of identifying failures in, or ensuring the integrity of, decades-old piping systems.[17]

[16] Ibid, 55-59
[17] Ibid, 37

Holes such as that shown above leak, and neither Holtec nor the NRC can properly assume that it is the only one. Holtec must be required to conduct a new site assessment to determine the extent of leakage,, i.e., so that " radiological, regulated, and hazardous wastes are identified, categorized and quantified to support decommissioning and waste management planning "(CDE, p. 14), and to include in its PSDAR and DCE the costs of removing contamination around buried pipes and tanks and a showing that the DTF has sufficient funds to do so.

Tritium and Other Radionuclides in Groundwater[18]

The Pilgrim Tritium in Groundwater Program has shown significant radioactive contamination (tritium, cesium-137, cobalt-60, manganese-54) in Pilgrim's soil. Neither this contamination nor the cost of removing it, is mentioned in Holtec's PSDAR or DCE.

Prior to 2007, Pilgrim had no groundwater monitoring program. What had leaked into and contaminated the site is unknown; but what was found when wells were put into place in 2007 strongly suggests perhaps considerable prior leakage.[31]

Since 2007, Entergy's own groundwater well tests, and MDPH's analysis of split [19]samples, have confirmed Pilgrim is leaking radionuclides and contaminating the soil and groundwater. Entergy's tests have shown levels ranging from non-detect levels to as high as

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[18] https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclearpowerstation; https://jonesriver.org/pilgrim-contamination/ ; and see Attachment 2 for a full report. [31] Only four wells were installed in 2007.

[19] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, January 2014

70,000 piC/L.[32] EPA's standard for tritium in drinking water is 20,000 piC/L; California's goal is 400 piC/L. Every year since 2007 there has been at least one well with levels well above the upper limit of normal background levels. In all but 2 years, there was at least one well above Mass DPH's screening level of 3,000 piC/L and 3 years with at least one well above EPA's safe drinking water standard of 20,000 piC/L.

By April 2012 an underground line leading to the discharge canal had separated. The leak was accidently discovered when tritiated water was found coming out of an electrical junction box inside the facility.[20] Five months later, groundwater tests results showed high tritium levels (4,882-5,307 pCi/L), in one of the wells and this was suspected to be related to the separated underground line. [26] Soil sampling was done, and preliminary results showed tritium, cobalt-60, and cesium-137 at levels above normal (1,150 picocuries per kilogram (pCi/kg) of cobalt-60 and 2,490 pCi/kg of cesium-137). [35]

By January 2014 – nine months after the leak was originally discovered – excessive levels of tritium (69,000-70,000 pCi/L), the highest in Pilgrim's recorded history, were detected near a basin that collects radiologically contaminated water and ultimately sends it to Cape Cod Bay. Entergy and Mass DPH continued their investigations, unsure of the sources of leakage, and performed no cleanup.[21]

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[20] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, May 2013
[26] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, Sept 2013
[35] Split sample testing at MDPH
[21] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. Jan. 2014.

More than a year later, Pilgrim's newest groundwater wells continued to show elevated levels of tritium and final soil testing results show levels of tritium, manganese-54, cesium-137, and cobalt-60 at various depths near the separated underground line above typical background levels.[22]

According to Mass DPH in its August 2014, November 2014, and May 2015 Groundwater Monitoring Reports, tritium levels continued to trend higher in some of Pilgrim's wells and radionuclides (e.g., Cobalt-60 and Cesium-137) were still being found in soils on the site. The November report describes new samples showing high levels of tritium in air conditioning condensate at the facility (3,500-4,000 piC/L).

In addition to the contaminating spills described above, at least five other historic spill events that have been reported on the Pilgrim site since 1976. [23] For instance, in 1988 there was a spill of low-level radioactive waste water. The radioactively contaminated liquid waste was discovered inside a process building and had leaked outside the building. An estimated 2,300 gallons of contaminated water spilled, and 200 gallons leaked outside the building from under a door. About 2,500 square feet of asphalt and 600 cubic feet of sand and gravel were contaminated. [39]

Soil samples obtained in 2014 as part of a larger tritium leak investigation showed high levels of manganese-54, cesium-137, and cobalt-60 at various depths near a separated underground line above typical background level.[24]

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[22] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. May 2014.
[23] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. Aug 2014. [39] Mass DPH. 1988. Investigation of Radioactive Spill at Pilgrim on November 16, 1988. Prepared by Radiation Control Program.
[24] *Ibid*. at 67

For the non-drinking water reporting standards for cobalt-60 (5.27 years half-life), cesium-137 (30.17 years half-life), and manganese-54 (312 days half-life), see Table4. For drinking water, EPA's MCL for these radionuclides is 4 mrem per year. For cesium-137, the level found in Pilgrim's soil was 38x more than the reporting standard. For cobalt-60, the level found in Pilgrim's soil was more than 8x the reporting standard.

Table 4. EPA's maximum contaminant level (MCL), non-drinking water reporting standards, and the average concentration assumed to yield 4 mrem per year for select radionuclides

Radionuclide	**EPA's MCL for Drinking Water**	**Non-Drinking Water Reporting Standards (Entergy/NRC)[73]**	**Average Conceyield 4 assumed to mre**
Tritium	4 mrem/year	30,000 piC/L	20,000 piC/L
Manganese-54	4 mrem/year	1,000 piC/L	300 piC/L
Cesium-137	4 mrem/year	50 piC/L	200 piC/L
Cobalt-60	4 mrem/year	300 piC/L	100 piC/L

Absent a new and complete site assessment, there is no certainty of the sources of Pilgrim's leaks. Likely candidates include leaks from the Condenser Bay Area, seismic gaps, a crack in the Torus Floor, materials and soil from subsequent construction left on site, and agerelated degradation. Extreme temperatures and storms, salt water and air, corrosive

chemicals, and intense radiation most likely have caused components to thin and crack, compromising the structural integrity of the facility and underground/buried pipes.[25]

During the past 12 years in which the licensee has known about the leaks, nothing has been done to clean up the soil. The cost of removing all on-site radioactive tritium and other radioactive materials that have been released into the soil must be included in Holtec's LTA, PSDAR and CDE. They have not been.

Once again, Holtec must be required to conduct a new site assessment to determine the extent of leakage, i.e., so that "radiological, regulated, and hazardous wastes are identified, categorized and quantified to support decommissioning and waste management planning. (DCE, p. 14) Unless it does so, it will not be able to include in its PSDAR and DCE an accurate estimate of the costs of removing contamination around buried pipes and tanks, to show that the DTF has sufficient funds without which there can be no financial assurance, or to show that Holtec Pilgrim and HDI are financially responsible.

Stormwater Drains and Electrical Vaults[26]

Pilgrim has twenty-five electrical vaults on site. The vaults and other sources of untreated water are pumped out to four stormwater drains and directly into Cape Cod Bay. Over the past twenty-five years, Pilgrim's storm drains were supposed to be tested twice per year for pollutants, oil, grease, total suspended solids, as required by EPA. But Entergy failed to conduct

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[25] Pilgrim Watch, Contention 1, The Aging Management Plan Does Not Adequately Inspect and Monitor for Leaks in All Systems and Components That May Contain Radioactively Contaminated Water; Pilgrim Watch Post Hearing Findings of Fact and Conclusion of Law, June 9.2008, Docket 50-293, NRC Adams, ML 081650345

[26] https://jonesriver.org/getfile/ccbw/2012/10/RAD-REPORT_2017.07.18_VS3.pdf (Attachment 3) [33] EPA's 2016 Draft Authorization to Discharge under the National Pollution Discharge Elimination System (Fact Sheet)

sampling over roughly the past 10 years, according to the EPA.[33] Sampling has only occurred three times since January 2009, and only three of the four storm drains were tested. There is also a fifth "miscellaneous" storm that has never been tested, apparently because it is inaccessible.

When storm drain sampling was done (from 1998-2007), certain parameters were exceeded on many occasions.[27] Initial sampling by EPA from only seven vaults found total suspended solids, cyanide, phenols, phthalates, PCBs, antimony, iron, copper, zinc, lead, nickel, cadmium, hexavalent chromium. Lead, copper, and zinc exceeded marine water quality criteria.

Monitoring results from standing water in storm water manholes, junction boxes, and electrical duct banks show radioactive materials at tritium levels as high as 1,500 pCi/L in some storm water manholes and up to 4,500 pCi/L in some electrical duct bank manholes. [28] Even though these levels may be low in relation to the excessive levels in the groundwater, they still exceed the background level of 5-25 piC/L for surface water and 6-13 piC/L for groundwater.

Unless and until Holtec performs a new and complete site analysis, the actual extent of drain and vault radioactivity and the costs or removing it will not be known

Holtec reliance on Entergy's environmental radiological monitoring data

Holtec says that "PNPS will continue to comply with the Offsite Dose Calculation Manual, Radiological Environmental Monitoring Program, and the Groundwater Protection Initiative Program during decommissioning (LTA, 1.4 Additional Considerations). The reports are not

[27] page 31 of EPA's 2016 Draft Authorization to Discharge under the National Pollution Discharge Elimination System (Fact Sheet)
[28] Ibid, at 22

reliable, according to NRC's own task force, likely raising costs during decommissioning and negatively impacting public health.

The NRC's Groundwater Contamination (Tritium) at Nuclear Plants Task Force Final Report, September 1, 2006[29] identified "that *under the existing regulatory requirements* the potential exists for unplanned and unmonitored releases of radioactive liquids to migrate offsite into the public domain undetected." (LLTF Executive Summary ii)

Section 3.1.4 of the LLTF recommended that the following regarding the Radiological Environmental Monitoring Program.

- The radiation detection capabilities specified in the Buried Tanks and Pipes Monitoring Program (BTP) are the 1970's state-of-the-art for routine environmental measurements in laboratories. More sensitive radiation detection capability exists today, but there is no regulatory requirement for the plants to have this equipment. The guidance primarily focuses on gamma isotopic analysis of environmental material and on tritium in water samples. There are minimal requirements for analyzing environmental samples for beta- and alpha -emitting radionuclides. P.18
- The regulatory guidance provides built in flexibility in the scope of the REMP. It …allows licensees to reduce the scope of and frequency of the sampling program, without the NRC approval, on historical data...if a licensee's environmental samples have not detected licensed radioactive material in several years, then the licensee typically reduces the scope and sample frequency of the associated environmental pathway. NRC inspections have observed reductions in the scope and frequency of licensee programs… p.19

The Task Force concluded (Conclusions 3.2.1.3):

[29] NRC's Groundwater Contamination (tritium) at Nuclear Plants Task Force Final Report, September 1, 2006; https://www.nrc.gov/docs/ML0626/ML062650312.pdf

- (2) The radiological effluent and environmental monitoring program requirements and guidance largely reflect radioactive waste streams that were typically from nuclear plant operation in the 1970's. The issues that were important then, i.e. principal gamma emitters giving the significant dose, while still important today, have been joined by new issues. Today, as a result of better fuel performance, and improved radioactive source terms reduction programs, a new radioactive waste stream has evolved. The new liquid radioactive source terms are made up of a lower fraction of gamma emitting radionuclides and a higher fraction of weak beta emitters. The NRC program has not evolved with the changes in technology and industry programs
- (3) The REMP has allowed licensees significant flexibility to make changes to their programs without NRC prior approval. The historical trend has been to reduce the scope of the program. There is no guidance on when the program needs to be expanded.

Its Recommendations:

(1) The NRC should revise the radiological effluent and environmental monitoring program requirements and guidance consistent with current industry standards and commercially available radiation detection technology.

(2) Guidance for the REMP should be revised to limit the amount of flexibility in its conduct. Guidance is needed on when the program, based on data or environmental conditions, should be expanded.

(6) The NRC should require adequate assurance that spills and leaks will be detected before radionuclides migrate offsite via an unmonitored pathway.

The LLTF stated further in its Executive Summary ii that, …relatively low leakage rates may not be detected by plant operators, even over an extended period of time."

Hazardous Waste Dumping[30]

Numerous sources have reported that drums of hazardous waste were buried on the Pilgrim site in the 1980s and/or 1990s.[93] Barrels of chemical waste were reportedly shipped from New Jersey were buried along Power House Road (Pilgrim's access road) and then overplanted with evergreen trees.

This contamination was the subject of public comments to the NRC in 2007.[31] These comments are reported in Pilgrim's "Generic Environmental Impact Statement for License Renewal:" **"**The public, NRC officials and Entergy staff also are well aware of burials off the Access Road." The NRC responded to this comment by saying that the comment was noted and would be kept on file to "ensure that these types of areas will be identified during plant

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[30] https://jonesriver.org/getfile/ccbw/2012/10/RAD-REPORT_2017.07.18_VS3.pdf (Attachment 3)
[31] Bramhall W. October 2013 Pilgrim Coalition Newsletter. <http://archive.constantcontact.com/fs159/1109945140723/archive/1115182751860.html> Accessed 11/24/2015 [49] 21E is a classification given to hazardous material disposal sites by MassDEP.

decommissioning." Now is the time to identify "these types of areas," and to provide the costs of remediation.

In October 2015, community members filed a formal "Chapter 21E"[49] report to MassDEP about these hazardous materials. The Chapter 21E report triggers regulations that requires the agency to investigate and report its findings to the public. MassDEP followed up a year later saying that without more evidence, such as samples showing contamination, or pictures of stuff being buried, there is nothing more the agency could do.

There may be additional waste buried that requires investigation. Holtec must conduct the necessary investigations, and its decommissioning costs must include whatever is required to make the site clean.

APPENDIX I-B (PW Motion, pages 97-104)

Pilgrim's History of Spills, Leaks, Mismanagement - Requires Site Assessment & NEPA[50]

1. Pilgrim opened with bad fuel and no off-gas treatment system
2. Later Pilgrim blew its filters in June 1982.
3. Operating with bad fuel and blowing its filters, prompted Mass Dept. Public Health to do a case-control study of adult leukemia testing the hypothesis that the closer you lived or worked at Pilgrim there would be an increase in leukemia. The hypothesis was confirmed.[51]
4. Due to these leaks, many lethal radionuclides, including for example tritium, manganese54, cesium-137, Sr-90, I-131, cobalt-60, and neptunium[52] were found in the surface water, groundwater, and soils at Pilgrim at levels exceeding "background" levels.
5. The Annual Radiological Environmental Reports (see especially the 1983 report following the June 1982 releases) indicate considerable offsite contamination, some media having >1000 times Cs-137 of what would be expected.
6. These releases prompted additional health studies that were published in the 1980's thru 2004 showing radiation linked diseases in communities near Pilgrim. (See Pilgrim Watch Motion to Intervene Pilgrim LRA, Contention 5, (5.3.3) and Exhibits F-2-F-4, Adams Library, Accession NO. ML061630125.)

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Pilgrim Chronology 1967- 2015, https://jonesriver.org/legal/pilgrim-chronology-1967-2015/ Exhibit 4 [51]
The Southeastern Massachusetts Health Study [published in the *Archives of Environmental Health*, Vol. 51, p.266, July-August 1996 (Pilgrim Motion Request for Hearing and Motion to Intervene, May 2006, Exhibit F-2, NRC Adams, EHD, Pilgrim LR, Pleadings 2006) [52]
Neptunium releases into Cape Cod Bay reported by Stuart Shalat, who worked for the contractor doing the refueling in the 1980s. Stuart Shalat, Sc.D. Associate Professor Robert Wood Johnson Medical School, Exposure Science Division, Environmental and Occupational Health Sciences Institute

7. Knowing that there was offsite contamination, the only reasonable assumption is that there is contamination onsite also. This requires a site assessment and NEPA analysis, not yet done.
8. Contamination onsite is exacerbated by Pilgrim's long history of mismanagement.[32]
9. Pilgrim was shut down from 1986-1989 due to a series of failures
10. January 21, 1988, a 5,000 cubic yard pile of dirt containing radioactive cesium-134, cesium137, and cobalt-60 was found in a parking lot near the reactor. (*Radioactivity was detected in dirt pile near Pilgrim*, Boston Globe, L. Tye, January 21, 1988).
11. February 2014: NRC identified Pilgrim as one of the nine worst performing nuclear reactors in the U.S.
12. In September 2015, Pilgrim was moved to NRC's lowest safety ranking (Category 4), joining two other Entergy reactors. (http://www.nrc.gov/info-finder/reactors/pilg/specialoversight.html) Pilgrim remains in the lowest safety ranking in 2019.
13. December 2016, Special Inspection[33]**:** NRC unintentionally "leaked" an email containing NRC report covering the November 28 - December 8 inspection. Written by Donald Jackson,

[32] Pilgrim Chronology 1967- 2015, https://jonesriver.org/legal/pilgrim-chronology-1967-2015/ Exhibit 4

[33] http://www.capecodtimes.com/news/20161206/nrc-email-pilgrim-plant-overwhelmed

the lead inspector, this report included a long list of flaws at the plant that were observed during the initial week of the inspection. In the email, Donald Jackson, said that, "***"The plant seems***

overwhelmed just trying to run the station."

14. The list of Pilgrim failures mentioned in the leaked email were: failure of plant workers to follow established industry procedures; broken equipment that never gets properly fixed; lack of required expertise among plant experts; failure of some staff to understand their roles and responsibilities; a team of employees who appear to be struggling with keeping the nuclear plant running; and NRC inspectors are observing current indications of a safety culture problem that a bunch of talking probably won't fix."

15. A "plant (that) seems overwhelmed just trying to run the station" increases the probability of leaks.

16. All of these facts, and those below, require a site assessment and NEPA analysis.

Contamination resulting from Buried Pipes and Tanks

17. Pilgrim's buried pipes and tanks are made of materials that corrode - concrete, carbon steel, stainless steel, titanium and external coatings and wraps are susceptible to age-related and environmental degradation.[41]

18. The pipes and tanks are old and subject to age-related degradation.[42] Most were put in place in the 60's.

19. Some of the pipes and tanks contain industrial process, radionuclides in wastewater and embedded in the pipe/tank.

20. Degradation of these components can lead to leaks of toxic materials into groundwater and soils. A site analysis and NEPA is required.

[41] See for full discussion buried pipes and tanks, Pilgrim Watch was admitted to Pilgrim's License Renewal Proceeding and filed Contention 1, *The Aging Management Plan Does Not Adequately Inspect and Monitor for Leaks in All Systems and Components That May Contain Radioactively Contaminated Water*. We refer the ASLB to the file, especially Pilgrim Watch Post Hearing Findings of Fact and Conclusion of Law, June 9.2008, Docket 50-293
[42] Pilgrim Watch Post-Hearing Findings of Fact Conclusions of Law, June 9, 2008,11
[57] Ibid 55-59

21. There has been no adequate program for inspecting buried pipes and tanks.

22. NEI's Buried Piping/Underground Piping and Tanks Integrity Initiative, that began in 2009, is voluntary and inadequate. These voluntary processes have allowed leaks and spills to go unnoticed.[57]

Tritium and Other Radionuclides in Groundwater[34][35]

23. The Pilgrim Tritium in Groundwater Program has shown significant radioactive contamination (tritium, cesium-137, cobalt-60, manganese-54) in Pilgrim's soil.

24. Prior to 2007, Pilgrim had no groundwater monitoring program. What had leaked into and contaminated the site is unknown; but what was found when wells were put into place in 2007 strongly suggests perhaps considerable prior leakage

25. Since 2007, Entergy's own groundwater well tests, and MDPH's analysis of split samples, have confirmed Pilgrim is leaking radionuclides and contaminating the soil and groundwater. Entergy's tests have shown levels ranging from non-detect levels to as high as 70,000 piC/L.[59] 20,000 is the EPA limit; California's goal is 400.

26. In all but 2 years, there was at least one well above Mass DPH's screening level of 3,000 piC/L and 3 years with at least one well above EPA's safe drinking water standard of 20,000 piC/L.

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[34] https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclearpowerstation; https://jonesriver.org/pilgrim-contamination/ ; and see Attachment 3 for a full report.
[35] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, January 2014

27. April 2012 an underground line leading to the discharge canal had separated. The leak was accidently discovered when tritiated water was found coming out of an electrical junction box inside the facility.[36]

28. Five months later, groundwater tests results showed high tritium levels (4,882-5,307 pCi/L), in one of the wells and this was suspected to be related to the separated underground line. [37]

29. Soil sampling was done, and preliminary results showed tritium, cobalt-60, and cesium-137 at levels above normal (1,150 picocuries per kilogram (pCi/kg) of cobalt-60 and 2,490 pCi/kg of cesium-137). [47]

30. By January 2014 – nine months after the leak was originally discovered – excessive levels of tritium (69,000-70,000 pCi/L), the highest in Pilgrim's recorded history, were detected near a basin that collects radiologically contaminated water and ultimately sends it to Cape Cod Bay.

31. Entergy and Mass DPH continued their investigations, unsure of the sources of leakage, and performed no cleanup.[38]

32. More than a year later, Pilgrim's newest groundwater wells continued to show elevated levels of tritium and final soil testing results show levels of tritium, manganese-54, cesium137, and cobalt-60 at various depths near the separated underground line above typical background levels.[39]

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[36] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, May 2013
[37] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, Sept 2013 [47] Split sample testing at MDPH
[38] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. Jan. 2014.
[39] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. May 2014.

33. In addition to the contaminating spills described above, at least five other historic spill events that have been reported on the Pilgrim site since 1976. [40]

34. Tritium moves quickly in the soil; other radionuclides more slowly. Therefore, if the monitoring wells show only tritium it does not prove that other radionuclides, perhaps with longer half-lives, may be upstream.

35. In 1988 there was a spill of low-level radioactive waste water. The radioactively contaminated liquid waste was discovered inside a process building and had leaked outside the building. An estimated 2,300 gallons of contaminated water spilled, and 200 gallons leaked outside the building from under a door. About 2,500 square feet of asphalt and 600 cubic feet of sand and gravel were contaminated.[41]

36. Absent a new and complete site assessment, there is no certainty of the sources of Pilgrim's leaks.

37. Likely candidates include leaks from the Condenser Bay Area, seismic gaps, a crack in the Torus Floor, materials and soil from subsequent construction left on site, and age-related degradation.

38. Extreme temperatures and storms, salt water and air, corrosive chemicals, and intense radiation most likely have caused components to thin and crack, compromising the structural integrity of the facility and underground/buried pipes.[67]

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[40] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. Aug 2014.

[41] Mass DPH. 1988. Investigation of Radioactive Spill at Pilgrim on November 16, 1988. Prepared by Radiation Control Program. 67

Pilgrim Watch, Contention 1, The Aging Management Plan Does Not Adequately Inspect and Monitor for Leaks in All Systems and Components That May Contain Radioactively Contaminated Water; Pilgrim Watch Post Hearing Findings of Fact and Conclusion of Law, June 9.2008, Docket 50-293, NRC Adams, ML 081650345

39. During the past 12 years in which the licensee has known about the leaks, nothing has been done to clean up the soil. A site and NEPA is needed.

Stormwater Drains and Electrical Vaults[42]

40. When storm drain sampling was done (from 1998-2007), certain parameters were exceeded on many occasions.[43]

41. Initial sampling by EPA from only seven vaults found total suspended solids, cyanide, phenols, phthalates, PCBs, antimony, iron, copper, zinc, lead, nickel, cadmium, hexavalent chromium. Lead, copper, and zinc exceeded marine water quality criteria.

42. Monitoring results from standing water in storm water manholes, junction boxes, and electrical duct banks show radioactive materials at tritium levels as high as 1,500 pCi/L in some storm water manholes and up to 4,500 pCi/L in some electrical duct bank manholes.

Holtec reliance on Entergy's environmental radiological monitoring data

43. Holtec says that "PNPS will continue to comply with the Offsite Dose Calculation Manual, Radiological Environmental Monitoring Program, and the Groundwater Protection Initiative Program during decommissioning (LTA, 1.4 Additional Considerations). The reports are not reliable, according to NRC's own task force, likely negatively impacting public health.

44. The NRC's Groundwater Contamination (Tritium) at Nuclear Plants Task Force Final Report, September 1, 2006[44] identified "that *under the existing regulatory requirements* the potential

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[42] https://jonesriver.org/getfile/ccbw/2012/10/RAD-REPORT_2017.07.18_VS3.pdf (Attachment 3)

[43] page 31 of EPA's 2016 Draft Authorization to Discharge under the National Pollution Discharge Elimination System (Fact Sheet)

[44] NRC's Groundwater Contamination (tritium) at Nuclear Plants Task Force Final Report, September 1, 2006; https://www.nrc.gov/docs/ML0626/ML062650312.pdf

exists for unplanned and unmonitored releases of radioactive liquids to migrate offsite into the public domain undetected." (LLTF Executive Summary ii)

45. The LLFT recommended for example: (1) The NRC should revise the radiological effluent and environmental monitoring program requirements and guidance consistent with current industry standards and commercially available radiation detection technology. (2) Guidance for the REMP should be revised to limit the amount of flexibility in its conduct. Guidance is needed on when the program, based on data or environmental conditions, should be expanded. (6) The NRC should require adequate assurance that spills and leaks will be detected before radionuclides migrate offsite via an unmonitored pathway.
46. The LLTF stated further in its Executive Summary ii that, …relatively low leakage rates may not be detected by plant operators, even over an extended period of time."
47. We cannot rely on a review of monitoring reports. An actual site assessment and NEPA analysis are required.

Hazardous Waste Dumping

48. Drums of hazardous waste were buried on the Pilgrim site in the 1980s and/or 1990s. Holtec's LTA does not adequately consider them.
49. The NRC has noted burials of hazardous waste, saying that "these types of areas will be identified during decommissioning." Holtec's LTA does not adequately consider them, a site and NEPA assessment must.

Appendix II

Pages 13-14 from the Commonwealth of Massachusetts' Petition to Intervene and Hearing Request, Docket Nos. 50-293 & 72-1044, February 20, 201; Excerpts from Declarations of John Priest, Paul Locke and David Howland

<u>Commonwealth's Petition</u>

Failure to account for unanticipated costs

12. The LTA, Exemption Request, and Revised PSDAR also fail to comply with 10 C.F.R. § 50.82(a)(8)(i)(B) and (C) because, as explained in detail in the attached declarations, there are multiple ways that Holtec could experience significant, unaccounted for, cost overruns.

These cost overruns could very likely lead to a shortfall in the Decommissioning Trust Fund and an associated public health, safety, and environmental risk. They include:

(a) Delays in the work schedule leading to increased costs for overhead and project management. Even without any added direct costs, a delay in a single activity would likely delay the overall decommissioning schedule, which would lead to a significant, unaccounted for increase in costs for overhead and project staffing and management. Brewer Decl. ¶¶ 8-9;

(b) Compliance with existing Massachusetts standards for non-radiological hazardous materials cleanup under the Massachusetts Oil and Hazardous Material Release Prevention and Response Act, Mass. Gen. L. c. 21E, §§ 1-22 (Chapter 21E) and its regulations, the

Massachusetts Contingency Plan (MCP), 310 C.M.R. §§ 40.0000, et seq., or unanticipated site conditions that are not accounted for in Holtec's Cost Estimate. Brewer Decl. ¶ 10; Locke Decl. ¶¶ 6-9; Howland Decl. ¶¶ 6-7.

These unaccounted-for requirements and issues could result in higher than estimated costs and a longer timeline for completion, which, in turn, could result in delays and a shortfall in the Decommissioning Trust Fund. Brewer Decl. ¶ 10;

(c) The likely discovery of previously unknown radiological or non-radiological contamination. Brewer Decl. ¶ 11; Locke Decl.¶¶ 3-4; Howland Decl. ¶¶ 5-7; Priest Decl. ¶¶ 11-14. Holtec has not yet performed a site characterization of Pilgrim. Locke Decl.¶¶ 7-9; Howland Decl. ¶¶ 5-7; Priest Decl. ¶¶ 5-14. Thus, Holtec based its cost estimate only on historical data, which it has not disclosed in its Revised PSDAR. Brewer Decl. ¶ 11; Locke Decl.¶¶ 7-9; Howland Decl. ¶¶ 5-7. The actual extent of any contamination is thus unknown. Locke Decl.¶¶ 7-9; Howland Decl. ¶¶ 5-7; Priest Decl. ¶¶ 5-14. In the likely event that currently unidentified and unknown contamination is discovered, it could significantly increase the cost of decommissioning and site restoration. Brewer Decl. ¶ 11; Howland Decl. ¶¶ 5-6;

(d) A radiological incident at the site. Brewer Decl. ¶ 12. Once the spent nuclear fuel is in dry cask storage, the chances of a radiological incident decreases. Id. However, until that occurs, there is a risk of a radiological event. Id. For instance, there is a risk of a radiological event occurring during the transfer of spent nuclear fuel into the spent fuel pool, and again into dry casks. Id. Should this occur, a shortfall in the Decommissioning Trust Fund could occur from significant increases in both costs and delays. Id.;

(e) A DOE requirement to repackage spent nuclear fuel into new containers that DOE has approved for transportation in the event DOE fulfills its legal obligation to take possession of all spent nuclear fuel stored onsite. Brewer Decl. ¶ 13. Holtec assumes that

DOE will accept the spent nuclear fuel as-is, i.e., in the dry storage casks acquired by Entergy and Holtec. Id. However, DOE could arguably require the spent nuclear fuel to be repackaged into certain specific dry casks for transport. Id. If DOE were to require repackaging of the spent nuclear fuel, this could require Holtec to incur significant unaccounted-for costs, especially because Holtec will already have dismantled the spent nuclear fuel pool. Id.

<u>Declaration of John Priest,</u> attached to the Massachusetts Attorney General's Motion to Intervene and Request for Hearing Docket No. 50-293 &72-1044 LT, February 20, 2019 - Excerpts

3. I am familiar with the proposed sale of Pilgrim from Entergy to Holtec, Inc. I have reviewed documents filed with the Nuclear Regulatory Commission (NRC) by Holtec International, including Holtec's Revised Post-Shutdown Decommissioning Activities Report and Revised Site-Specific Decommissioning Cost Estimate (Holtec PSDAR) for Pilgrim and the License Transfer application. Based on my review of the Holtec PSDAR, my knowledge of Pilgrim, gained both through my work at the plant and industry experience related to reactor decommissioning, and my role as Director of Massachusetts' Radiation Control Program, I do not believe that Holtec has reasonably accounted for all site-specific factors in its decommissioning cost estimate. I reached this conclusion for the following reasons. I do not believe that Holtec has reasonably accounted for all site-specific factors in its decommissioning cost estimate. I reached this conclusion for the following reasons.

SITE-SPECIFIC INVESTIGATION AND ENVIRONMENTAL ASSESSMENTS

4. Holtec has not done and has not indicated to DPH that it plans to do, a full site investigation (radiological and non-radiological) before acquiring Pilgrim from Entergy. A full site investigation is necessary to accurately determine the ultimate anticipated cost of decommissioning, spent fuel management, and site restoration. Instead, Holtec relied on a series of NRC Generic Environmental Impact Statements for nuclear power plant decommissioning and license termination and renewal:

5. The National Environmental Policy Act (NEPA) requires the NRC to prepare a detailed statement assessing the environmental impact of and alternatives to major federal actions, which includes decommissioning of nuclear power plants. ***

6. In their PSDAR, Holtec relied on previously filed Generic Environmental Impact Statements related to Pilgrim in evaluating whether the environmental impacts

associated with decommissioning activities will be constrained by those previous statements and in estimating the costs associated with decommissioning, spent fuel management, and site restoration. NUREG-1437, Revision 1, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, June 2013, briefly discusses climate change. However, the PSDAR does not discuss the potential future impact of changes to the coastline or water table due to climate change, including the ability to adequately survey below ground components or structures and the discovery of contaminants in previously unassessed areas.

8. In 2010, Entergy reported increased tritium measured at one well. In response to recommendations from DPH, Entergy has installed additional wells and continued to monitor for tritium and investigate possible sources. To date, the cause of the tritium contamination has not been definitively identified. Entergy reported to DPH that it believed the contaminant was released from cracks in the basement of the condenser bay and into the adjacent seismic gaps between the buildings. To the extent tritium is discovered in groundwater in excess of the drinking water maximum contaminant levels (MCL) set by the U.S. Environmental Protection Agency (EPA), Holtec will have to ensure remediation. It is unknown whether the potential cost of having to remediate tritium in the groundwater was considered in Holtec's PSDAR.

9. Based on my site knowledge, contamination has previously been identified by the utilities in the soil in the vicinity of the condensate water storage tank, the reactor truck lock and radioactive waste building. Further, there were other releases into the environment associated with a former condenser tube refurbishment building east of the radioactive waste truck lock. Historically, contaminated soil from previous site remediation has been "stockpiled" on a small hill along the east protected area fence. DPH does not know whether these sites and others were captured as part of decommissioning records required by 10 C.F.R. § 50.75(g), communicated to Holtec and evaluated by Holtec in its decommissioning cost estimate. Based on my knowledge of this site and experience at other nuclear power plants, it is reasonable to assume based on this site's history that other contaminants will be identified once excavation and demolition begins.

1. Long-lived radionuclides are likely to be found in soils and groundwater far from the small excavation made to repair the leaks that likely allowed reactor condensate to enter into the site soils for many years. In addition, these same long-lived radionuclides are likely to be found in many other structures, systems, and components, which may also have unknowingly leaked over the decades into soils and the groundwater at the Pilgrim property

INDUSTRY EXPERIENCE

2. During radiological surveys that occurred prior to decommissioning of the Vermont Yankee Nuclear Power Plant, the Vermont Department of Health found cesium-137, strontium 90, and other long half-life radioactive materials in soil samples. In addition to Vermont Yankee, other New England decommissioning projects at Maine Yankee and Connecticut Yankee uncovered long half-life radioactive materials and hard-to-detect radionuclides in soils. Similar contaminants can be expected at the Pilgrim property, including carbon-14, nickel-63, strontium 90, cesium-137 and transuranics, which include radioisotopes of plutonium, curium, neptunium, and americium.

12. Discussions with the New England Compact, Health Department staff in Vermont and Maine and Department of Energy and Environmental Protection staff in Connecticut indicate that decommissioning activities commonly reveal previously unidentified and unknown radiologically contaminated media that must be addressed and remediated during decommissioning and prior to license termination. For example, highly contaminated pockets of groundwater were discovered dammed up by existing subsurface structures at Maine Yankee and caused significant cost increases. In addition, the licensee at Connecticut Yankee had to excavate a large trench in soil around the reactor and its components that was not identified or accounted for in Connecticut Yankee's initial planning and cost estimates.

13.The Holtec PSDAR neither identifies nor reasonably accounts for the challenges of remediating contaminants encountered during decommissioning, including but not limited to tritium, radioactive "hard to detect" or other long-lived radionuclides in the soil and in structures, systems, and components. These considerations should be factored into the planning and funding for the decommissioning of Pilgrim, but it is not apparent from the PSDAR that Holtec did so.

14. The discovery of additional contamination not accounted for in previous site investigations or previously filed Generic and Site-Specific Environmental Impact Statements will result in additional costs to Holtec. A complete site characterization (i.e., an assessment of the vertical and horizontal extent of all radiological and nonradiological contamination at the site) and a Supplemental Environmental Impact Statement that considers the information yielded by such a site-specific characterization and considers climate change effects is necessary to provide a more accurate basis on which to estimate costs of decommissioning.

EXCAVATION / DEMOLITION

15. During discussions with DPH, Holtec has stated that previous remediation of Pilgrim eliminates the need to excavate deeper than three feet below grade.

    Consistent with this, Holtec's PSDAR states that "During demolition, aboveground structures will be removed to a nominal depth of three (3) feet below the surrounding grade level. Characterization surveys will then be performed in the remainder of the below ground structures and any areas with activity exceeding established [Derived Concentration Guideline Levels (DCGLs)] will be removed."

16. Industry experience regarding the presence of "hard to detect" and long-lived radionuclides at other nuclear decommissioning sites, as discussed above, creates doubt that Holtec will not need to excavate deeper than three feet below grade.

17. The Holtec PSDAR does not detail their plan to address soils outside the structures and components and how they would be characterized and remediated. As written, Holtec does not account for the costs or evaluate the health and safety effects of such a contamination. It is not clear from the Holtec PSDAR that Holtec addressed these issues in the contingency analysis in its cost estimate or, if it did so, whether it properly accounted from them. A detailed analysis of the likelihood of further excavation and associated costs is necessary to accurately estimate those contingencies.

ENVIRONMENTAL RADIATION MONITORING

18. The Holtec PSDAR does not describe the planned radiological environmental monitoring program, including both continuation of "real time" monitoring, direct radiation exposure dosimetry and environmental land use analysis (monitoring power plant by-product radionuclides in milk, vegetation, seafood, etc.). These activities should be conducted through the decommissioning timeframe, including spent fuel pool cleanout, dry fuel storage cask loading, reactor building and associated structure demolition, and finally site restoration. The values in table 31 of the cost estimate included in the PSDAR represent a small fraction of costs needed to continue the current level of environmental monitoring. These considerations should be factored into the planning and funding for the decommissioning of the Pilgrim property.

19. The radiological environmental monitoring program should include a plan to submit all legacy and NRC-filed site assessments and surveys to Massachusetts, conduct radiological and non-radiological groundwater contamination sampling, report results to Massachusetts, and provide split samples as requested.

EMERGENCY PLANNING

20. The PSDAR does not adequately address preparedness in the event of a radiological emergency during decommissioning or the transfer of spent fuel to the spent fuel pool or from the spent fuel pool to dry casks or consider the cost of such an incident. An adequate radiological emergency preparedness plan would include specific protocols for both "small scale" host community events and "larger scale" state resource scenarios.

21. Holtec does not adequately address their capabilities to monitor and respond to the following:

    (a) Leaks of large quantities of radioactive materials in solid or liquid form into the environment;

    (b) Deficiencies in the structures, systems, and components containing stored radioactive materials;

    (c) Response plan for emergent scenarios including combustible fires containing either low level radioactive contaminants or spent fuel, and hostile actions that destroy key structures that store radioactive materials;

    (d) Security measures surrounding the dry fuel pad, which should include substantial physical barriers, especially once it is relocated closer to a nearby road;

    (e) Details on remote and onsite radiation monitoring of the facility and spent fuel storage; or

    (f) Adequate routine physical inspection of dry casks and detailed contingency for damaged/degraded dry fuel storage containers.

22. All of these items represent discrete, foreseeable risks that Holtec did not provide sufficient detail that they have considered and accounted for in the PSDAR.

RADIOACTIVE WASTE TRANSPORTATION

23. The Holtec PSDAR addresses the transportation approach for Class A, Low Specific Activity, or Surface Contaminated Object classes of waste. It states Holtec will use a combination of truck, rail and potentially barge to support bulk quantity removal of waste. Since there is no active rail line at the site, Holtec states that a truck will be used to deliver the waste to a transload facility in Massachusetts. However, no such transload facility is licensed by the Massachusetts Radiation Control Program to perform such waste processing or repackaging for waste transfer. A more specific waste removal plan would be necessary to provide an accurate cost estimate.

24. Additionally, regarding the safety of transfer and storage of radioactive materials, the Holtec PSDAR does not include details describing state review for removal and transportation of all radioactive waste and does not describe provision of funding to agencies that will expend resources on plan review, approval and implementation, such as the Massachusetts State Police for route planning and escort of high-level waste.

RADIOLOGICAL STANDARDS

25. The Holtec PSDAR only references the NRC Final Status limit of 25 millirems per year for unrestricted release from all pathways. The Massachusetts standard for unrestricted release of residual radioactivity (cleanup) is no more than 10 millirems per year (105 C.M.R. § 120.245). In addition, EPA has established a drinking water MCL of no more than 4 millirems per year. The Holtec PSDAR does not include details describing Holtec's plan for testing and demonstration for meeting the Massachusetts cleanup standard or the EPA drinking water MCL for all property transferred from Entergy to Holtec.

26. In order to apply a consistent clean up standard for all sites containing radioactive materials in Massachusetts, DPH issued a formal request that Holtec submit a proposed compliance document detailing the methods and protocols for compliance with the Massachusetts clean-up and EPA drinking water MCL prior to the unrestricted release of all or any part of the property transferred from Entergy to Holtec. DPH additionally requested these clean-up standards be incorporated into Holtec's PSDAR.

27. Holtec's PSDAR neither incorporated the Massachusetts cleanup standard nor the EPA groundwater standard but noted that they are "actively engaged in discussions with the Commonwealth of Massachusetts related to the establishment of an independent voluntary agreement regarding radiological release standards." Holtec has expressed a willingness to sign an agreement with the Commonwealth on the radiological release standard.

<u>Declaration of Paul Locke</u>, attached to the Commonwealth's Motion to Intervene and Request for Hearing Docket No. 50-293 &72-1044 LT, February 20, 2019 - Excerpts

1. I am the Assistant Commissioner of the Bureau of Waste Site Cleanup (BWSC) at the Massachusetts Department of Environmental Protection. I joined the agency in 1987, when it was known as the Massachusetts Department of Environmental Quality Engineering, as a human health and environmental risk assessor in the Office of Research and Standards (ORS). Before I became Assistant Commissioner in 2015, I was the Section Chief for Risk Analysis in ORS, Director of Policy & Program Development in BWSC, and Director of

Response & Remediation in BWSC. I hold a Master of Science (MS) degree in Civil Engineering (Public Health Program) from Tufts University and a Bachelor of Arts (BA) in Chemistry from Harvard College.

6. Pilgrim is located on Cape Cod Bay, adjacent to wetlands, and sits above a Potentially Productive Aquifer. A Potentially Productive Aquifer is an aquifer delineated by the U.S. Geological Survey (USGS) as a high or medium yield aquifer (310 C.M.R. § 40.0006) and such aquifers are protected for their potential future use as a public water supply source (310 C.M.R. § 40.0932). Any oil or hazardous material released to the environment at Pilgrim has the potential to affect both human and environmental receptors through direct contact with contaminated soil, use of the groundwater, and migration to adjacent surface waters and wetland resources. Based on my experience at MassDEP, large industrial facilities, including power plants like Pilgrim, use a variety of oil and hazardous material as part of their operations and facilities. These include asbestos, transformer oils (including PCB-containing oils), and cleaning and/or degreasing solvents (including chlorinated volatile organic compounds, or cVOCs). Methods for handling, storing and disposing of oil and hazardous materials have evolved over time, and it is not uncommon for older facilities like Pilgrim to have released oil and hazardous materials to the environment following common past practices. The potential impact of any such release is unknown until a comprehensive site assessment is conducted. Both Chapter 21E and the MCP define a "site" to be the location where oil or hazardous material has come to be located. A comprehensive site assessment includes the identification of releases of oil or hazardous material on a property and delineation of the extent of those release – including the investigation of off-property migration that may have occurred.

7. I have reviewed the November 16, 2018 Revised Post-Shutdown Decommissioning Activities Report and DECON Site-Specific Decommissioning Cost Estimate prepared by Comprehensive Decommissioning International, LLC for Holtec Decommissioning International, LLC (HDI). The Revised Post-Shutdown Decommissioning Report notes that Holtec will perform site characterization activities during the decommissioning process to supplement what is currently known about the nature and extent of radiological and nonradiological contamination at the site. Holtec will then use that information to establish contamination levels throughout the plant and adjust activities accordingly. On its face, the Report is, in my opinion, deficient because it (i) does not include an inventory of oil and hazardous materials that have been used at the facility and which may have been released to the surrounding environment and (ii) does not describe assessment activities that would occur outside the plant that would identify past releases of oil or hazardous materials and any contaminated media that Holtec legally needs to address.

8. I have also reviewed the release notifications and site cleanup activities that have occurred at Pilgrim pursuant to the MCP. As noted above, both Chapter 21E and the MCP require a site owner or operator to notify MassDEP when a release of hazardous material occurs

that meets certain specified criteria. MassDEP's records indicate that work was conducted under fourteen (14) distinct Release Tracking Numbers (RTNs) for release notifications that occurred from November 16, 1994 through December 20, 2016. An RTN is the unique file number assigned by MassDEP to a release or threat of release reported in accordance with 310 C.M.R. § 40.0300. The following briefly summarizes those RTNs:

(a) Nine (9) RTNs were assigned for releases of hydrogen gas, and no analysis of impacts to groundwater or soil was performed.

(b) One (1) RTN addressed a release of hydraulic oil to pavement, and no analysis of impacts to groundwater or soil was performed.

(c) One (1) RTN addressed a heating fuel release at a former residential property distant from the facility itself and was not related to plant operation.

(d) One (1) RTN addressed an exothermic reaction of an epoxy/hardener mixture that occurred within a 55-gallon drum and liner, and no analysis of impacts to groundwater or soil was performed.

(e) Two (2) RTNs addressed releases of transformer oil at the Main Transformer system, which included soil and groundwater characterization in the immediate vicinity of the releases.

As noted, eleven (11) of the releases required no investigation of underlying soil or groundwater. The remaining three (3) releases involved limited (localized) soil and groundwater sampling. The results of these investigations provide little insight as to any potential environmental contamination that may be present throughout the site.

9. Based upon my review of this material and my experience at MassDEP, it is my opinion that Holtec has not adequately evaluated and included in its cost estimate the costs of environmental site assessment, remediation, and restoration and that it is likely that Holtec's cost estimate significantly underestimates what it will actual cost to perform that work. My opinion is also informed by the following facts: (a) Past environmental site assessments conducted for releases of oil and hazardous material at Pilgrim have been limited in nature and are not indicative of potential contamination present. (b) The Revised Post-Shutdown Decommissioning Activities Report does not specifically address any environmental assessment of the site soil, groundwater, wetlands and surface water resources that would be implemented as part of the decommissioning. (c) The costs of environmental remediation and site restoration depend upon the nature and extent of contamination and, ultimately, the risk posed to potentially affected human and environmental receptors. These costs are best estimated following a comprehensive site assessment. The cost estimates for the work at the Pilgrim plant appear to be based on expectations rather than even a Preliminary (Phase 1) Site Assessment that is required under the MCP.

<u>Declaration of David Howland</u>, attached to the Commonwealth's Motion to Intervene and Request for Hearing Docket No. 50-293 &72-1044 LT, February 20, 2019 - Excerpts

1. I am classified as an Environmental Engineer IV and serve as the Regional Engineer in the Western Regional Office for the Massachusetts Department of Environmental Protection (MassDEP). I joined the Massachusetts Department of Water Pollution Control, a precursor to MassDEP, in 1974. Since that time, I have held positions and roles with progressively increasing responsibility in multiple program areas such as Water Pollution Control, Air Pollution Control, Solid Waste Management, Hazardous Waste Management, Waste Site Clean-up, Drinking Water, and Wetlands until I reached my current position in 2000. I hold a Master of Public Health from the University of Massachusetts – Amherst and a Bachelor of Science Degree from St. Lawrence University.

4. One of the most important lessons learned from the Yankee Rowe decommissioning process was the need and importance of a comprehensive (radiological and nonradiological) site characterization. A comprehensive site characterization is used to fully determine the scope of site contamination, the appropriate remediation method, and to estimate the cost to clean-up the site. Until a comprehensive site characterization is performed, radiation specialists, environmental engineers and other consultants simply cannot estimate with any reasonable certainty how much it will cost to perform all necessary work.

5. The site characterization conducted at Yankee Rowe led to the discovery of previously unaccounted for contamination that caused costs to escalate significantly above and well beyond the original, pre-characterization cost-estimates. At Yankee Rowe, for example, the discovery of polychlorinated biphenyl (PCB) contaminated soils and structures and the discovery of a tritium release from the spent fuel pool dramatically increased actual cleanup costs. The PCB contamination by itself caused significant cost increases because it is extraordinarily expensive to recover and treat PCB contaminated soils and sediment. The discovery of PCB coated steel and concrete building components also proved costly, because the PCBs had to be removed prior to recycling, reusing, or local landfill disposal of non-PCB contaminated materials. Remaining PCB contaminated waste had to be transported to a PCB licensed disposal facility. In addition, the discovery of the tritium release necessitated an extensive and costly hydrological assessment to accurately depict the plume. Without a thorough facility characterization of potentially impacted areas, these types of issues and the associated cost increases cannot be quantified and decommissioning, and site restoration costs cannot be quantified and decommissioning, and site restoration costs cannot be estimated with any reasonable certainty.

6. The Yankee Rowe decommissioning process also reinforces the fact that one cannot isolate the costs associated with radiological decontamination work from the costs associated with the remediation of non-radiological contamination. At Yankee

Rowe, for example, the comprehensive site characterization discovered that facility structures at the site would contain both radiological and chemical contamination. Because of this discovery, Yankee Rowe had to work with both state and federal regulatory authorities to select appropriate abatement and disposal options for the debris. It was also difficult to isolate the radiological wastes from the non-radiological wastes, which caused the incurrence of costs that could not be attributed solely to radiological or non-radiological decontamination efforts. Holtec's plan recognizes this fact, as it proposes to conduct both radiological and non-radiological work at the same time and over a short eight-year period. Based on my experience, I do not believe radiological decontamination can be conducted independently from hazardous materials decontamination. For this reason, it is not possible to evaluate whether Pilgrim's Decommissioning Trust Fund contains sufficient funds by looking only at radiological decontamination costs.

7. In this case, Holtec's PSDAR also does not reference any site-based empirical data to support the work plan or its cost projections. For this reason, MassDEP is unable to determine if Holtec can perform the non-radiological clean up and restoration work outlined generally in its PSDAR without significant cost overruns. For example, as outlined above, the presence of PCBs can result in significant cost increases due to the need to assess and remediate contaminated soil, groundwater, and dispose of structural components. Given Pilgrim's age, it is likely that Holtec will discover PCBs in coatings, caulk and oils throughout the plant once it performs a comprehensive site assessment. As with PCBs, asbestos abatement of mastics, mortar mixes, caulk, flooring, wall board, ceiling tiles, roofing and insulation will be a significant and costly environmental cleanup obligation. Other materials such as lead and halogenated degreasers like trichloroethylene can require extensive work to remediate and are likely to be found at Pilgrim given its age and the activities conducted at the site.