From:	Pine duBois
To:	Docket, Hearing
Cc:	Lamb, John; Watson, Bruce; Klukan, Brett; David Johnston; Jack Priest; Sean Mullin; John Giarrusso
Subject:	[External_Sender] Revised PSDAR and Revised Site-Specific DCE for Pilgrim Nuclear Power Station
Date:	Monday, March 04, 2019 5:05:27 PM
Attachments:	JRWA comment Holtec PSDAR.pdf

For your consideration I am attaching comments to address some errors and omissions in the (revised) PSDAR which could reflect on the DCE submitted by Holtec International. My concern is that the NPDES Permit and Fact Sheet referenced by Holtec is still in DRAFT form under review by EPA, and that without addressing particular challenges the companies will face over time due to rising sea levels, the potential to impact successful decommissioning and site restoration can have significant cost consequences that must be addressed.

Thank you for your consideration

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Save the River, Save the World

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

In the Matter of **Docket No. NRC 2018-0279**

Entergy Corporation

Pilgrim Nuclear Power Station

License Transfer Agreement Application

Via Email: hearingdocket@nrc.gov

PILGRIM WATCH COMMENT DOCKET NO. NRC 2018-0279

Mary Lampert
Pilgrim Watch, director
148 Washington Street
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Dated, March 4, 2019

PILGRIM WATCH COMMENT DOCKET NO. NRC 2018-0279

Pilgrim Watch provides comment in the above captioned matter that includes the application (LTA); Holtec's Exemption Request to use the DTF for site restoration and spent fuel management purposes (LTA Enclosure 2); and Holtec's PSDAR and Site-Specific Cost Estimate (LTA Attachment 2).

Pilgrim Filed a Petition to Intervene and Hearing Request in Docket No. 50-293 & 72-1044 LT on February 20, 2019. This comment largely repeats the bases and facts of Pilgrim Watch's Petition to Intervene and Hearing Request. New information is included, also.

We are commenting here in appreciation of the likelihood that the NRC staff that reviews the comments may be in a different "silo" than those who will be part of the review of the Petition to Intervene and Request for Hearing.

Pilgrim Watch shows that:

a. The LTA documents do not provide reasonable assurance that there is sufficient financial assurance. As a result, the funding shortfall will place public health, safety, the environment, and financial interests at risk.

b. The documents also show that the Commission must conduct, at minimum, a comprehensive environmental assessment at the beginning of the decommissioning process that is needed to determine actual cost estimates and to prevent the runoff of contaminants offsite. Previous site- specific environmental impact statements do not bound environmental impacts.

Therefore, the application should be denied; and a hearing provided to the Commonwealth and Pilgrim Watch.

FINANCIAL ASSURANCE- SECTION 1

The Applicant's LTA does not provide the required financial assurance. It does not show that either HDI or Holtec Pilgrim is financially responsible, or that either has or has access to adequate funds for decommissioning. Neither does the LTA provide any reasonable assurance that Holtec Pilgrim and HDI have, or will have, the financial resources required to deal with environmental impacts that would place the public health, safety, and the environment at risk.

BASES

1. As discussed in detail below the LTA and PSDAR that Entergy and Holtec have filed with the NRC are misleading and incomplete and are based on incorrect but important assumptions. They do not present the evidence that would be required for the NRC properly to conclude that there is the level of financial assurance required to meet the regulatory requirements for the proposed license transfer and amendment. It is well established that Pilgrim Watch "may rely on alleged inaccuracies and omissions" to challenge a license amendment.[1]

2. The Atomic Energy Act (AEA) requires the NRC to ensure protection of public health, safety, and the environment (AEA, Sec.2(d)):

> The processing and utilization of source, byproduct, and special nuclear material must be regulated in the national interest and in order to provide for the common defense and security and to protect the health and safety of the public.

3. The NRC agrees that a shortfall in decommissioning funding would place public health, safety, and the environment at risk. Financial assurance is critical, and a licensee must ensure that sufficient funds are available throughout the decommissioning process:

> The NRC has a statutory duty to protect the public health and safety and the environment. The requirements for financial assurance were issued because

[1] *In re Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc.*, Docket No. 50-271-LA-3, LBP-15-24, at 13 (Aug. 31, 2015), *vacated*, CLI-16-08.

> *inadequate or untimely consideration of decommissioning, specifically in the areas of planning and financial assurance, could result in significant adverse health, safety and environmental impacts.* The requirements are based on extensive studies of the technology, safety, and costs of decommissioning (53 FR 24018). The NRC determined that there are significant radiation hazards associated with non-decommissioned nuclear reactors. The NRC also determined that the public health and safety can best be protected if its regulations require licensees to use methods which provide reasonable assurance that, at the time of termination of operations, adequate funds are available so that decommissioning can be carried out in a safe and timely manner and that lack of funds does not result in delays that may cause potential health and safety problems (53 FR 24018, 24033). *The purpose of financial assurance is* to provide a second line of defense, if the financial operations of the licensee are insufficient, by themselves, *to ensure that sufficient funds are available to carry out decommissioning (*63 FR 50465, 50473).[2]

4. Holtec Pilgrim and Holtec Decommissioning International ("HDI") have not shown that they possess, or will be able to procure, the funds necessary to safely decommission the Pilgrim site. The lack of sufficient funds places Pilgrim Watch and its members, and neighboring citizens at risk that these proposed new licensees will deplete the Decommissioning Trust Fund before they have met their decommissioning obligations. Any shortfall in the Decommissioning Trust Fund would put Pilgrim Watch and its members, and indeed the entire Commonwealth of Massachusetts, at risk that the site will not be fully radiologically decontaminated.[3]

5. As explained in detail below, the limited assets of the proposed new licensees, Holtec Pilgrim and HDI, are insufficient to pay even the decommissioning costs outlined in the PSDAR and LTA, much less to cover any significant or unconsidered shortfalls resulting from

[2] NRC, *Questions and Answers on Decommissioning Financial Assurance*, at 1 (ADAMS Accession No. ML111950031).

[3] *Entergy*, LBP-15-24, at 22 ("As Vermont states, 'assuring adequate funds for a reactor owner to meet its decommissioning obligations is part of the bedrock on which NRC has built its judgment of reasonable assurance of adequate protection for the public health and safety and protection of the environment.").

likely costs that Holtec incurs before the entire site (including the ISFSI) is decommissioned and released.

6. The PSDAR and LTA do not contain the information to demonstrate reasonable assurance that sufficient funds are available to properly complete the decommissioning process. Neither do they show the detailed cost estimate for decommissioning, or an adequate contingency factor any identification of and justification for using the DCE's key assumptions, required by 10 C.F.R §72.30(b)

7. Holtec PSDAR and Decommissioning Cost Estimate provide essentially no margin for error. They admit that only $3.6 million (about one-third of one percent of the supposed current value of the DTF) will remain after the decommissioning work set forth in the PSDAR and LTA have been completed; and, say that they expect to spend the entire Contingency Allowance accomplishing the work outlined in the PSDAR.

8. Holtec's PSDAR and DCE do not include the adequate contingency factor required by 10 CFR §72.30(b)(2)(ii). Holtec admits that its "The Contingency Allowance is … expected to be fully consumed." (PSDAR, Sec. 4.5)

9. Holtec's PSDAR and DCE ignore Boston Edison's $40 million legal claim. (Commonwealth's Petition for Leave to Intervene, Feb 20, 2019, pg.,11)

10. Holtec's PSDAR and cost estimates fail to include its exemption request to use the DTF for spent fuel management costs and site restoration. If approved, it could lead to a shortfall in the amount of funding available to safely decommission and radiologically decontaminate the site and manage the spent fuel onsite endangering public health and safety. (Commonwealth's Petition for Leave to Intervene, Feb 20, 2019, pg., 24)

11. The statements in the LTA and Entergy's covering letter make clear that the only reason that the two LLCs, HDI and Holtec Pilgrim, are supposedly financially qualified is that Holtec Pilgrim will own the DTF, and will be obligated to pay "HDI's costs arising out of or associated with HDI's operation and maintenance of Pilgrim in accordance with the NRC facility Licenses, which includes, without limitation, HDI's decommissioning costs and spent fuel management costs." (LTA, pg., 18.)

> "HDI will be financially qualified, because under the terms of its operating agreement, Holtec Pilgrim will be required to pay for HDI's costs of operation relating to Pilgrim, including decommissioning and spent fuel management costs" (LTA, pg., 17)

> "HDI is financially qualified to be Pilgrim's decommissioning licensed operator, because under the terms of the Decommissioning Operator Services Agreement between Holtec Pilgrim and HDI, Holtec Pilgrim will be required to pay for HDI's costs of post-shutdown operation, including all decommissioning costs at Pilgrim." (Letter, pg. 3; LTA Enclosure 1, pg., 1)

> "Thus, the existing decommissioning trust funds provide the appropriate basis for the financial qualifications of Holtec Pilgrim." (LTA Enclosure 1, pg., 16)

10. Nothing in the LTA or PSDAR suggests that any Entergy entity, or any Holtec entity except the two named Holtec LLCs, will have any financial responsibility for any of what the PSDAR calls the "licensed activities." There is no Parent Company Guarantee ("PCG"); and "the NRC does not have the authority to require a parent company to pay for the decommissioning expenses of its subsidiary-licensee, except to the extent the parent may voluntarily provide a PCG" (see Questions and Answers on Decommissioning Financial Assurance, ML111950031**).**

11. At a meeting of the Nuclear Decommissioning Citizens Advisory Panel ("NDCAP") in Plymouth, Holtec made quite clear that it has no intention of agreeing to provide any such guarantee.

12. At a NDCAP meeting, Holtec also said that it expects to sue the DOE for reimbursement of costs that Holtec will incur for spent fuel management, and indicated that it would not agree to put whatever monies a Holtec entity might recover from DOE into the Pilgrim Decommissioning Trust Fund, despite the fact that Holtec expects the NRC to allow Holtec to use almost half of the total funds in the DTF for the very same spent fuel management costs that DOE might reimburse.

13. Even if Holtec, Holtec Pilgrim, and HDI did agree to use any recovery from DOE to reimburse the DTF for Pilgrim's spent fuel management costs, the NRC has consistently rejected licensee attempts to use such potential future recoveries from DOE to show financial assurance - for the simple reason that no recovery is guaranteed and the amount that might be recovered is uncertain. See, 10 C.F.R. § 50.75(e)(iii)(A) (chosen method of financial assurance must "guarantee that decommissioning costs will be paid").

13. The proposed license transfer and amendment are explicitly intertwined with Holtec Pilgrim's Post-Shutdown Decommissioning Activities Report (PSDAR), including cost estimates for decommissioning, spent fuel management, and site restoration, and also rely on Pilgrim's outdated, incomplete and inaccurate 2000 GEIS and 2006 SEIS.

14. Neither the costs nor the economic impacts of decommissioning are "bounded" by the 2002 GEIS, 2006 SEIS and other documents listed. A site assessment at the Pilgrim site would provide new and important showing that the 2002 GEIS and 2006 SEIS are outdated and that additional decommissioning costs are required to deal with Pilgrim's actual conditions.

15. NRC approval of the license transfer and amendment request would effectively approve the PSDAR and its financial and environmental analyses and assurance. The PSDAR is material to this proceeding "because it concerns the real-world consequences of approving the [license amendment request]."[4]

16. The proposed license transfer and PSDAR will inexorably lead to a shortfall in the amount of funding available to fully and safely decommission and radiologically decontaminate Pilgrim and to manage its spent nuclear fuel as long as it remains on-site. Any such shortfall could place public health, safety, and the environment at risk.

FACTS

Fundamental facts are that Holtec Pilgrim and HDI are not financially qualified, and that neither can provide the required financial assurance. The LTA makes clear that the only apparent asset of Holtec Pilgrim and HDI is Pilgrim's Decommissioning Trust Fund; nothing in the LTA indicates that either has, or has access to, any additional funds; and as shown below, there is not and will not be sufficient money in the Decommissioning Trust Fund to pay the costs that will be incurred during decommissioning.

THE LTA DOES NOT ENSURE SUFFICIENT FUNDS FOR DECOMMISSIONING

As discussed in detail below, the LTA (and the PSDAR and DCE it includes) does not ensure that adequate funds for decommissioning will be available for at least the following reasons. Holtec makes incorrect assumptions and ignores significant facts each of which will result in additional costs, above and beyond the funds available for decommissioning. Although 10 CFR.

[4] *Entergy*, LBP-15-24, at 41.

§72.30 requires it to do so, Holtec has not justified key assumptions contained in the PSDAR and DCE.

Even if the NRC were to accept Holtec's assumptions, only 0.03% of the DTF will remain after decommissioning. The DTF will not be sufficient if any of Holtec's cost estimate assumptions are too low (as we show that they are) or if Holtec Pilgrim and HDI incur any of the multitudinous additional costs that are not considered in the PSDAR or DCE.

Examples showing that many of Holtec's assumptions are wrong, that the DTF is not sufficient, and that Holtec Pilgrim and HDI are not financially responsible and have not provided financial assurance include the following:

A. Holtec's Cost Estimates incorrectly assume that Holtec's projected Contingency Allowance is sufficient
B. Holtec's assertion that there is sufficient money in the DTF incorrectly assumes that decommissioning costs will not rise faster than inflation
C. If the exemption request to use the DTF for spent fuel management and site restoration are approved, it could lead to a shortfall in the amount of funding available to safely decommission and radiologically decontaminate the site and manage the spent fuel on site endangering public health and safety.
D. Boston Edison's $40 million legal claim ignored.
E. Holtec's estimated spent fuel management costs are based on the unlikely and unexplained assumption that DOE will remove all spent fuel by 2063.
F. Holtec's Cost estimates are based on the incorrect assumption that the Pilgrim site is essentially "clean."
G. Holtec's cost estimates incorrectly assume radiological occupational and public dose based on outdated documents.
H. Holtec's cost estimates incorrectly assumed incorrect socioeconomics costs of decommissioning.
I. Holtec's cost estimate assumptions ignore the cost of managing Low Level Radioactive Waste

J. Holtec's LTA ignores potential costs from fires in structures, systems and components containing radioactive and hazardous material.

K. Holtec's DCE fails to consider costs likely to result from climate change impacts on the site.

L. Holtec cost estimates fail to consider that a significant shortfall in funds could occur if DOE requires repackaging of spent nuclear fuel into new containers approved by DOE for transportation.

M. Holtec fails adequately to consider delays in the work schedule leading to increased costs for overhead and project management.

N. Holtec's cost estimates fail to consider pending state-law requirements that will decrease funds available for radiological decontamination

O. Holtec's DCE fails to consider DTF funds that would not be available if NRC does not grant Holtec's exemption request to use the DTF for spent fuel management costs and site remediation.

P. Holtec's DCE fails to consider the economic consequences if the license exemption requests filed by Entergy may not be transferable to Holtec adding additional costs.

Q. Holtec's DCE fails to consider the likely adverse health impacts expected in special pathway receptor populations and for that matter in the general public

R. Holtec's costs estimates ignore the costs of mitigating radiological accident(s)

S. Holtec's LTA Provides No Assurance that Holtec Pilgrim and HDI Will Have the Funds Necessary to Decommission the ISFSI.

Each of these is discussed in detail below.

A. Holtec's Cost Estimates incorrectly assume that Holtec's projected Contingency Allowance is Sufficient

10 CFR 72.30(b)(2)(ii) requires that "a decommissioning plan must contain … [a]n adequate contingency factor." Holtec's PSDAR and LTA do not do so.

According to Holtec's PSDAR, "a Contingency Allowance of 17 percent was determined to be reasonable for the Pilgrim decommissioning project [and] is incorporated into the estimate of License Termination, Spent Fuel Management and Site Restoration costs presented herein." (PSDAR, Sec. 4.5)

Seventeen percent of Holtec's estimated License Termination, Spent Fuel Management and Site Restoration costs is $237 million. However, Holtec admits that (PSDAR, Sec. 4.5) that its "Contingency Allowance is … expected to be fully consumed [and] does not account for inflation or escalation of the price of goods and services over the course of the project."

In other words, Holtec does not expect that any of the projected $237 million "contingency allowance" would be available to cover decommissioning costs that will increase faster than the rate of inflation, spent fuel management costs incurred after 2062, site restoration costs resulting from the fact that the Pilgrim site is not clean, or any of the other myriad costs that Holtec's DCE and PSDAR have essentially ignored.

By any realistic measure, Holtec's has no "rainy-day fund" or "decommissioning plan" that "contain[s] … [a]n adequate contingency factor," and does not provide financial assurance.

B. Holtec's Assertion that there is Sufficient Money in the DTF Incorrectly Assumes that Decommissioning Costs Will Not Rise Faster Than Inflation

In the PSDAR and LTA, Holtec Pilgrim and HDI assumed that the Decommissioning Trust Fund would grow at the rate of 2% more than inflation. Pilgrim Watch will not quarrel with this assumption.

However, they also assumed, incorrectly and with no apparent basis or justification as required by 10 CFR §72.30(b)(3), that decommissioning costs will not rise faster than inflation:

> "The decommissioning costs presented in this report are reported in 2018 dollars. Escalation of future decommissioning costs over the remaining decommissioning project life-cycle are excluded." (PSDAR, p. 19; DCE, pp. 7, 18)

This assumption is simply wrong. Both the history of decommissioning costs and the NRC's own statements show precisely the contrary – that *decommissioning costs will increase more than inflation.*

This one fact alone demonstrates that the Decommissioning Trust Fund does not, and will not, provide any basis for Holtec's claim that "the existing decommissioning trust funds provide the appropriate basis for the financial qualifications of Holtec Pilgrim." (LTA Enclosure 1, pg. 16)

The NRC's own Questions and Answers on Decommissioning Financial Assurance specifically state that decommissioning costs will increase at a rate higher than the rate of inflation, and that over a period of only 20 years (40 years less than the 60 year period allowed for decommissioning) there will be 2.5 to 5.6 times increase in costs, i.e., *the annual increase in costs will be 5% to 9%* - much more than the average annual 3.7% rate of inflation:[5]

> "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] Over the past 60 years, the average annual US rate of inflation has been about 3.7 percent. Over the last 10 years it has been about 1.55%; in 2018 it was 2.44%.

Callan Associates produces an annual analysis and report of decommissioning funds and costs. Its 2015 Nuclear Decommissioning Funding Study[6] said that "Total decommissioning cost estimates have risen 60% since 2008," an annual rate of about 6%, and that "2014 decommissioning cost estimates rose approximately 11% from the previous year." 2015 Nuclear Decommissioning Funding Study, p. 3.

Callan's "2018 Nuclear Decommissioning Funding Study"[7] 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. Study, pp. 3, 9. During the same period, inflation was about 1.3% annually; in other words, decommissioning costs increased at a *rate of 3.7% over inflation*.[8]

In short, both the NRC statements and Callan's historical analysis are clear that there is no rational support for HDI's assumption that decommissioning costs will not increase faster than inflation. The only rational and factually supportable assumption would be that decommissioning costs will increase at an annual rate that is at least about 4% higher than the rate of annual inflation.[9]

The unavoidable conclusion is that essentially any "more than inflation" increase in decommissioning costs will wipe-out HDI's "left-over" $3 million. Any increase in

[6] https://www.callan.com/library/2015
[7] https://www.callan.com/library/2018
[8] It is important to note that Callan reported that total estimated decommissioning costs decreased about 2.5% in 2017. The decrease was attributed to the fact that a number of reactors had decided to decommission rapidly after shut-down (as Holtec plans for Pilgrim.) rather than waiting until the end of the NRC's permitted 60-year period (as reflected in Entergy's PSDAR). See https://www.powermag.com/data-shows-nuclear-plant-decommissioning-costs-falling/. This decrease is an overall number; and it does not reflect any decrease in a reactor's site- specific decommissioning costs.
[9] The NRC's predicted 5% to 9% increase in costs is 2.3% to 5.3%. more than the 3.7% inflation average, e.g., an average of about 3.3% more than average inflation and is 3.3% to 7.3% more than inflation over the past 10 years Callan's eight-year history reports an average increase in decommissioning costs of about 4.4% more than inflation.

decommissioning costs in the ranges that the NRC (5% to 9%) predicts, and Callan (5% to 6%) reports, would result in a hundreds of millions of dollars shortfall in the DTF.

For example, the HDI decommissioning cost estimate ("DCE"') required by 10 CFR §72.30(b)(2) projects accomplishing most decommissioning (what the PSDAR calls "License Termination") in six years – 2019-2024 – at a total 2018-dollar cost of about $577 million. Holtec projects accomplishing most site restoration in 5 years - 2021-2025 – at a cost, again in 2018 dollars, of about $39 million.

Based on Pilgrim Watch's calculations, if decommissioning costs were to increase at an annual rate of 4% more than inflation, a fair assumption based on NRC predictions and Callan Associates reports the 2018-dollar cost of decommissioning/license termination from 2019-2024 would increase to about $672 million, $95 million more than the DCE projection; and the 2018-dollar cost of site restoration from 2021-2025 would be about 47 million, $8 million more than the DCE allows.[10]

Holtec's projected spent fuel management cost estimates total a little more than $500 million, about $221 million in 2019-2021 and an average of about 6.7 million a year from then to 2063. If these costs were also to increase at an annual rate of 4% over inflation, Pilgrim Watch's calculations show that the cost of spent fuel management from 2019-2063 would increase to over $950 million, $450 million more than the DCE allows.

In sum, if decommissioning costs increase as the NRC and Callan say they will, at an annual rate of 4%, the cost of decommissioning Pilgrim will be about a billion dollars more than

[10] Because HDI plans to decommission at the front end rather than almost 60 years after Pilgrim shuts down, its actual 2018-dollar costs of decommissioning are far less than Entergy's actual decommissioning costs would be.

Holtec projects, even if none of the other shortcomings in Holtec's assumptions discussed below are considered. Holtec's cost estimates leave only $3.6 million, after all is said and done.

Pilgrim Watch does not doubt that others, based on different assumptions of periods of time or the annual increase in decommissioning costs, might make somewhat different assumptions. But the bottom line is clear – decommissioning costs will (as the NRC has said) increase faster than inflation, neither Holtec Pilgrim nor HDI has or will have access to sufficient assets, and neither Holtec nor HDI is financially responsible or has provided the necessary financial assurance.

Pilgrim Watch does not say that a decommissioning cost estimate must be precise. But for the NRC regulations and procedures to make any sense at all, a decommissioning cost estimate must be based on reasonable and justifiable assumptions. Holtec's assumption that decommissioning costs would not rise faster than inflation was not reasonable or justified. See 10 CFR 72.30(b)(3) that requires "Identification of and justification for using the key assumptions contained in the DCE."

For this reason alone, absent enforceable agreements by Holtec, Holtec and Holtec Pilgrim to provide significant additional financial assurance, such as a large Parent Company Guarantee (PCG) and agreement to put all recovery from the DOE into the DTF, the LTA cannot properly be granted.

C. <u>If the exemption request to use the DTF for spent fuel management and site restoration is approved, it could lead to a shortfall in the amount of funding available to safely decommission, radiologically decontaminate, and manage the spent fuel on site endangering public health and safety</u>

NRC's definition of decommissioning is "The safe removal of a facility from service and reduction of residual radioactivity to a level that permits termination of the NRC license." NRC's definition does not include: the removal or storage of spent fuel; demolition of decontaminated structures; or Site restoration activities after residual radioactivity has been removed. NRC Rules restrict use of the Decommissioning Trust Fund to reducing "radiological radioactivity." NRC is granting exemptions to allow DTF to be used for demolition and site restoration. However, by allowing use of the fund for these other jobs, reduces what is left for removing radiological contamination.

D. Boston Edison's $40 Million Legal Claim

The Massachusetts Attorney General's Motion to Intervene and Request for Hearing, February 20, 2019, at 11 explains that:

> Entergy and Holtec also fail to inform the Commission that Boston Edison Company (doing business as Eversource) has an outstanding legal claim that is likely to decrease the amount of money that Holtec may recover from the U.S. Department of Energy (DOE) for spent fuel management by approximately $40 million. When Boston Edison Company sold Pilgrim to Entergy, Boston Edison claims that it provided Entergy with funds to cover post decommissioning spent fuel management costs. In re Boston Edison Co., 1999 WL 239703, 192 P.U.R. 4th 418, 3-4 (Mass. D.T.E. 1999). Boston Edison then sued DOE to recover those costs, arguing that absent DOE's breach of the Standard Contract, Boston Edison would not have incurred them.
>
> After a lengthy trial, the United States Court of Claims Federal Circuit Court agreed with Boston Edison and valued Boston Edison's damages at approximately $40 million. Subsequently, the United States Court of Appeals for the Federal Circuit agreed that Boston Edison had spent approximately $40 million due to DOE's breach at the time of sale, but "the estimated value of future damages agreed upon by two private parties should not set the amount of the government's liability for partial breach." Boston Edison v. United States, 658 F.3d 1361, 1367 (Fed. Cir. 2011). Thus, "the damages of DOE's pre-transfer breach cannot be determined until the actual costs of [spent nuclear fuel] disposal is incurred at the time of decommissioning." Boston

Edison Co. v. United States, 106 Fed. Cl. 330, 334 (Fed. Cl. 2012) (citing Boston Edison, 658 F.3d at 1367). Consequently, the Court reserved Boston Edison's claim of $40 million until after the commencement of decommissioning and spent fuel management costs are incurred. Entergy Nuclear Generation Co. v. United States, 130 Fed. Cl. 466, 472-73 (Fed. Cl. 2017) (citations omitted). Throughout this litigation, DOE has consistently stated that if the Court orders DOE to pay Boston Edison damages for spent fuel management, DOE will reduce the amount that it pays Entergy by the same (i.e., DOE will not pay twice for the same spent fuel management damages).

Entergy and Holtec have not accounted for this potential reserved claim in the LTA and related Cost Estimate. Indeed, Holtec does not even mention Boston Edison's future claim when discussing future litigation or settlement of claims due to DOE's breach of the Standard Contract. See LTA, Encl. 1, at 18-19. Instead, Holtec states that it intends to recover from DOE all of its spent fuel management costs caused by DOE's breach of the Standard Contract. Id. However, this reliance is misplaced because it fails to acknowledge that any spent fuel management costs it recovers is likely to be reduced by at least the approximately $40 million potentially due to Boston Edison. This omission provides further reason to question the analysis that adequate financial assurance exists in this case.

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

The spent fuel management costs projected in Holtec's PSDAR, DCE and LTA depend on Holtec's at least three unexplained and unlikely assumptions: that DOE will remove all spent fuel from the Pilgrim site by 2062. (Holtec PSDAR, pgs., 23 and 58), that Holtec will never have to repair or replace any failed casks or pads, and that Holtec will not to repackage spent nuclear fuel into new containers approved by DOE for transportation**.**

All of these assumptions are unjustified.

Holtec assumes "DOE will commence acceptance of PNPS's spent fuel in 2030 and, assuming a maximum rate of transfer described in the DOE Acceptance Priority Ranking & Annual Capacity Report (Reference 10), the spent fuel is projected to be fully removed the Pilgrim site in 2062, consistent with the current DOE spent fuel management and acceptance strategy (References 9 and 10)." DCE, p. 23.

Pilgrim Watch will assume *arguendo* that, once fuel transfer begins, it will proceed at "a maximum rate of transfer described in … Reference 10), and that removing spent fuel from Pilgrim will then take 32 years to accomplish.

But there is no reasonable basis for Holtec's assumption that "DOE will commence acceptance of PNPS's spent fuel in 2030;" that assumption is not justified by either of the two references upon which it rests. Reference 9 is concerned only with the rate of transfer to a site that has been constructed and is ready to accept spent nuclear fuel. The only Holtec reference that is concerned with when such a site might actually exist is Reference 10, DOE's January 2013 *Strategy for The Management and Disposal of Used Nuclear Fuel and High -Level Radioactive Waste*. ("DOE Strategy"). [11]

Holtec ignores that the DOE strategy 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). It does even try to guess by when an interim or geologic repository might actually exist.

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

Holtec's assumption that "DOE will commence acceptance of PNPS's spent fuel in 2030 appears to rest on the DOE Strategy's statement that:

> With *appropriate authorizations from Congress*," "The Administration currently *plans to implement a program over the next 10 years* that:
>
> - Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
> - *Advances toward the siting and licensing of a larger interim storage facility to be available by 2025* that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
> - *Makes demonstrable progress on the siting and characterization of repository sites* to facilitate the availability of a geologic repository by 2048.

The keys here are:

- "With appropriate authorizations from Congress"
  To Pilgrim Watch's knowledge there have been no such authorizations in the 6 years since the DOE Strategy was announced. None are mentioned in Holtec's LTA.

- "plans to implement a program over the next ten years"
  Six years have passed since the DOE Strategy was announced. To Pilgrim Watch's knowledge, no such plans have been implemented. None are mentioned in Holtec's LTA.

- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025.
  To Pilgrim Watch's knowledge, the only "advances" are that Holtec's 2017 application, to construct and operate a consolidated interim storage facility in New Mexico is pending before the NRC; and Interim Storage Partners' (ISP) application for a site in Andrews County Texas. There is nothing in Holtec's LTA to indicate that either of these facilities will be sited, licensed or available by 2025.

- "Makes demonstrable progress … to facilitate the availability of a geologic repository by 2048."

> Holtec's LTA mentions no such progress. The only "progress" of which Pilgrim Watch knows is that a number of bills relating to the storage of spent nuclear fuel have been introduced in Congress.

In short, the DOE Strategy is nothing more than a "plan" or "goal" for which "legislation is needed in the near term" (DOE Strategy, pp.13-14)

The fact that the Strategy provides no rational basis for Holtec's assumption that "DOE will commence acceptance of PNPS's spent fuel in 2030" is confirmed by later statements in the Strategy:

- Full implementation of this program will require legislation to enable the timely deployment of the system elements noted above. DOE Strategy. p. 2
- This Strategy provides a basis for the Administration to work with Congress. DOE Strategy. p. 4
- The Administration's goal is to have a repository sited by 2026; the site characterized, and the repository designed and licensed by 2042; and the repository constructed, and its operations started by 2048. DOE Strategy. p. 8

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

Congress has not passed enabling legislation. There is significant opposition to both Holtec's planned interim site in New Mexico and ISP's in West Texas. Yucca has made no progress; there are hundreds of contentions opposing it,[12] along with anticipated lawsuits along transportation routes- from cities, states, environmental groups, such as NIRS[13]

[12] http://www.state.nv.us/nucwaste/licensing/Contentions_NV.pdf.
[13] Civilian Nuclear Waste Disposal, Congressional Research Service, Sept 6 2018. (https://fas.org/sgp/crs/misc/RL33461.pdf); www.NIRS.org

Nuclear waste may be stored at Pilgrim indefinitely, despite the unsupported assumption in the PSDAR (section 5.1) that it will leave the site beginning in 2030 and ending in 2062.

NRC's 2014 Continued Storage Rule discussed onsite storage for 100 years;[14] that would be until 3019 for Pilgrim, 57 years longer than Holtec presumed. Holtec's PSDAR (pp. 60-61) estimated on-going spent fuel storage costs at $ 7.2 million per year in 2018 dollars. Even if one were to assume that there would be no greater-than-inflation increase in those costs, those 57 additional years of spent fuel storage would add more than $380 million to Holtec's estimated cost. These additional costs far exceed the $3 million leftover in the DTF in Holtec's cost estimates.

Again, Holtec's LTA provides no explanation of its assumption that there will be no spent fuel on Pilgrim's site after 2062, or any financial assurance that Holtec will be able to pay reasonably expected spent fuel management expenses.

Holtec's LTA also makes the unexplained assumptions that Holtec will never have to repair or replace any failed casks or pads, and not will not have to repackage spent nuclear fuel into new containers approved by DOE for transportation**.** The PSDAR and DCE include no costs for repair or repackaging.

Regardless of when DOE may take title to Pilgrim's spent fuel, the dry casks will have to be repacked so that they can be transferred to either an interim or permanent repository. In addition, and both before and after 2062, Holtec will be responsible for repairing or replacing any dry casks that might fail; and will be required to replace both the casks and ISFSI storage pad if spent fuel remains on site every 100 years. The first casks will be 100 years old less than 100 years from now.

[14] https://www.nrc.gov/waste/spent-fuel-storage/wcd.html

Holtec will be required to continue paying ISFSI maintenance and security as long as spent fuel is on site, perhaps indefinitely. Also, the canisters may corrode and leak and are vulnerable to acts of malice, adding considerable costs for mitigation. (See discussion regarding severe accidents at pp. 66-80)

Spent Fuel Management is expensive. Holtec's LTA makes unwarranted assumptions about the likely costs, and for this additional reason fails to provide assurance that Holtec Pilgrim and HDI are financially responsible and will have the funds required for decommissioning.

F. Holtec's Cost estimates are based on the incorrect assumption that the Pilgrim site is essentially "Clean."

Holtec and the NRC appear to agree that an accurate cost estimate is necessary for a safe and timely plant decommissioning (NUREG-0586, Supplement 1, p. 68; DCE, p.55.)

But, at the time it filed its PSDAR and DCE, Holtec had not characterized the Pilgrim site, and had done essentially nothing to determine what contaminants are on the site or what it would cost to remove them.

Rather, Holtec admits that its cost estimates are based on nothing more than what appears to be an initial cursory "review of PNPS decommissioning records required by 10 CFR 50.75(g) records." Holtec says it will review of what it calls Entergy's "Historic Site Assessment (HSA)" sometime in the future:

> In the time leading up to, and immediately following, the equity sale/closure and license transfer, the following activities will be performed: … Review of the Historical Site Assessment (HSA) to support the identification, categorization, and quantification

of radiological, regulated, and hazardous wastes in support of waste management planning." Holtec PSDAR pp 8-9 (emphasis added)

"During Period 1, planning and preparing for the prompt decontamination and dismantlement of PNPS will begin by completing the following activities: … Conduct site characterization activities so that radiological, regulated, and hazardous wastes are identified, categorized, and quantified to support decommissioning and waste management planning." Holtec PSDAR, pp 10-11

"In the time leading up to and immediately following the equity sale and license transfer, preparations for performance of decommissioning will include …. Facility characterization so that radiological, regulated, and hazardous wastes are identified, categorized and quantified to support decommissioning and waste management planning. DCE, p. 14

But the PSDAR and DCE make clear that Holtec prepared its cost estimates without having "conduct[ed] site characterization activities so that radiological, regulated, and hazardous wastes are identified, categorized, and quantified to support decommissioning and waste management planning." (PSDAR, pp 10-11) Even Holtec admits that site characterization must be completed as part of "planning and preparing for the prompt decontamination and dismantlement of PNPS," (PSDAR, pp 10-11) and that site characterization is essential for Holtec "to supplement plant historical knowledge and the PNPS" and further the identification, categorization, and quantification of radiological, regulated, and hazardous wastes." PSDAR, p. 11.

What this makes clear is at least four critical facts:

1. At the time it filed its PSDAR and DCE, Holtec simply did not know what radiological and hazardous waste now exist on Pilgrim's site.

2. Holtec's PSDAR and estimated costs are not based on the actual condition of the Pilgrim site.

3. Holtec's PSDAR does not, provide the "accurate decommissioning cost [that is] necessary for a safe and timely plant decommissioning." (NUREG-0586, supra.)

4. Holtec had no basis or justification for its assumption that there is "no significant contamination" on the Pilgrim site (DCE, p. 22).

Holtec quite properly does not attempt to justify its assumption that its PSDAR provided accurate cost estimates based on the Entergy HSA that Holtec had not reviewed when it filed its PSDAR and DCE. To the extent that Holtec might seek to justify its assumed PSDAR cost estimates based on "Pilgrim plant data and historical information obtained from Energy Nuclear Operations" (PSDAR summary, p. 7), that assumption would be similarly unjustified. The PSDAR is effectively silent as to what any such "data and historical information" might be and Holtec admits that the data and information both need to be supplemented by future site characterizations (PSDAR, p. 11) and confirmed (DCE, p. 22).

Holtec also could not properly assume that the site is "clean" based on a GEIS and SEIS that are old, incomplete, and inaccurate [15] The PSDAR and LTA provide no basis for concluding, as required by 10 CFR 50.82(a)(4) (i), that the environmental impacts associated with site-specific decommissioning activities are bounded by these old impact statements.

The PSDAR and LTA rely on the 2002 GEIS and Pilgrim's 2006 SEIS. The GEIS (2002) is a generic document and is outdated by 17 years. A site-specific environmental analysis is required since no two reactor sites and history are identical, but the SEIS (outdated by 12 years)

[15] The SEIS NUREG-1437, Supplement 29, Volume 1, Section 7.1, Decommissioning, concludes that "there are no impacts related to these issues beyond those discussed in the GEIS. For all of these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted."

was simply a review by NRC staff of documents provided by Entergy and involved no actual analysis by NRC of soil or liquid samples.[16]

The GEIS, SEIS and Holtec incorrectly assume that the Pilgrim site is essentially clean. However, and as discussed in detail below, the GEIS, SEIS, PSDAR and LTA ignore both old information regarding the reactor's history, and new and significant information since the GEIS and SEIS were published. Holtec's attempt to bound environmental impacts with the old GEIS and SEIS suggests that Holtec knows that that a new site assessment and environmental impact statement would show that the PSDAR and DCE do not include any rational or acceptable estimate of the costs of clean-up.

Whether by design, or because it does not know what contamination actually exists, Holtec's PSDAR made the unjustified apparent assumptions that Pilgrim's site was essentially clean, and that its PSDAR needed to provide only a "relatively small amount of the decommissioning cost … for the demolition of uncontaminated structures and restoration of the site. (p. 62). The only Site Restoration costs its PSDAR foresees "are those costs associated with conventional dismantling, demolition, and removal from the site of structures and systems after confirmation that radioactive contaminants have been removed. (p 19); an assumption again based absent information about the actual condition of the Pilgrim site.

As shown below, it is clear that the limited information on which Holtec based its PSDAR estimates did not include important relevant facts and overlooked significant contamination.

[16] Audit of NRC's License Renewal Program (OIG-07-A-15), September 6, 2007

The actual cost of decontaminating and restoring the Pilgrim site will be more, probably far more than Holtec has estimated. At Connecticut Yankee, for instance, previously undiscovered strontium-90 contributed to the actual cost of decommissioning Connecticut Yankee being *double* what had been estimated. During the decommissioning of Maine Yankee, the licensee encountered pockets of highly contaminated groundwater dammed up by existing structures, leading to cost increases. The Yankee Rowe site in Massachusetts incurred significant cost increases during decommissioning when PCBs were discovered in paint covering the steel from the vapor container that housed the nuclear reactor, as well as in sheathing on underground cables. Other plants have also ended up costing much more than what was estimated for decommissioning- Diablo Canyon 1&2, San Onofre 2&3.[17]

The NRC cannot properly conclude that the DTF provides financial assurance or that Holtec-Pilgrim or HDI are financially responsible. To do so, the NRC would have to ignore that Holtec's decommissioning cost estimates are based on unsupported assumptions, ignore the actual conditions of the Pilgrim site, accept that there will be no complete or accurate radiological and hazardous materials site investigation and characterization, and accept that there would be certainty regarding what is required or what it will cost to clean-up the site.

For Holtec to show that Holtec Pilgrim and HDI are financially responsible, and to provide the required financial assurance, it must conduct a new and complete site characterization, and submit a cost estimate based on the actual conditions at Pilgrim.

[17] *See, e.g.*, NRC, SECY-13-0105, at Summary Table, available at http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2013/2013-0105scy.pdf (listing estimated costs under the NRC's minimum formula ranging from $438 million, counting the River Bend Station as one unit, to over $1 billion).

Examples of Radiological/ Hazardous Contamination[18]

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 until 1987; 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.[19] Due to these leaks, many lethal radionuclides, including for example tritium, manganese54, cesium-137, Sr-90, I-131, cobalt-60, and neptunium[20] were found in the surface water, groundwater, and soils at Pilgrim at levels exceeding "background" levels.

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.

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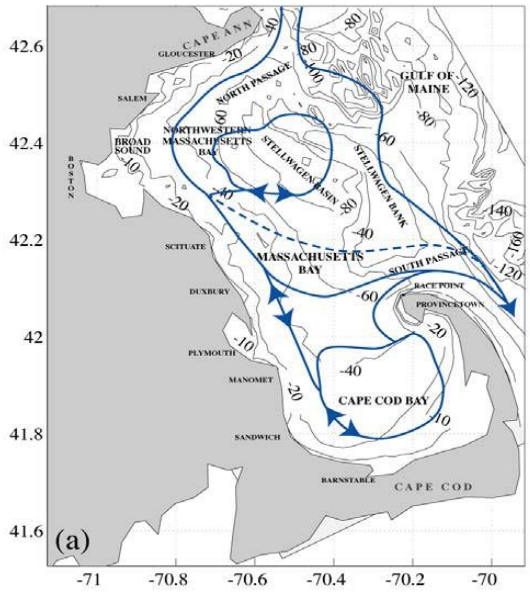
[18] These examples are discussed in more detail in the following documents: Jones River Watershed Association's Entergy's Legacy of Contamination at Pilgrim Nuclear Power Station Draft 3, section vi-vii, Exhibit 3; and, Pilgrim Watch Intervention Pilgrim License Renewal Application, Contention 1 filings,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

[19] *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)

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

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 and marshes; 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,[21] show circulation in Massachusetts and Cape Cod Bays.

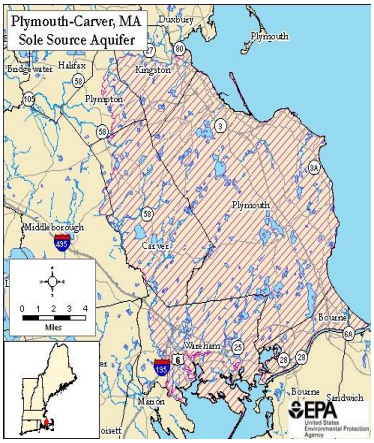


The dispersion of discharges also varies seasonally. From information available, it is reasonable to predict that currents, winds and tides would spread contaminants around Cape Cod Bay, into Massachusetts Bay and eventually south down the outside arm of Cape Cod, impacting

21 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

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.[22]

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

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

rod problem." [23] 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.[24]

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. (available NRC's Adams library) 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.

[23] 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.[25]

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.

[25] **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).

Contamination onsite is exacerbated by Pilgrim's long history of mismanagement[26]

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/info-finder/reactors/pilg/special-oversight.html) December 2016, Special Inspection:[27] 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,

[26] Pilgrim Chronology 1967- 2015, https://jonesriver.org/legal/pilgrim-chronology-1967-2015/ Exhibit 4
[27] http://www.capecodtimes.com/news/20161206/nrc-email-pilgrim-plant-overwhelmed

- broken equipment that never gets properly fixed,
- lack of required expertise among plant experts,
- 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

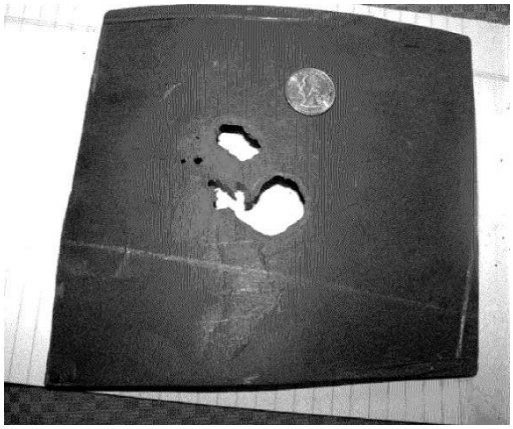
Pilgrim's buried pipes and tanks are made of materials that corrode - concrete, carbon steel, stainless steel, titanium and external coatings and wraps are susceptible to age-related and environmental degradation.[28] The pipes and tanks are old and subject to age-related degradation.[29] Some of the 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.

[28] 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

[29] Pilgrim Watch Post-Hearing Findings of Fact Conclusions of Law, June 9, 2008,11

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.[30]

The photograph below shows a hole in one of Pilgrim's buried SSW discharge pipes.[31] 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.

[30] Ibid,
[31] Pilgrim License Renewal Application Proceeding, Entergy submissions, PillR0045779-Pill R00457

These voluntary processes have allowed leaks and spills to go unnoticed,[32] and are incapable of identifying failures in, or ensuring the integrity of, decades-old piping systems.[33]

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[34]

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.[35]

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

[32] Ibid, 55-59
[33] Ibid, 37
[34] https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclear-power-station; https://jonesriver.org/pilgrim-contamination/ ; and see Attachment 2 for a full report.
[35] Only four wells were installed in 2007.

groundwater. Entergy's tests have shown levels ranging from non-detect levels to as high as 70,000 piC/L.[36] 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.[37] 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. [38] 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). [39]

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.[40]

[M] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, January 2014
[37] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, May 2013
[38] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, Sept 2013
[39] Split sample testing at MDPH
[40] 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.[41]

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. [42] 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. [43]

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.[44]

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[41] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. May 2014.
[42] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. Aug 2014.
[43] Mass DPH. 1988. Investigation of Radioactive Spill at Pilgrim on November 16, 1988. Prepared by Radiation Control Program.
[44] *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 Concentration assumed to yield 4 mrem/year**
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 age-related 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.[45]

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[46]

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

[45] 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
[46] https://jonesriver.org/getfile/ccbw/2012/10/RAD-REPORT_2017.07.18_VS3.pdf (Attachment 3)

sampling over roughly the past 10 years, according to the EPA.[47] 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.[48] 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. [49] 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

[47] EPA's 2016 Draft Authorization to Discharge under the National Pollution Discharge Elimination System (Fact Sheet)
[48] page 31 of EPA's 2016 Draft Authorization to Discharge under the National Pollution Discharge Elimination System (Fact Sheet)
[49] 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[50] 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

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

The Task Force concluded (Conclusions 3.2.1.3):

- (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."

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

Mr. Priest is the Director of the Radiation Control Department, Massachusetts Department of Public Health. He worked at multiple nuclear power plants, including Pilgrim Nuclear Power Station. During that time, he was "responsible for oversight of radiological plant surveys to support power plant operations, the radiological monitoring of the station staff and members of the public, and emergency planning activities with federal, state and local agencies."

Highlights of Mr. Priest's declaration include the following.

> 3. 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. 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.

12. 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

13. 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 non-radiological 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, above-ground 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 3-1 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.

Hazardous Waste

Site specific analysis of hazardous waste onsite is absent from the application. A site-specific analysis at the beginning of the decommissioning is required to document where it is, how to remove it, and costs.

Declaration of Paul Locke, the Assistant Commissioner of the Bureau of Waste Site Cleanup (BWSC) at the Massachusetts Department of Environmental Protection (MassDEP)

Excerpts from the declaration of Paul Locke, the Assistant Commissioner of the Bureau of Waste Site Cleanup (BWSC) at the Massachusetts Department of Environmental Protection (MassDEP) in the February 20, 2019 Mass Attorney Generals Motion to Intervene provides highlights.

5. 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, an environmental engineer and currently serving as Regional Engineer in the Western Regional Office of Mass Department of Environmental Protection</u>

Excerpts from the declaration of David Howland, an environmental engineer and currently serving as Regional Engineer in the Western Regional Office of Mass Department of Environmental Protection in the Massachusetts Attorney General's February 20, 2019 Request for Hearing and helped manage MassDEP oversight of the non-radiological decommissioning of Yankee Rowe. His testimony further shows the actual and likely presence of hazardous materials, not identified in the LTA, that will increase costs and threaten public health and safety if not quickly identified and remediated.

4. 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 clean-up 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.

Hazardous Waste Dumping[51]

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 over-planted with evergreen trees.

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

This contamination was the subject of public comments to the NRC in 2007.[52] 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 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"[53] 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.

G. Holtec's cost estimates incorrectly assume radiological occupational and public dose based on outdated documents.

Holtec used the 2002 GEIS to base its decision on radiological impacts to the public and workers. (Holtec PSDAR 5.1.8) The outdated GEIS in turn ***used risk coefficients per unit dose***

[52] Bramhall W. October 2013 Pilgrim Coalition Newsletter.
<http://archive.constantcontact.com/fs159/1109945140723/archive/1115182751860.html> Accessed 11/24/2015
[53] 21E is a classification given to hazardous material disposal sites by MassDEP.

recommended by the International Commission on Radiological Protection (ICRP) issued in 1991- **28 years ago**.

Holtec's assumed dose ignored new and significant information. The National Academies BEIR VII report (2006),[54] the most recent report from the National Academies, found far greater health impacts than the 1991 ICRP. BEIR VII found mortality rates for women from exposure to radiation were 37.5 % higher than a BEIR 1990 report and that the impact of allowable radiation standards on workers was twice that estimated in 1991. Allowable dose during decommissioning must be reduced to reflect BEIR VII, new and significant information supported by the Commonwealth, which will inevitably result in an increase in Holtec's estimated decommissioning costs.

BEIR VII lifetime risk model predicts that approximately **1 person in 100 would be expected to develop cancer (solid cancer or leukemia) from a dose of 0.1 Sv [10,000 millirem] above background**" (BEIR VII, p. 8) shows the risk from a lifetime (70 year) exposure to various levels of radiation. Exposure to 25 millirem/year equates to a lifetime cancer risk of 175/100,000; whereas a 10 millirem/year equates to a lifetime cancer risk of 70/100,000-a significant difference when considering that EPA permits only 1 in 100,000.

EPA's and DEP's risk level goal for a **mixture of chemicals** is a lifetime cancer incidence risk of **1 in one hundred thousand (1/100,000).** DEP's risk level goal for **one chemical** is lifetime cancer incidence risk of **1 in a million (1/1,000,000)**

Lifetime Cancer Risk estimates based on BEIR VII are much higher. The Table below, based on BEIR VII's conclusion that "the BEIR VII lifetime risk model predicts that approximately **1 person in 100 would be expected to develop cancer (solid cancer or leukemia) from a dose of 0.1 Sv [10,000 millirem] above background**" (BEIR VII, p. 8) shows the risk from a lifetime (70 year) exposure to various levels of radiation.

[54] https://www.nap.edu/catalog/11340/health-risks-from-exposure-to-low-levels-of-ionizing-radiation

BEIR VII explains that "Because of limitations in the data used to develop risk models, risk estimates are uncertain, and estimates that are a factor of two or three larger or smaller cannot be excluded."		
Exposure-millirem/year	**Lifetime Cancer Incidence Risk**	**Cleanup Standards**
10 millirem/year	70/100,000 (0.7/1,000)	Current Massachusetts Limit for Unrestricted Use for its licensees; requested limit to Holtec
25 millirem/year	175/100,000 (1.75/1,000)	NRC Limit for Unrestricted Use site
100 millirem/year	700/100,000 (7/1,000)	NRC & Mass. Limit for Restricted Use site
500 millirem/year	3,500/100,000 (35/1,000)	
Cancer Incidence Risk resulting from whole body exposure is about 2 times mortality risk	**Reproductive disorders** occur at lower levels of radiation exposure than cancer	

H. Holtec's cost estimates incorrectly assumed incorrect socioeconomics costs of decommissioning.

Holtec's PSDAR (5.1.12) acknowledged that decommissioning PNPS is expected to result in negative socioeconomic impacts. But it relied on outdated 2002 GEIS findings.

A 2015 University of Massachusetts-Amherst study, commissioned by Plymouth and ignored by Holtec, found that the economic impact on Plymouth alone would be almost $500 million, and that there would be a more than $100 million impact on the rest of the region:[55]

[55] The Pilgrim Nuclear Power Station Study: A Socio-Economic Analysis and Closure Transition Guide Book Jonathan G. Cooper, University of Massachusetts – Amherst, April 2015 (https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1080&context=larp_ms_projects)

Pilgrim Station in 2014 Direct Impacts

$440 Million Wholesale value of electricity produced
586 - Pilgrim Station workforce
$77 Million Wages and benefits for plant workforce
$60 Million Spending for goods and services in southeastern Massachusetts
$17.4 Million State and local taxes and other payments
$300K Charitable giving by Entergy and Pilgrim Station

Secondary Impacts

$105 Million Additional economic output attributable to Pilgrim Station
589 - Additional jobs created by Pilgrim Station
$30 Million Wages and benefits paid by additional jobs

Town of Plymouth Impacts

190 - Pilgrim Station employees living in Plymouth
$24.9 Million Wages and benefits paid to plant employees
$58.5 Million Value of real estate owned by plant employees
$10.3 Million Municipal revenue from Pilgrim Station
$950K Municipal revenue from employee property tax payments
$23K - $61K Municipal revenue from biennial refueling outages

Regional Impacts

Pilgrim Station's operation stimulates additional economic activity in Plymouth and Barnstable counties. The in-region spending by both Pilgrim Station vendors and plant employees creates an additional $105 million in regional economic output.

Nuclear power plant employment is stable and well-compensated, enabling employees to attain home ownership.

Additional socioeconomic impacts include that that Radiological Emergency Planning contributions from the licensee to towns and the state will drop despite the fact that the risk is not eliminated. MEMA's Nuclear Preparedness 2016 budget with costs assessed

to licensees of operating reactors in the Commonwealth was $482,901.[56] Towns in Pilgrim's emergency planning zone negotiate funding with Entergy. 2016 receipts ranged from $85,000/yr. to $295,000/yr. plus monies for training and equipment. If the towns do not continue to receive funds, training and equipment, they will be unable to provide the protection that their community needs, deserves and that they want to provide. Pending legislation in the state legislature would require that the licensee fund post shutdown emergency planning expenses.

Also, actual or perceived contamination in Cape Cod Bay and surrounding waterways will have regional impact on coastal economies. For example, on commercial seafood, marine transportation, coastal tourism and recreation, marine science and technology, marine-related construction and infrastructure, and real estate.

I. Holtec's cost estimate assumptions ignore the cost of managing Low Level Radioactive Waste

In addition to spent nuclear fuel, Class A, B and C Radioactive Waste (LLRW) is also stored at Pilgrim, some of it in containers along the shoreline. Pilgrim's LLRW, for example, includes the control rods, resins, sludge, filters, and will include the entire nuclear power reactor when it is eventually dismantled,[57] and is another potential source of contamination onsite and to Cape Cod Bay resulting in significant increased costs.

[56] Massachusetts Emergency Management 2016 Nuclear Preparedness Budget $482,910 (2015 spending $ 447,176) costs assessed on operating reactor licensees in the Commonwealth http://www.mass.gov/bb/h1/fy16h1/brec_16/act_16/h88000100.htm

[57] High-Level Dollars Low-Level Sense, Arjun Makhijani, A Report of The Institute for Energy and Environmental Research, 1992

The figure below shows the shoreline location of Entergy's storage of LLRW. It shows that Pilgrim has about 20-30 white storage containers located approximately 30 feet away from the coastal bank. It will be susceptible to the impacts of climate change-sea level rise, storm surges, flooding. According to the NRC, only one of these containers currently contains Greater-than-Class- C waste, the most toxic type of LLRW, and the others are presently empty. We assume they will be filled during decommissioning.

In the photograph, the white containers are for Low Level Radioactive Waste. To the right of the storage area is the LLRW building that compress materials to store or for shipment.

The LLRW waste will remain on the Pilgrim site, like the high-level radioactive waste, until an offsite repository accepts Pilgrim's LLRW. Massachusetts does not belong to any compacts.

For Class B and C radioactive waste Holtec's PSDAR (at 13) says that "an import petition will be filed with the Texas Compact Commission to gain approval for disposal of out of compact waste at the Waste Control Specialists (WCS) facility in Texas." Acceptance may well be more expensive than to compact members, and timely acceptance is not guaranteed to non-compact members. Potential higher fees and prolonged onsite storage are not factored into

Holtec's cost estimates. Huge amounts of Class A, B and C radioactive waste will result during the decommissioning process, and likely more of these storage containers pictured will be used.

J. Holtec's LTA ignores potential costs from fires in structures, systems and components containing radioactive and hazardous material.

During decommissioning, there is a serious concern about fire protection for the structures, systems, and components containing radioactive and hazardous materials in storage. Capabilities to monitor for and respond to these kinds of toxic emergencies are not addressed by Holtec. Fire in a building would result in increase in mixed waste adding to cost and also impact worker and potentially public health. Holtec's cost estimates should include the cost of an adequate study to locating sites where potential masses of contaminated material susceptible to ignition might accumulate during decommissioning and the costs of forestalling a fire by removing or limiting heat, oxygen, and/or fuel. Also, Holtec's cost estimates should include costs for training and equipment for offsite fire personnel that are counted on in an emergency.

K. Holtec's DCE fails to consider costs likely to result from climate change impacts on the site.

Holtec's DCE, and its contingency allowance, similarly do not take into account any estimates of increased costs resulting from climate change. The documents that Holtec relied upon do not even mention climate change.

New and significant information, ignored by Holtec, show that climate change impacts on the site are likely to decrease Holtec's capability to cleanup and to cause delay in work schedule, increacing costs.[58]

Based on current levels of greenhouse gas prediction, the UN Intergovernmental Panel on Climate Change (IPCC) 2018 Report[59] shows sea levels will rise more rapidly; severe storms will occur more frequently, coinciding with high tides and exceptional wave heights; rising groundwater tables, and floods more severe. The National Geographic (December 16, 2015) identified Pilgrim among the 13 nuclear reactors impacted by sea-level rise and predicted that, "if significant protective measures were not taken, these sites could be threatened."[60]

As climate change impacts get worse and decommissioning commences in 2019 storm drains and stormwater testing (discussed above) will become even more critical, as these outlets could become further conduits for pollution into Cape Cod Bay. Increased flooding and storm intensity, sea level rise, and rising groundwater tables could increasingly flush contaminates present in groundwater and soil into Cape Cod Bay.

The numerous negative impacts resulting from climate change not considered by Holtec that would likely increase decommissioning costs include:

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[58] See for an overview of climate change impacts on Pilgrim that includes a critique of Entergy's flood hazard evaluation report (AREVA Report) by Florida-based Coastal Risk Consulting (CRC), Analysis of AREVA Flood Hazard Re-Evaluation Report: Pilgrim Nuclear Power Station, Plymouth, MA ("CRC Report") https://jonesriver.org/ecology/climate/

[59] https://research.un.org/en/climate-change/reports

[60] **http://news.nationalgeographic.com/energy/2015/12/151215-as-sea-levels-rise-are-coastal-nuclear-plants-ready/**

- Increased flooding and storm surge resulting from climate change is likely to cause corrosion of underground piping, tanks and structures and subsequent leakage. And corrosion and potential leakage of the Greater-than-Class-C waste and low-level waste containers located close to Cape Cod Bay.
- Radiological and hazardous waste contamination, if not cleaned up quickly, will be washed out into Cape Cod Bay unable to be retrieved.
- Severe storms and flooding can result in loss of offsite power and potential damage to the diesel generators located by the bay. The spent fuel pool requires electricity to operate its safety systems. In Fukushima extreme weather conditions at the site prevented workers to perform necessary mitigating actions. Severe storms and flooding could present conditions at Pilgrim so that workers could not perform their jobs.

Once again, Holtec's DCE does not include any estimates of the costs of removing these contaminants; and these costs are not included in Holtec's contingency allowance.

L. Holtec cost estimates fail to consider that a significant shortfall in funds could occur if DOE requires repackaging of spent nuclear fuel into new containers approved by DOE for transportation.

The U.S. Government Accountability Office reported in 2014: "per DOE, under provisions of the standard contract, the agency does not consider spent nuclear fuel in canisters to be an acceptable form for waste it will receive. This may require utilities to remove the spent nuclear fuel already packaged in dry storage canisters". [U.S. Government Accountability Office, Spent

Nuclear Fuel Management: Outreach Needed to Help Gain Public Acceptance for Federal Activities That Address Liability, GAO-15.141, October 2014, P. 30.[61]

Repackaging spent fuel so that it can be transported off-site will be expensive, but that cost has been ignored by Holtec.[62]

According to Task Order 12: Standardized Transportation, Aging, and Disposal Canister Feasibility Study, Option 3 (1 PWR/1 BWR/13.1/U) it will cost $34,311,000,000 to repackage 140,000 MT; the per ton cost is $245,078.00.[63]

A BWR assembly has an average weight of 281 Kg, and thus, the per assembly cost is ~$68,887.00. At the Pilgrim station, repackaging could add $261,770,600 to the predisposal costs, not included in D&D funds or Holtec's estimates. Moreover, DOE 's Standard Contract under the Nuclear Waste Policy Act requires reactor operators to pay for this additional expense from the NWPA fund. This per-assembly cost above is based on one large centralized repackaging facility handling the entire projected SNF inventory. If reactor operators have to establish repackaging infrastructures at decommissioned or closed reactors, the lack repackaging becomes an even more expensive proposition.

M. Holtec fails adequately to consider delays in the work schedule leading to increased costs for overhead and project management.

Cleaning up previously unknown radiological or nonradiological contamination will delay the work schedule escalating costs. There inevitably will be other delays as there always are in large projects. HDI is new to decommissioning.

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[61] http://www.gao.gov/assets/670/666454.pdf]

[62] Robert Alvarez analysis for Pilgrim 2018, https://ips-dc.org/ips-authors/robert-alvarez/

[63] https://curie.ornl.gov/system/files/documents/not%20yet%20assigned/STAD_Canister_Feasibility_Study_AREVA_Final_1.pdf (p-5-2)

N. Holtec's cost estimates fail to consider pending state-law requirements that will decrease funds available for radiological decontamination.

There are a number of now-pending Massachusetts laws and regulations that, if passed or adopted, they would result in additional costs to Holtec and reduce the funds available for decommissioning.

- **Radiological Cleanup Standard:** The Massachusetts of Public Health issued a MEMO requesting that the licensee agree to a <10/ml/rem/yr. and < 4 ml/rem/yr. for drinking water sources from all pathways. Holtec's PSDAR says that they are considering singing the MEMO. If Holtec does not agree, Massachusetts is considering a regulation that, after decommissioning is complete and the NRC has released the site, would require the site to meet this lower standard. State Legislation filed 01/19 by Senator deMacedo (S. 183579) and Representative Muratore (HD 1752) includes a < 10 ml/rem/yr. standard and less than 4ml/rem yr. for drinking water pathways.
- **Pending state-law requirements for funding offsite emergency planning and MDPH's Environmental:** H.181704, filed by Representatives Cutler and LaNatra require a licensee to fund offsite emergency planning post shutdown.
  H183826 filed by Representatives Meschino and Cutler requiring an increase in funding for MDPH monitoring.
- **Pending state- law requiring a $25 million annual fee to establish a Postclosure Trust Fund:** SD 598 Senator Patrick O'Connor.

O. Holtec's DCE fails to consider DTF funds that would not be available if NRC does not grant Holtec's exemption request to use the DTF for spent fuel management costs and site remediation.

HDI submitted a request to NRC to allow the DTF to be used for spent fuel management and site restoration costs; and asked NRC to approve the request by the time of the transfer. (Enclosure 2, LTA) If approved, it would divert hundreds of millions of dollars from the Decommissioning Fund for non-decommissioning uses, and greatly increase the chances of a shortfall in the Decommissioning Fund that could leave the site radiologically contaminated.

Entergy has requested additional exemptions. Any licensee amendment request granted to Entergy would have been based on Entergy's, not Holtec's, analyses when the request was submitted and would not apply to Holtec. Holtec likely will file similar license amendment request(s) and would be subject to a hearing because the request is directly related and intertwined with the LTA.

P. Holtec's DCE fails to consider the economic consequences if the license exemption requests filed by Entergy may not be transferable to Holtec adding additional costs.

Entergy has requested additional exemptions. Any licensee amendment request granted to Entergy would have been based on Entergy's, not Holtec's, analyses when the request was submitted and would not apply to Holtec. Again, Holtec must file its own license amendment request(s) and would be subject to a hearing because the request is directly related and intertwined with the LTA.

Q. <u>Holtec's DCE fails to consider the likely adverse health impacts expected in special pathway receptor populations and for that matter in the general public</u>

Holtec's unfounded reliance on Entergy's old environmental monitoring reports is the basis for its conclusions regarding environmental justice. The PSDAR says that, "Potential impacts to minority and low-income populations would mostly consist of radiological effects. Based on the radiological environmental monitoring program data from PNPS, the SEIS determined that the radiation and radioactivity in the environmental media monitored around the plant have been well within applicable regulatory limits. As a result, the SEIS found that no disproportionately high and adverse human health impacts would be expected in special pathway receptor populations (i.e., minority and or low-income populations) in the region as a result of subsistence consumption of water, local food, fish, and wildlife." (LTA, 5.1.13 Environmental Justice)

As discussed in the foregoing at pp. 47-49, the NRC's Groundwater Contamination (tritium) at Nuclear Plants Task Force Final Report, September 1, 2006[64] 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)

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

R. Holtec's costs estimates ignore the costs of mitigating radiological accident(s)

Radiological accidents are neither remote, speculative nor worst case scenarios; instead they are reasonably foreseeable. HDI (PSDAR, 5.19) concludes that the impacts of PNPS decommissioning on radiological accidents are small and are bounded by the previously issued GEIS.

NRC staff concluded in the SEIS that "there are no impacts of severe accidents beyond those discussed in the GEIS." (SEIS 5.1.2).

Both the GEIS and the SEIS concluded the risk from severe accidents is small. They improperly ignore vulnerability and the impact of a spent fuel pool accident or ISFI accident on decommissioning costs and public safety and environment.

However, as we show, the spent fuel pool and dry casks are vulnerable and the potential consequences huge. Therefore, the potential of a radiological incident must be properly analyzed and then Holtec set monies aside for potential mitigation.

The GEIS and SEIS, that Holtec relied upon, do not bound environmental impacts or radiological accidents, for at least the following reasons.

- The GEIS was published in 2002 and is outdated. [65] For example, the BEIR VII Report and the University of Massachusetts Socio-Economic Impact Report had not yet been published, and many of the examples of radiological/hazardous contamination had yet to occur.
- The GEIS was also flawed. In assessing offsite related accidents, the GEIS only considered: seismic events, aircraft crashes (not small aircraft, that pose the more realistic and serious

[65] Comments on The US Nuclear Regulatory Commission's Waste Confidence Generic Environmental Impact Statement, Dr. Gordon Thompson, December 19, 2013.

threat), tornadoes with high winds; and fuel related accidents-fuel drops and loss of water, ignoring the greatest danger the partial loss water in the spent fuel pool.

- The GEIS and SEIS both ignore the escalating terrorist threat with US infrastructure, including nuclear reactors as targets. Both predate awareness of an increased threat from cyber-attacks,[66] drones, and electromagnetic attacks.[67] For example, while reactor safety systems are more or less isolated from an outside cyberattack, a hack knocking out the electrical grid system would shut down power to all reactor safety systems. On-site emergency power generators are then vulnerable to insider and armed assault seeking to cause a meltdown. Loss of electric grid may disenable security cameras.
- The GEIS and SEIS incorrectly assert that the environmental impact of accident-induced or attack-induced pool fires is SMALL. That assertion is incorrect. The environmental impact is LARGE due to the large inventory of radionuclides in the pool.
- Perhaps because Pilgrim's ISFSI did not yet exist, the GEIS and SEIS totally ignore ISFSI radiological accidents. The casks are vulnerable to attack and releases from cracks caused by age, corrosion, manufacturing defects. Each cask contains a huge amount of radioactivity and each cask contains >1/2 the Cesium-137 released at Chernobyl. The environmental impact is LARGE.
- Emergency plans are insufficient now during operations; and will be far less sufficient when funding is reduced and then completely cut to offsite departments- MEMA, local EPZ towns

[66] December 15, 2017, NRC issues license amendment to Pilgrim to change the implementation date for cyber security *upgrades from December 15, 2017 to December 31, 2020 – after Pilgrim is closed.*

[67] ***Electromagnetic Defense Task Force*** (***EDTF***): ***2018 Report***. (Source: US Air Force's Air University; issued Nov 28, ***2018***). From 20–22 August ***2018***, Air University Website, LeMay Papers http://www.defense-aerospace.com/articles-view/release/3/198020/report-highlights-gaps-in-us-electro_magnetic-capabilities,

and host communities. For example, the sirens are coming down and recent disasters have demonstrated cell and standard phones cannot be relied upon.

- Also, the GEIS and SEIS use an inappropriate arithmetic definition of radiological risk, probability times consequences. Holtec's and the GEIS' environmental impact determination with respect to severe accidents, is a risk assessment - the product of the probability and the consequences of an accident. This means that a high consequence low-probability events, like a severe accident, will result in a small impact determination, because the probability is determined to be low so no matter how severe the consequences they will be trivialized.
    - The risk and consequences are considered low because NRC had not in 2002, or now, conducted the comprehensive empirical and analytic inquiry needed to thoroughly understand probability and consequences; they inappropriately assume that the risk environment remains static; and both rely on false assumptions and ignore "inconvenient truths."

Spent Fuel Pool Accidents Ignored by the GEIS, SEIS and Holtec - Examples

Fuel Handling Accidents: Accidents can and do happen, even with single-proof cranes. For example at Vermont Yankee (May 2008)[68] the brakes on the crane didn't function properly and it almost dropped a load of high-level radioactive waste during the first removal of spent fuel assemblies from the spent fuel pool into a cask for dry cask storage outside of the plant. According to reports at the time, the brakes on the crane did not respond properly because its electrical relays were "out of adjustment." The cask came within 1½ inches of the floor, when the operator wanted it to stop four inches above the floor. Another mishap or near-miss failure with a single-proof crane

[68] https://www.reformer.com/stories/nrc-reviews-vy-safety-system-after-crane-failure,65923

occurred at Palisades March 18, 2006 attirbutable to worker error[69]. Human error, either in operations or manufacturing, is not considered, as it needs to be, in the GEIS, SEIS or by Holtec.

Canister Drop in the pool: If a cask is dropped in the pool and the pool floor is breached, there are many safety-related components located on the floors below the spent fuel pool which could be disabled that could simultaneously initiate an accident and disable accident mitigation equipment. If a hole is punched in the pool floor or walls and water is lost simply to the top of the assemblies, a pool fire will likely follow.

A canister drop can lead to a crack in the canister- especially a concern with HBU fuel. Each canister contains over ½ the Cesium-137 released at Chernobyl.

Causes of Spent Fuel Pool Cooling Water Loss. There are many potential causes of "a significant draw-down of the spent fuel pool." Water could be lost from a spent-fuel pool through leakage, boiling, siphoning, pumping, displacement by objects falling into the pool, or overturning of the pool. These modes of water loss could arise from events, alone or in combination, that include: (i) acts of malice by persons within or outside the plant boundary; (ii) an aircraft impact; (iii) an earthquake; (iv) dropping of a fuel cask; (v) accidental fires or explosions.[70]

Partial drain-down: The GEIS did not recognize different consequences of both a full drain-down and a partial drain-down. This is an important omission because total drainage of the pool is not the most severe case of water loss. In a partial drain-down the presence of residual water would block air convection, e.g., by blocking air flow beneath the racks.[71] Previously, in

[69] https://www.nirs.org/press/03-20-2006/
[70] Environmental Impacts of Storing Spent Fuel and High-Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Nuclear Waste Confidence Decision and Environmental Impact Determination, Gordon Thompson, February 6, 2009; Comments on the US Nuclear Regulatory Commission's Draft Consequence Study of a Beyond Design Basis Earthquake Affecting Spent Fuel Pool for a US Mark 1 Boiling Water Reactor, Gordon Thompson, August 1, 2013
[71] http://www.environmental-defense-institute.org/publications/Cover.Ltr.Thompson.NRC.SNF.Short.pdf

filings made during a 2002 license-amendment proceeding, NRC staff assumed that a fire would be inevitable if the water fell to the top of the racks.

Pool Fire Ignition Time: NRC Staff and industry today incorrectly claim that that it would take, a minimum of 10 hours for the fuel in a boiling water reactor aged 10 months or in a PWR for 16 months to heat to zirconium ignition temperature; and that the 10- hour period "allows for the licensee to take onsite mitigation measures or, if necessary, for offsite authorities to take appropriate response actions using an all-hazards approach emergency management plan."

NRC staff assumes that the minimum delay time for SNF ignition can be calculated by further assuming that an SNF assembly is perfectly insulated thermally. The NRC analysis provides no basis for assuming these assumptions are correct.

A 10-hour minimum delay time for BWR SNF aged 10 months is potentially plausible. But that is not the whole story. For example, an attack scenario could cause partial drain-down and a local radiation field precluding access; and likewise, a fuel handling accident during transfer from pool to dry casks - such as a cask drop.

Mitigation. Contrary to NRC's and Holtec's current estimate, 10 hours is not a guaranteed enough time to put out a spent fuel fire. An attack scenario could rapidly cause partial drain-down and result in a local radiation field that precludes access to the fire. There is no basis for assuming that a site's Flex program to provide supplemental water will be sufficient. For example, Pilgrim Watch and the Union of Concerned Scientists showed that Pilgrim's Flex plan to provide supplemental water had little to no probability of working, especially in severe storm conditions.[72]

[72] Presentation to NRC: Status of Fukushima Lessons, Union of Concerned Scientists, David Lochbaum, July 31, 2014, https://www.nrc.gov/reading-rm/doc-collections/commission/slides/2014/20140731/lochbaum-20140731.pdf

Evacuation. Ten hours is not enough time for offsite authorities to take appropriate response actions using an all-hazards approach emergency management plan. NRC's emergency preparedness recommendation, option EP-2, essentially eliminates offsite emergency preparedness at Level 2 (pool storage) and Level 3 (ISFI storage). In addition, the notification requirement to State and Local Governmental is changed from 15 minutes to 60 minutes; and public alert and notification systems and Evacuation Time Estimates (even with a significant population change) are not required. As early as Level 2, challenging drills and exercises involving hostile action said not to be warranted, and ORO participation in radiological drills and exercises would no longer be required. Even with offsite emergency plans in place during operations, a timely (less than 10 hour) evacuation is not possible[73]; therefore, absent offsite preparedness there is no way that 10-hours would allow offsite authorities to evacuate the population.

ISFSI Accidents the GEIS, SEIS and Holtec Ignore - Examples

Holtec assumes that, "No contamination or activation of the ISFSI pads is assumed. As such, only verification surveys are included for the pad in the decommissioning estimate." (PSDAR, pg.,25) They do not consider, as they should, something going wrong.

Causes of a Dry Cask Canister Rupture. Holtec ignores the potential of a dry cask canister rupture. Casks, although safer than spent fuel pool storage, are vulnerable to attack,

; Pilgrim Watch Comment (11.16.2014) Waterways Application, No. W14-414, Cape Cod Bay, Plymouth, Plymouth County, Ch 91 Application of Entergy Nuclear Operations, Inc. Pilgrim Nuclear Power Station; Pilgrim Watch Comment NRC, January 30, 2014

[73] Pilgrim Watch's 2.206 Petition To Modify, Suspend, Or Take Any Other Action To The Operating License Of Pilgrim Station Until The NRC Can Assure Emergency Preparedness Plans Are In Place To Provide Reasonable Assurance Public Health & Safety Are Protected In The Event Of A Radiological Emergency (19.30.2013);Pilgrim Watch's September 3, 2014 Supplement To Its August 30, 2013 2.206 Petition To Modify, Suspend, Or Take Any Other Action To The Operating License Of Pilgrim Station Until The NRC Can Assure Emergency Preparedness Plans Are In Place To Provide Reasonable Assurance Public Health & Safety Are Protected In The Event Of A Radiological Emergency (09.03.2014) https://www.nrc.gov/docs/ML1433/ML14338A180.pdf

described below.[74]

Vulnerability Pools and ISFSI to Acts of Malice

Reactors make ideal targets for outside or inside attackers for the simple reasons that they contain large amounts of radioactivity that could create severe impacts, and their defense is "light" in a military sense. The design of GE BWR Mark I reactors like Pilgrim makes those reactors highly vulnerable to attack because their spent fuel pools are in the top floor of the reactor, outside primary containment with a light roof structure overhead. In addition, Pilgrim's spent fuel when removed from inside the reactor is placed in thin-walled dry casks. The casks are stacked vertically out in the open making them vulnerable to attack. Each cask contains about ½ the Cesium-137 released during the Chernobyl accident.

The ISFSI is in the process of being moved to higher ground. But it will be very close to a public road, Rocky Hill Road. There is no plan to place the ISFSI in a reinforced building, surround it with earthen berms (a dirt cheap solution) or erect a blast shield. The ISFSI as it now sits with the canisters lined up vertically is described as "candlepin bowling for terrorists."

The following table, prepared by Dr. Gordon Thompson for the Massachusetts Attorney General,[75] summarizes available means of attack. It shows that nuclear power plants are vulnerable.

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[74] Environmental Impacts of Storing Spent Fuel and High-Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Nuclear Waste Confidence Decision and Environmental Impact Determination, Gordon Thompson, February 6, 2009 (https://www.nrc.gov/docs/ML1001/ML100150145.pdf); Comments on the US Nuclear Regulatory Commission's Draft Consequence Study of a Beyond Design Basis Earthquake Affecting Spent Fuel Pool for a US Mark 1 Boiling Water Reactor, Gordon Thompson, August 1, 2013 (https://www.nrc.gov/docs/ML1401/ML14016A068.pdf)

[75]The Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene With respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plants Operating License and Petition for Backfit Order Requiring New Design features to Protect Against Spent Fuel Pool Accidents, Docket

Mode of Attack	CHARACTERISTICS	PRESENT DEFENSE
Commando-style by land	• Could involve heavy weapons/sophisticated tactics • Attack requiring substantial planning and resources	Alarms, fences, lightly-armed guards, with offsite backup
Commando-style by water	• Could involve heavy weapons/sophisticated tactics • Could target intake canal • Attack may be planned to coordinate with a land attack	500 yard no entry zone – marked by buoys – simply, "no trespassing" signs Periodic Coast Guard surveillance by boat or plane
Land-vehicle bomb	• Readily obtainable • Highly destructive if detonated at target	Vehicle barriers at entry points to Protected Area
Anti-tank missile	• Readily obtainable • Highly destructive at point of impact	None if missile is launched from offsite
Commercial aircraft	• More difficult to obtain than pre-9/11 • Can destroy larger, softer targets	None
Explosive-laden smaller aircraft	• Readily attainable • Can destroy smaller, harder targets	None

Dr. Gordon Thompson also analyzed the impact of a shaped charge as one potential instrument of attack.[30] The analysis shows that the cylindrical wall of the canister is about 1/2 inch (1.3 m) thick, and could be readily penetrated by available weapons. The spent fuel

No. 50-293, May 26, 2006 includes a Report to The Massachusetts Attorney General On The Vulnerability of Pilgrim's Spent Fuel Pool - Risks and Risk-Reducing Options Associated with Pool Storage of Spent Nuclear Fuel at the Pilgrim and Vermont Yankee Nuclear Power Plants, Gordon Thompson, May 25, 2006 (Risks and Risk-Reducing Options Associated with Pool Storage of Spent Nuclear Fuel at the Pilgrim and Vermont Yankee Nuclear Power Plants, Gordon Thompson, May 25, 2006. (https://www.nrc.gov/docs/ML1001/ML100150145.pdf)

[30] Gordon R. Thompson, *Environmental Impacts of storing Spent Nuclear Fuel and High- Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Waste Confidence Decision and Environmental Impact Determination* (Cambridge, Massachusetts: Institute for Resource and Security Studies, 6 February 2009). Tables also in Declaration of 1 August 2013 by Gordon R. Thompson: Comments on the US Nuclear Regulatory Commission's Draft Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a US Mark I Boiling Water Reactor

assemblies inside the canister are long, narrow tubes made of zirconium alloy, inside of which uranium oxide fuel pellets are stacked. The walls of the tubes (the fuel cladding) are about 0.023 inch (0.6 mm) thick. Zirconium is a flammable metal.

Table 7-7: Performance of US Army Shaped Charges, M3 and M2A3

Target Material	Indicator	Type of Shaped Charge	
		M3	M2A3
Reinforced concrete	Maximum wall thickness that can be perforated	60 in	36 in
	Depth of penetration in thick walls	60 in	30 in
	Diameter of hole	• 5 in at entrance • 2 in minimum	• 3.5 in at entrance • 2 in minimum
	Depth of hole with second charge placed over first hole	84 in	45 in
Armor plate	Perforation	At least 20 in	12 in
	Average diameter of hole	2.5 in	1.5 in

Notes: (a) Data are from: Army, 1967, pp 13-15 and page 100. (b) The M2A3 charge has a mass of 12 lb, a maximum diameter of 7 in, and a total length of 15 in including the standoff ring. (c) The M3 charge has a mass of 30 lb, a maximum diameter of 9 in, a charge length of 15.5 in, and a standoff pedestal 15 in long.

Table 7-8: Types of Atmospheric Release from a Spent-Fuel-Storage Module at an ISFSI as a Result of a Potential Attack

Type of Event	Module Behavior	Relevant Instruments and Modes of Attack	Characteristics of Atmospheric Release
Type I: Vaporization	• Entire module is vaporized	• Module is within the fireball of a nuclear-weapon explosion	• Radioactive content of module is lofted into the atmosphere and amplifies fallout
Type II: Rupture and Dispersal (Large)	• MPC and overpack are broken open • Fuel is dislodged from MPC and broken apart • Some ignition of zircaloy fuel cladding may occur, without sustained combustion	• Aerial bombing • Artillery, rockets, etc. • Effects of blast etc. outside the fireball of a nuclear weapon explosion	• Solid pieces of various sizes are scattered in vicinity • Gases and small particles form an aerial plume that travels downwind • Some release of volatile species (esp. cesium-137) if incendiary effects occur
Type III: Rupture and Dispersal (Small)	• MPC and overpack are ruptured but retain basic shape • Fuel is damaged but most rods retain basic shape • No combustion inside MPC	• Vehicle bomb • Impact by commercial aircraft • Perforation by shaped charge	• Scattering and plume formation as for Type II event, but involving smaller amounts of material • Little release of volatile species
Type IV: Rupture and Combustion	• MPC is ruptured, allowing air ingress and egress • Zircaloy fuel cladding is ignited and combustion propagates within the MPC	• Missiles with tandem warheads • Close-up use of shaped charges and incendiary devices • Thermic lance • Removal of overpack lid	• Scattering and plume formation as for Type III event • Substantial release of volatile species, exceeding amounts for Type II release

One scenario for an atmospheric release from a dry cask would involve mechanically creating a comparatively small hole in the canister. This could be the result, for example, of the air blast produced by a nearby explosion, or by the impact of an aircraft or missile. If the force was sufficient to puncture the canister, it would also shake the spent fuel assemblies and damage their cladding. A hole with an equivalent diameter of 2.3 mm would release radioactive gases and particles and result in an inhalation dose (CEDE) of 6.3 rem to a person 900 m downwind from the release. Most of that dose would be attributable to release of two-millionths (1.9E-06) of the MPC's inventory of radioisotopes in the "fines" category.

Another scenario for an atmospheric release would involve the creation of one or more holes in a canister, with a size and position that allows ingress and egress of air. In addition, this scenario would involve the ignition of incendiary material inside the canister, causing ignition and sustained burning of the zirconium alloy cladding of the spent fuel. Heat produced by burning of the cladding would release volatile radioactive material to the atmosphere. Heat from combustion of cladding would be ample to raise the temperature of adjacent fuel pellets to well above the boiling point of cesium.

Potential for Release from a Cask and Consequences: Dr. Thompson observed that a cask is not robust in terms of its ability to withstand penetration by weapons that are available to sub-national groups. A typical cask would contain 1.3 MCi of cesium-137, about half the total amount of cesium-137 released during the Chernobyl reactor accident of 1986. Most of the offsite radiation exposure from the Chernobyl accident was due to cesium-137. Thus, a fire

inside an ISFSI module, as described in the preceding paragraph, could cause significant radiological harm.[76]

Casks may corrode and leak – especially over a long period of onsite storage

Casks may remain onsite indefinitely subjected at Pilgrim, for example, to salt induced stress corrosion cracking and threatened by sea level rise. The thin (0.5") stainless steel canisters crack may crack within 30 years. No current technology exists to inspect, repair, or replace cracked canisters. With limited monitoring, we will only know after the fact that a cask has leaked radiation. [77] NRC's Mark Lombard stated that there is no technology to find cracks or judge its depth in Holtec Casks[78]. (October 6, 2015) Dr. Kris Singh said that it is not feasible to repair Holtec's steel canisters. (October 14, 2014).[79] Mitigation will be costly. The $3 million excess in the fund after decommissioning estimated by Holtec will be totally insufficient.

High Burnup Fuel (HBU)

Pilgrim has approximately 35% HBU; yet the NRC is just starting a test to see whether the casks can handle it, with results not in until 2027. Robert Alvarez (https://www.ips-dc.org/ips-authors/robert-alvarez/) explains the problems in doing so:

> Research shows that under high-burnup conditions, fuel rod cladding may not be relied upon as a key barrier to prevent the escape of radioactivity, especially during prolonged storage in the "dry casks."

[76] Ibid; and also see: Assessing risks of potential malicious actions at commercial nuclear facilities: the case of a proposed independent spent fuel storage installation at the diablo canyon site, Gordon Thompson, June 27, 2007 (https://www.nrc.gov/docs/ML1001/ML100150145.pdf)

[77] San Onofre Dry Cask Storage Issues analyses at: https://sanonofresafety.files.wordpress.com/2011/11/drycaskstorageissues2014-09-23.pdf

[78] (https://www.youtube.com/watch?v=QtFs9u5Z2CA&t=17s)

[79] (https://www.youtube.com/watch?v=QtFs9u5Z2CA&t=17s)

High-burnup waste reduces the fuel cladding thickness and a hydrogen-based rust forms on the zirconium metal used for the cladding, which can cause the cladding to become brittle and fail- a costly event.

- In addition, under high-burnup conditions, increased pressure between the uranium fuel pellets in a fuel assembly and the inner wall of the cladding that encloses them causes the cladding to thin and elongate.
- And the same research has shown that high burnup fuel temperatures make the used fuel more vulnerable to damage from handling and transport; cladding can fail when used fuel assemblies are removed from cooling pools, when they are vacuum dried, and when they are placed in storage canisters.
- High burnup spent nuclear fuel is proving to be an impediment to the safe storage and disposal of spent nuclear fuel. For more than a decade, evidence of the negative impacts on fuel cladding and pellets from high burnup has increased, while resolution of these problems remains elusive.
- NRC Meeting Presentation Slides Dry Storage & Transportation of High Burnup, 9/6/18 meeting, slides 14 & 15: NRC said that storage and transportation of HBU is safe, providing no technical bases, for 60 years – no guarantee for longer storage when fuel may still be onsite.

Consequences of a spent fuel pool fire or cask rupture.

The GEIS, SEIS and Holtec minimize the potential consequences of a spent fuel pool fire or a cask rupture. The amount of radiation released likely would far exceed the EPA's one rem release limit, and the resulting off-site damage to property and health would be unimaginable.

Pilgrim's pool contains approximately 70 million curies.[80] Much of the damage from a pool fire or dry cask failure would be caused by the release of Cesium-137. To make the risk meaningful, it is useful to compare the inventory of Cs-137 in Pilgrim's pool and core with the amount of Cs-137 released at Chernobyl.[81] Chernobyl - 2,403,000 curies Cs-137; Pilgrim's pool - more than 44,000,000 curies Cs-137; Pilgrim's Core - 5,130,000 curies Cs-137. Each cask contains more than half the total amount of Cs-137 released at Chernobyl

Studies of the consequences of a spent fuel pool fire show huge, potential consequences, ignored by Holtec and the documents Holtec relies on.

- 2016 Princeton Study: A major Spent Fuel Pool fire could contaminate as much as 100,000 square kilometers of land (38,610 square miles) and force the evacuation of millions.[82]
- 2013 NRC Study: A severe spent fuel pool accident would render an area larger than Massachusetts uninhabitable for decades and displace more than 4 million people.[83]
- 2006 Massachusetts Attorney General Study: $488 Billion dollars, 24,000 cancers, hundreds of miles uninhabitable[84]

[80] Spent Nuclear Pools in the US: Reducing the Deadly Risks of Storage, Robert Alvarez, IPS, May 2011, pg., 14
[81] See 2012 GAO Report: GAO -12-797, Spent Nuclear Fuel: Accumulating Quantities at Commercial Reactors Present Storage and Other Challenges, http://www.gao.gov/assets/600/593745.pdf.
[82] Frank N. von Hippel, Michael Schoeppner, "Reducing the Danger from Fires in Spent Fuel Pools," Science & Global Security 24, no.3 (2016): 141-173 http://scienceandglobalsecurity.org/archive/sgs24vonhippel.pdf;Richard Stone, "Spent fuel fire on U.S. soil could dwarf impact of Fukushima," *Science*, May 24, 2016. (NRC variable at: http://www.sciencemag.org/news/2016/05/spent-fuel-fire-us-soil-could-dwarf-impact-fukushima
[83] Consequence Study of a Beyond Design-Basis Earthquake Affecting the Spent Fuel Pool for A U.S. Mark I Boiling Water Reactor (October 2013) at 232 (Table 62) and 162 (table 33), Adams Accession NO ML13256A342)
[84] The Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene With respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plants Operating License and Petition for Backfit Order Requiring New Design features to Protect Against Spent Fuel Pool Accidents, Docket No. 50-293, May 26, 2006 includes a Report to The Massachusetts Attorney General On The Potential Consequences Of A Spent Fuel Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant, Jan Beyea, PhD., May 25, 2006 (NRC RC Electronic Hearing Docket, Pilgrim 50-293-LR, 2—6 pleadings, MAAGO 05/26 (ML061640065) & Beyea (ML061640329)

Dry Cask: A typical cask would contain 1.3 MCi of cesium-137, about half the total amount of Cesium-137 released during the Chernobyl reactor accident of 1986. Most of the offsite radiation exposure from the Chernobyl accident was due to Cesium-137. Thus, a fire inside an ISFSI module from a terrorist attack or significant rupture of the cask could cause significant radiological harm[85] and huge expense.

These facts cannot be ignored. The documents that Holtec relies upon, are outdated and factually incorrect. They do not bound environmental impact. Even today, NRC is ignoring both the vulnerability and severe consequences of spent fuel pools and cask storage. Site Specific analysis of spent fuel incidents are required before approval of the LTA. Funds for mitigation after a spent fuel accident must be included in cost estimates.

S. Holtec's LTA Provides No Assurance that Holtec Pilgrim and HDI Will Have the Funds Necessary to Decommission the ISFSI.

Holtec says that ongoing ISFSI operations will continue until 9/7/2063 (DCE 17) and the ISFSI will be decommissioned in 2063 (DCE 16). Holtec's estimated cost of decommissioning the ISFSI, in 2018 dollars will be about $4.2 million.[86] DCE, pp 66, 70. In making this estimate, Holtec again incorrectly assumes that decommissioning costs will not increase more than inflation. It also assumes, with no apparent basis particularly since ISFSI decommissioning will not happen until at least 54 years from now, that there will be "no contamination or activation of the ISFSI pads." DCE, pg. 25.

[85] Environmental Impacts of Storing Spent Fuel and High-Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Nuclear Waste Confidence Decision and Environmental Impact Determination, Gordon Thompson, February 6, 2009; Comments on the US Nuclear Regulatory Commission's Draft Consequence Study of a Beyond Design Basis Earthquake Affecting Spent Fuel Pool for a US Mark 1 Boiling Water Reactor, Gordon Thompson, August 1, 2013, pg., 30

[86] Holtec admits that its estimated $4.2 million cost assumes that there will be "no contamination or activation of the ISFSI pads." DCE, pg. 25

An important question, not answered in Holtec's LTA, is where the funds to pay ISFSI decommissioning costs will come from.

Holtec's LTA is clear that its $1.134 billion estimated cost is the cost to decommission the site, safeguard the spent fuel *until it can be transferred to the DOE* and restore the impacted area of the site." (PSDAR, p. 18; DCE, pg. 8). The Schedule of "planned decommissioning activities" in Section 2.0 of the PSDAR, (PSDAR, pg. 5) includes "Ongoing ISFSI Operations" but not ISFSI decommissioning. (PSDAR, pg. 8)

Holtec's Cash Flow Analysis (DCE, pp. 61.62) does not include the costs of decommissioning the ISFSI, and the $3.6 million that Holtec expects to be "left over" is not enough. This is particularly clear when the likely increase in decommissioning costs is taken into account. For example, if DOE fails to pick up the spent fuel by 2062, as Holtec assumes, then Pilgrim will began incurring significant additional costs; and that money has to be spent by the licensee before any possibility of refurbishment from DOE. In 2063 alone, spent fuel annual cost of approximately $7 million will exceed the $3.6 million left over. Not picking up the fuel raises the possibility of far greater cost overruns to the tune of hundreds of millions of dollars.

Pilgrim Watch's calculations show that the actual cost of decommissioning the ISFSI at the earliest point in time assumed by Holtec (2063), will be about $24 million if decommissioning costs between now and then increase at a rate 4% more than inflation, and would be about $6.5 million even if the decommissioning cost increase was only 1% more than inflation.

In the overall picture, a $6.5 to $24 million shortfall in the funds that must be available for ISFSI decommissioning is relatively small.

But this shortfall, together with the at least 16 other incorrect assumptions and ignored significant facts discussed above, each of which will result in additional costs above and beyond the funds available for decommissioning. Cumulative impact must but was not considered.

The existing decommissioning trust funds do not provide a basis upon which the NRC could properly find the required financial assurance. Holtec Pilgrim and HDI are not financially responsible. The LTA should be denied and sent back to the drawing board.

III. SITE ASSESSMENT-NEPA (SECTION 2)

THE LICENSE TRANSFER AND AMENDMENT REQUEST DOES NOT INCLUDE THE ENVIRONMENTAL REPORT REQUIRED BY 10 CFR 51.53(d), AND HAS NOT UNDERGONE THE ENVIRONMENTAL REVIEW REQUIRED BY THE NATIONAL ENVIRONMENTAL POLICY ACT

BASES

1. The National Environmental Policy Act (NEPA) requires that a NEPA analysis be performed.

The NRC responsibilities under NEPA are triggered by the fact that a federal agency "has actual power to control the project." *Ross v. Fed. Highway Admin.*, 162 F.3d 1046, 1051 (10th Cir. 1998). The NRC clearly has "actual power to control" the requested license transfer.

"[P]ermitting [Holtec] to decommission the facility" requires NEPA review. *Citizens Awareness Network, Inc. v. Nuclear Regulatory Comm'n,* 59 F.3d 284, 293 (1st Cir. 1995). "[R]egardless of the label the [Nuclear Regulatory] Commission places on its decision," the NRC "cannot t skirt NEPA or other statutory commands by essentially exempting a licensee from regulatory compliance, and then simply labelling its decision 'mere oversight' rather than a major federal action. To do so is manifestly arbitrary and capricious." *Id.*

2. NRC requires environmental impact statements for major federal actions. Approval of Holtec's proposal as a whole would constitute a major federal action.

NEPA requires federal agencies to prepare an Environmental Impact Statement for every "major federal action significantly affecting the quality of the human environment." 42 U.S.C 4332(2)(c); accord 10 C.F.R. 51.20 (a)(1). As discussed above with respect to Contention 1, and as shown in the Facts Supporting Contention 2 below, Holtec's actions will affect the quality of the environment.

40 C.F.R. § 1508.18 defines *major* federal actions as "actions with effects that *may* be major and which *are potentially subject to Federal control and responsibility*," including "[a]pproval of specific projects" or other instances where regulatory approval is necessary to a licensee's actions." The LTA has effects that "may be major," is potentially subject to [NRC] control. The LTA also requires "regulatory approval."

The D.C. Circuit Court of Appeals has held that a federal action is involved, "whenever an agency makes a decision which permits action by other parties which will affect the quality of the environment." *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm'n*, 481 F.2d 1079, 1088 (D.C. Cir. 1973). Consistently, the 9th Circuit has held that because the NRC has "mandatory obligation to review" Holtec's plans, the NRC's "failure to disapprove" of those plans would constitutes "major federal action" triggering NEPA review. *Ramsey v. Kantor*, 96 F.3d 434, 445 (9th Cir. 1996).

3. A NEPA review is required if there is a potential environmental impact.

The mere "possibility of a problem" requires the NRC "to evaluate seriously the risk" that this problem will occur, and what environmental consequences would ensue in those circumstances. *Id.*, U.S.C. § 4332(2)(C); *see also, e.g.*, *Blue Mountains*, 161 F.3d at 1211.

Even if the proposed license transfer might not have any environmental impacts, the *possibility* of significant environmental impacts precludes a FONSI and triggers the need for an Environmental Impact Statement.

NEPA explicitly requires an Environmental Impact Statement if an action has "effects that *may be* major and which are *potentially* subject to Federal control and responsibility." C.F.R. § 1508.18. (emphasis added). A "potential" significant effect suffices. *San Luis Obisco Mothers for Peace,* 449 F.3d at 1030. "[W]hen the determination that a significant impact will or will not result from the proposed action is a close call, an [environmental impact statement] should be prepared." *National Audubon Soc. v. Hoffman*, 132 F.3d 7, 13 (2d. Cir. 1997) (reversing a decision by the U.S. Forest Service not to prepare an environmental impact statement because the Forest Service failed to consider the possible effects of the challenged action). Agencies should "err in favor of preparation of an environmental impact statement." *Id*. at 18.

An environmental impact statement is required if the agency's review shows a "substantial possibility" that the project or action "may have a significant impact on the environment." *Id*. at 18. It is only when the NRC's action "*will not* have a significant effect on the human environment" that an environmental impact statement is not required. *Id*. at 13.

4. NEPA requires a comprehensive environmental review.

The NRC is required to take a "hard look" at the potential environmental consequences of Holtec's proposed action. *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 97 (1983). The required NEPA analysis must be comprehensive and address all "potential environmental effects," unless those effects are so unlikely as to be "remote and highly speculative." *San Luis Obispo Mothers for Peace v. NRC*, 449 F.3d 1016, 1030 (9th Cir. 2006).

"Ignoring possible environmental consequences will not suffice." *Found. on Econ. Trends v. Heckler*, 756 F.2d 143, 154 (D.C. Cir. 1985).

The potential effects of Pilgrim decommissioning (including operation of the ISFSI during the many years before it might be decommissioned) are neither remote or highly speculative; and they cannot be ignored.

5. NRC regulations require an environmental impact statement.

Under 10 C.F.R. §§ 51.53(d), every applicant for a "license amendment approving a license termination plan or decommissioning plan … shall submit with its application a separate document, entitled 'Supplement to Applicant's Environmental Report—Post Operating License Stage,' which will update 'Applicant's Environmental Report—Operating License Stage,' as appropriate, to reflect any new information or significant environmental change associated with the applicant's proposed decommissioning activities or with the applicant's proposed activities with respect to the planned storage of spent fuel."

Since the LTA also seeks to transfer Pilgrim's ISFSI and to operate the ISFSI after PNPS is decommissioned, an environmental impact statement is also required by 10 C.F.R. §§ 51.20 requires an environmental impact since the "license pursuant to part 72 of this chapter" would then be "for the storage of spent fuel in an independent spent fuel storage installation (ISFSI) at a site not occupied by a nuclear power reactor."

6. An environmental analysis is an important part of the NRC's review.

An Environmental Assessment helps an agency determine whether the proposed action is significant enough to require preparation of an Environmental Impact Statement. *Marsh v. Or. Natural Resources Council*, 490 U.S. 360, 371 (1989).

The NRC has recognized the value of a comprehensive NEPA analysis: "While NEPA does not require agencies to select particular options, it is intended to foster both informed decision-making and informed public participation, and thus to ensure that the agency does not act upon incomplete information, only to regret its decision after it is too late to correct." *In re Duke Energy Corporation (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units and 2*), CLI-02-17, 56 N.R.C. 1, 10 (2002).

An environmental impact statement "insures the integrity of the agency process by forcing it to face those stubborn, difficult to answer objections without ignoring them or sweeping them under the rug" and serves as an "environmental full disclosure law so that the public can weigh a project's benefits against its environmental costs." *National Audubon Soc.*, 132 F.3d at 12 (citing *Sierra Club v. United States Army Corps of Eng'rs*, 772 F.2d 1043, 1049 (2d. Cir. 1985)). The procedures of NEPA serve a "vital purpose" that "can be achieved only if the prescribed procedures are faithfully followed." *Lathan v. Brinegar*, 506 F.2d 677, 693 (9th Cir.1974).

7. <u>The NRC cannot issue a Finding of No Significant Impact (FONSI) without first evaluating all the evidence.</u>

The NRC can issue a FONSI only if it reasonably determines, based on an evaluation of all the evidence, that its action "will not have a significant effect on the human environment." (40 C.F.R. § 1508.13) A FONSI must include "a convincing statement of reasons to explain why a project's impacts are insignificant. *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1212 (9th Cir. 1998). S*ee also Citizens Against Toxic Sprays, Inc. v. Bergland*, 428 F. Supp. 908, 927 (D. Or. 1977) ("No subject to be covered by an [environmental impact statement] can be more important than the potential effects of a federal [action] upon the health of human beings [and the environment]."); *Maryland-Nat'l Capital Park & Planning Comm'n v. U.S. Postal*

Service, 487 F.2d 1029, 1039-40 (D.C. Cir. 1973) (agency must consider "genuine issues as to health" before deciding whether to prepare an environmental impact statement). If the agency determines that a full environmental impact statement is not necessary, the agency must then prepare a FONSI "sufficiently explaining why the proposed action will not have a significant environmental impact." 40 C.F.R. § 1501.4; *id.* § 1508.14; *New York v. NRC I*, 681 F.3d 471, 477 (D.C. Cir. 2012).

As shown here and by both the Commonwealth's and Pilgrim Watch's Motions to Intervene and Requests for Hearing in this proceeding, the proposed LTA will have a significant impact.

8. The generic determination of 10 CFR § 2.1315 does not apply.

Holtec seems to contend that no environmental assessment is required because of "the generic determination in 10 CFR 2.1315(a). According to Holtec, this "generic determination applies [because] the proposed conforming license amendment … does no more than conform the License to reflect the proposed transfer discussion." LTA, p. 20.

As shown at pages 3-4 above, this is simply not so. The proposed license amendment:

> Requires the NRC to find that "Holtec Pilgrim LLC is financially qualified" and that Holtec Decommissioning International is both "technically and financially qualified" (Proposed Amended License, p. 1, subparagraphs c and d), a finding that would have to overlook that the only asset of Holtec Pilgrim and Holtec Decommissioning International is Pilgrim's demonstrably insufficient Decommission Fund (see Contention 1, below) and that as a Holtec representative (Ms. Joy Russell) said ay an NDCAP meeting . Holtec itself has never decommissioned a site.

> MS. J. RUSSELL (Holtec): Holtec International has not decommissioned any sites.

a. Deletes the requirements that Pilgrim's owner "provide decommissioning funding assurance of no less than $396 million," provide a Provisional Trust fund in the amount of "$70 million," and "have access to a contingency fund of not less than fifty million dollars" (Proposed Amended License p. 4). Particularly given the inadequacy of the Decommissioning Trust Fund, this is a significant change.

b. Deletes the requirement that the Decommissioning Trust agreement prohibit investments in the Pilgrim Owner's parent company. (Proposed Amended License, p. 5).

Because of these requested changes, the generic determination of §2.1315 does not apply. In addition, the clear import of § 2.1315 is that when, as here, the requested amendment does far more than conform than conform the license, the NRC must consider both "significant safety hazards considerations" and "whether the health and safety of the public will be significantly affected", as required by NEPA.

Finally, and contrary to fact, even if the requested amendment did "no more than confirm the license to reflect the transfer action, the Commission should (as provided in § 2.1315(a), determine that its generic determination not apply here for all of the reasons set forth herein, including those set forth below:

a. The license transfer agreement raises significant questions with respect to safety hazards and whether the health and safety of the public will be affected.
b. Pilgrim has a long history of bad fuel, blown filters, leaks, releases, buried hazardous materials, and mismanagement (see pp. 36-51, above)
c. Neither Holtec nor the NRC knows what contamination exists at the PNPS site.
d. Holtec has not conducted a site analysis. hazard

e. Holtec has not yet reviewed what it calls Entergy's "Historic Site Assessment," a review that Holtec admits is needed "to support the identification, categorization, and quantification of radiological, regulated, and hazardous wastes in support of waste management planning." Holtec PSDAR pp 8-9

f. Holtec has made only an initial cursory "review of PNPS decommissioning records required by 10 CFR 50.75(g) records.

g. Holtec admits that a new site assessment is necessary so that "radiological, regulated, and hazardous wastes are identified, categorized and quantified to support decommissioning and waste management planning.".

h. NRC's Lessons Learned Task Force 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;" and recommended revising the regulations.

i. The NRC has noted burials of hazardous waste, saying that "these types of areas will be identified during plant decommissioning" but to date has not done so. See pp. 53-54 above. The Commonwealth's experts from the Massachusetts Department of Environmental Protection list hazardous materials on site or likely to be onsite.

9. <u>The categorical exclusion of 10 CFR § 51.22 does not apply.</u>

In its LTA, Holtec also says (LTA, pg. 10) that

> "The requested consent to transfer licensed owner and operator authority for Pilgrim is exempt from environmental review because it falls within the categorical exclusion contained in 10 CFR 51.22(c)(21) for which neither an Environmental Assessment nor an Environmental Impact Statement is required."

Holtec is again incorrect. 10 CFR § 51.22(b) could not be clearer. "[A]n environmental impact statement is not required" *"[e]xcept … upon the request of any*

interested person." Pilgrim Watch is an "interested person, and it" has requested "an Environmental Assessment [and] an Environmental Impact Report."

Beyond that, in the "special circumstances" that exist at PNPS (See pp.88-89, above), the Commission should determine that an environmental assessment or environmental impact statement is required.

Finally, Holtec's apparent suggestion no environmental assessment or environmental impact statement are ever required for any "Approvals of direct or indirect transfers of any license issued by NRC or any associated amendments of license required to reflect the approval of a direct or indirect transfer of an NRC license" (10 CFR § 51.22 (c)(21)) goes much too far. 10 CFR § 51.22 (a) says that some categories of licensing and regulatory actions are "eligible for categorical exclusion," but neither the Atomic Energy Act, NEPA, nor the NRC's exhaustive regulations directed to licensing or licensing transfers can countenance a conclusion that no "amendments of license required to reflect the approval of a direct or indirect transfer of an NRC license," no matter how flawed, have any environmental effect and are automatically excluded from any environmental review.

10. <u>The environmental impacts are not "bounded" by previous environmental impact statements.</u>

Holtec says that it "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."

What Holtec "has concluded" is, once again, wrong. The "previously issued environmental impact statements" do not and cannot bound numerous environmental impacts associated with Holtec's decommissioning plan because they are neither completely nor accurately discussed in "the previously issued environmental impact statements, much less environmental impacts resulting from events that occurred after the previous EIS's were issued, or for some other reason were not considered at all.

Holtec's PSDAR reviews some environmental impacts of decommissioning (pgs., 20-35). But Holtec fails to show potential environmental impacts that would result from Holtec *not* performing a thorough and proper site assessment at the beginning of the decommissioning process. Such an up-front site assessment is required for Holtec to properly cleanup the site, to provide a valid cost estimate, and to assure the money will be there to do the job needed to protect public health and safety.

As shown here and in the Commonwealth's and Pilgrim Watch's Petitions, the "previously issued environmental impact statements" were inadequate.

11. <u>The lack of sufficient decommissioning funds increases the need for an environmental impact statement.</u>

Neither Holtec Pilgrim nor HDI is financially responsible, neither has or has access to any funds other than the DTF, and the DTF does not and will not have sufficient funds for decommissioning.

The NRC agrees that a shortfall in decommissioning funding would place public health, safety, and the environment at risk.

> The requirements for financial assurance were issued because *inadequate or untimely consideration of decommissioning, specifically in the areas of planning and financial assurance, could result in significant adverse health, safety and environmental impacts. … The purpose of financial assurance is* to provide a second line of defense, if the financial operations of the licensee are insufficient, by themselves, *to ensure that sufficient funds are available to carry out decommissioning (*63 FR 50465, 50473). NRC *Questions and Answers on Decommissioning Financial Assurance,* at 1 (ADAMS Accession No. ML111950031, italics added).

Absent a complete and accurate environmental impact statement, neither the NRC nor anyone else will know what needs to be done to completely and safely decommission Pilgrim and protect the public health and safety, or what is needed to provide real financial assurance.

FACTS[87]

Pilgrim Watch specifically incorporates, as if fully set forth here, the Bases of Finances in section 1, the Facts Supporting section 1, and the Bases of section 2.

As shown above, NEPA and NRC Regulations require an environmental impact statement. The actual facts here make clear that prior environmental statements do not include, and that neither Holtec nor the NRC knows, the actual conditions at the Pilgrim site.

Other facts supporting at least one of section 1 and section 2 include the following.

Pilgrim is located on the shore of Cape Cod Bay; in a densely populated neighborhood; on top of the Plymouth-Carver Aquifer; and it is in America's Hometown, a national

[87] Many of the facts set forth below here also support Contention 1 and should be considered in connection with Contention 1.

tourist location. Its location puts a premium on an early site assessment and NEPA analysis

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1. Pilgrim is sited beside Cape Cod Bay. Due to the topography of the site, contaminants will leak into the Bay.
2. Massachusetts and Cape Cod Bays are tidal. NUREG-1427, 2.2.5.1.
3. 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, marshes and wet lands; in the outgoing tide they will flow into and circulate around Cape Cod Bay and beyond.
4. Climate change is causing sea level rise, increases in the number and severity of storms, and flooding. This will result in contaminants left onsite washing out to Cape Cod Bay and adjacent waters; and hasten corrosion by exposure to salt and moisture of buried pipes, tanks and structures left in the ground that contain radiological or hazardous material. Low Level Radioactive Waste is stored about 30 feet from Cape Cod Bay, Holtec's LTA does not adequately consider and analyze this. An early site assessment and NEPA must analyze the impact of climate change on the site.
5. Holtec's LTA and previous environmental impact statements do not adequately consider the possibility of site-specific impacts resulting from the plant's close proximity to residential neighborhoods (and potential airborne asbestos and lead contamination, as well as potential impacts from a radiological incident or radiological dispersion during demolition work and disruption of soils).

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

Neither Holtec nor the NRC knows what contamination exists at the Pilgrim site.

7. Holtec has not conducted a site analysis.
8. Holtec has not yet reviewed what it calls Entergy's "Historic Site Assessment." (HSA)
9. Holtec admits a review of the HSA is needed "to support the identification, categorization, and quantification of radiological, regulated, and hazardous wastes in support of waste management planning." Holtec PSDAR pp 8-9.
10. Holtec has made only an initial cursory "review of PNPS decommissioning records required by 10 CFR 50.75(g) records.
11. Holtec admits that a new site assessment is necessary so that "radiological, regulated, and hazardous wastes are identified, categorized and quantified to support decommissioning and waste management planning. " (CDE, p. 14).
12. Previously issued environmental impact statements do not and cannot bound numerous environmental impacts associated with Holtec's decommissioning plan that are either incompletely and inaccurately discussed in the previously issued environmental impact statements or are not considered by them at all.
13. A site assessment at the Pilgrim site would provide new and important information that is not included in previously issued environmental impact statements, and that would show that previously issued environmental impact statements are outdated and incomplete.

14. NEPA explicitly requires an Environmental Impact Statement if an action such as a license transfer has "effects that *may be* major and which are *potentially* subject to Federal control and responsibility."

Specific facts and impacts that Holtec and previous environmental impacts have not adequately considered, the effects of which "may be major and which are potentially subject to Federal control and responsibility."

15. Holtec says its estimates are based on nothing more than what appears to be an initial cursory "review of PNPS decommissioning records required by 10 CFR 50.75(g) records." Holtec says it will review of what it calls Entergy's "Historic Site Assessment (HSA)" sometime in the future (PSDAR, 8-9)
16. Holtec has no basis to justify its assumption that there is "no significant contamination" on the Pilgrim site. (DCE, p.2)
17. The GEIS, SEIS and Holtec incorrectly assume that the Pilgrim site is essentially clean. However, GEIS, SEIS, PSDAR and LTA ignore both old information regarding the reactor's history, and new and significant information since the GEIS and SEIS were published. These documents do not bound environmental impacts. A new site assessment and NEPA are required.
18. An early site assessment and NEPA analysis will prevent the unexpected expenses experienced at other sites.
19. An updated site analysis or environmental impact statement would show that actual decommissioning costs, particularly removal of contamination and site restoration, may be far greater than Holtec's current LTA estimates, and prevent what happened at other sites from happening here. This is illustrated by the facts that:

a. At Connecticut Yankee, previously undiscovered strontium-90 contributed to the actual cost of decommissioning Connecticut Yankee being double what had been estimated.

b. During the decommissioning of Maine Yankee, the licensee encountered pockets of highly contaminated groundwater dammed up by existing structures, leading to cost increases.

c. The Yankee Rowe site in Massachusetts incurred significant cost increases during decommissioning when PCBs were discovered in paint covering the steel from the vapor container that housed the nuclear reactor, as well as in sheathing on underground cables.

Other plants such as Diablo Canyon 1&2, and San Onofre 2&3 have ended up costing much more than what was estimated for decommissioning.

Pilgrim's History of Spills, Leaks, Mismanagement - Requires Site Assessment & NEPA[88]

20. Pilgrim opened with bad fuel and no off-gas treatment system

21. Later Pilgrim blew its filters in June 1982.

22. 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.[89]

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

[89] *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)

23. Due to these leaks, many lethal radionuclides, including for example tritium, manganese54, cesium-137, Sr-90, I-131, cobalt-60, and neptunium[90] were found in the surface water, groundwater, and soils at Pilgrim at levels exceeding "background" levels.
24. 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.
25. 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.)
26. 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.
27. Contamination onsite is exacerbated by Pilgrim's long history of mismanagement.[91]
28. Pilgrim was shut down from 1986-1989 due to a series of failures
29. January 21, 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).
30. February 2014: NRC identified Pilgrim as one of the nine worst performing nuclear reactors in the U.S.

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

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

31. 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/special-oversight.html) Pilgrim remains in the lowest safety ranking in 2019.

32. December 2016, Special Inspection[92]**:** 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."***

33. 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."

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

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

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

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.[93]

36. The pipes and tanks are old and subject to age-related degradation.[94] Most were put in place in the 60's.
37. Some of the pipes and tanks contain industrial process, radionuclides in wastewater and embedded in the pipe/tank.
38. Degradation of these components can lead to leaks of toxic materials into groundwater and soils. A site analysis and NEPA is required.
39. There has been no adequate program for inspecting buried pipes and tanks.
40. 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.[95]

Tritium and Other Radionuclides in Groundwater[96]

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

[93] 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
[94] Pilgrim Watch Post-Hearing Findings of Fact Conclusions of Law, June 9, 2008,11
[95] Ibid 55-59
[96] https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclear-power-station; https://jonesriver.org/pilgrim-contamination/ ; and see Attachment 3 for a full report.

42. 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.
43. 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.[97] 20,000 is the EPA limit; California's goal is 400.
44. 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.
45. 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.[98]
46. 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. [99]
47. 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). [100]
48. 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

[M] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, January 2014
[98] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, May 2013
[99] Mass MDPH Pilgrim Nuclear Power Station (PNPS) tritium in groundwater monitoring wells, Sept 2013
[100] Split sample testing at MDPH

near a basin that collects radiologically contaminated water and ultimately sends it to Cape Cod Bay.

49. Entergy and Mass DPH continued their investigations, unsure of the sources of leakage, and performed no cleanup.[101]

50. 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.[102]

51. 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. [103]

52. 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.

53. 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.[104]

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

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[101] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. Jan. 2014.
[102] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. May 2014.
[103] Mass DPH. Pilgrim Nuclear Power Station (PNPS): tritium in groundwater monitoring wells. Aug 2014.
[104] Mass DPH. 1988. Investigation of Radioactive Spill at Pilgrim on November 16, 1988. Prepared by Radiation Control Program.

55. 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.

56. 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.[105]

57. 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[106]

58. When storm drain sampling was done (from 1998-2007), certain parameters were exceeded on many occasions.[107]

59. 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.

60. 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.

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[105] 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

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

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

Holtec reliance on Entergy's environmental radiological monitoring data

61. 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.
62. The NRC's Groundwater Contamination (Tritium) at Nuclear Plants Task Force Final Report, September 1, 2006[108] 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)
63. 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.
64. 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."
65. We cannot rely on a review of monitoring reports. An actual site assessment and NEPA analysis are required.

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

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

Mr. Priest is the Director of the Radiation Control Department, Massachusetts Department of Public Health. He worked at multiple nuclear power plants, including Pilgrim Nuclear Power Station. During that time, he was "responsible for oversight of radiological plant surveys to support power plant operations, the radiological monitoring of the station staff and members of the public, and emergency planning activities with federal, state and local agencies."

66. 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.
67. Further, there were other releases into the environment associated with a former condenser tube refurbishment building east of the radioactive waste truck lock.
68. Historically, contaminated soil from previous site remediation has been "stockpiled" on a small hill along the east protected area fence.
69. 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.
70. 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.
71. 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.

72. 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
73. 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.
74. A complete site characterization (i.e., an assessment of the vertical and horizontal extent of all radiological and non-radiological 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.
75. Industry experience regarding the presence of "hard to detect" and long-lived radionuclides at other nuclear decommissioning sites creates doubt that Holtec will not need to excavate deeper than three feet below grade.
76. The Holtec PSDAR does not detail their plan to address soils outside the structures and components and how they would be characterized and remediated.
77. As written, Holtec does not account for the costs or evaluate the health and safety effects of such a contamination.
78. 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.

79. Radiological Environmental Monitoring: 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.

80. The values in table 3-1 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.

81. 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.

82. Emergency Planning: 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.

83. An adequate radiological emergency preparedness plan would include specific protocols for both "small scale" host community events and "larger scale" state resource scenarios.

84. 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.
85. 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.

Hazardous Waste

86. Both of the Commonwealth's representatives that provided testimony on the Commonwealth's Motion to Intervene and Request for Hearing, Paul Locke and David Howland, stated that until a comprehensive site assessment is performed it is not possible to know what is there and make a reasonable cost estimate.
87. Paul Locke (MassDEP) said that: (1) "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).

88. 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.

89. The potential impact of any such release is unknown until a comprehensive site assessment is conducted."

90. Paul Locke testified further that, "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."

91. 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.

92. 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."

93. Paul Locke said again 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."

94. Paul Locke's opinion is 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."

95. David Howland (MassDEP) testified in agreement with Paul Locke that, "Holtec's PSDAR also does not reference any site-based empirical data to support the work plan or its cost projections."

96. David Howland explained: "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 clean-up 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."

Hazardous Waste Dumping

97. Drums of hazardous waste were buried on the Pilgrim site in the 1980s and/or 1990s. Holtec's LTA does not adequately consider them.

98. 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.

Climate Change Impacts on The Site.

99. Based on current levels of greenhouse gas prediction, the UN Intergovernmental Panel on Climate Change (IPCC) 2018 Report[109] shows sea levels will rise more rapidly; severe storms will occur more frequently, coinciding with high tides and exceptional wave heights; rising groundwater tables, and floods more severe. The National Geographic (December 16, 2015) identified Pilgrim among the 13 nuclear reactors impacted by sea-level rise and predicted that, "if significant protective measures were not taken, these sites could be threatened."[110]

100. As climate change impacts get worse and decommissioning commences in 2019 storm drains and stormwater testing (discussed above) will become even more critical, as these outlets could become further conduits for pollution into Cape Cod Bay. Increased flooding and storm intensity, sea level rise, and rising groundwater tables could increasingly flush contaminates present in groundwater and soil into Cape Cod Bay.

101. Numerous negative impacts resulting from climate change that need analysis:

[109] https://research.un.org/en/climate-change/reports

[110] http://news.nationalgeographic.com/energy/2015/12/151215-as-sea-levels-rise-are-coastal-nuclear-plants-ready/

- Increased flooding and storm surge resulting from climate change is likely to cause corrosion of underground piping, tanks and structures and subsequent leakage. And corrosion and potential leakage of the Greater-than-Class-C waste and low-level waste containers located close to Cape Cod Bay.
- Radiological and hazardous waste contamination, if not cleaned up quickly, will be washed out into Cape Cod Bay unable to be retrieved.
- Severe storms and flooding can result in loss of offsite power and potential damage to the diesel generators located by the bay. The spent fuel pool requires electricity to operate its safety systems. In Fukushima extreme weather conditions at the site prevented workers to perform necessary mitigating actions. Severe storms and flooding could present conditions at Pilgrim so that workers could not perform their jobs.

Flooding

102. Flooding risk needs analysis because it can result in contaminants washing out into Cape Cod Bay; and contribute to corrosion of buried components and consequent release of hazardous material.

103. In 2012, the Nuclear Regulatory Commission (NRC) requested information from all U.S. nuclear reactors, including PNPS, to support its review of the Fukushima Daiichi nuclear accident (NRC, 2012). Part of this request addressed flood and seismic hazards at reactor sites.

104. In March 2015, Entergy provided the NRC with a Flood Hazard Re-Evaluation Report prepared by AREVA, Inc. (AREVA, 2015). In September 2015, Jones River Watershed Association (JRWA) commissioned Coastal Risk Consulting, LLC (CRC) to provide an expert analysis of the methodologies and conclusions presented in the AREVA Flood

Hazard Re-Evaluation Report. (https://jonesriver.org/ecology/climate/review-pilgrims-flooding-re-evaluation/)

105. Post shutdown, having a detailed and robust flood assessment for PNPS is important. It will provide the basis for good planning and management for the site leading up to and throughout decommissioning, which will help curb flooding risks and ultimately protect public safety, environmental health, and the economic well-being of the area.

106. The following key points are presented and explained in this report:

- Local Intense Precipitation is shown in the AREVA Report to be a primary hazard of concern that could inundate the site by as much as 2.5 feet of rainwater (AREVA p. 29). However, the AREVA analysis underestimates this risk by using outdated precipitation data and not considering future climatic conditions, which are projected to increase precipitation amounts during heavy rainfall events.
- While the storm surge analysis was robust, sea level rise over the next 50 years was understated by relying primarily on historic rates of sea level rise. This approach produces only 0.46 feet of sea level rise by 2065. However, the National Oceanographic and Atmospheric Association (NOAA) estimates sea level rise of 3.05 feet by 2065.
- Groundwater, subsidence, and erosion are not considered in the analysis, further underestimating the risks to PNPS, particularly when analyzing the combined effects of extreme storm events.
- In addition to storm surge, other factors and mechanisms such as high tide and wave setup dramatically compound flooding. The main flaw in the Combined Flooding section of the AREVA Report relates to the limitations of the term “combined.” Of the five combined event scenarios provided in the NRC guidance document, NUREG/CR-7046,

Appendix H, only one is deemed appropriate for PNPS. This conclusion disregards a wide range of possibilities for analysis with the available.

107. The attached CRC's analysis of the Area report is valuable although it was prepared on a low budget and it too needs to be updated. Climate change impacts are moving quickly. A site assessment and NEPA analysis are required to model flooding impacts based on the most current data.

Low-Level Radioactive Waste (LLRW)

108. Pilgrim's LLRW, for example, includes the control rods, resins, sludge, filters, and will include the entire nuclear power reactor when it is eventually dismantled,[111] and is another potential source of contamination onsite and to Cape Cod Bay resulting in significant increased costs.

109. The waste is stored about 30 feet from Cape Cod bay.

110. The shoreline location makes it susceptible to climate change impacts; hence, a site and NEPA analysis is required.

111. The LLRW waste will remain on the Pilgrim site, like the high-level radioactive waste, until an offsite repository accepts Pilgrim's LLRW. Massachusetts does not belong to any compacts.

Radiological Occupational and Public Dose Based on Outdated Documents- not protective public and worker health.

112. Holtec used the 2002 GEIS to base its decision on radiological impacts to the public and workers. (Holtec PSDAR 5.1.8) The outdated GEIS in turn ***used risk coefficients per unit dose***

[111] High-Level Dollars Low-Level Sense, Arjun Makhijani, A Report of The Institute for Energy and Environmental Research, 1992

recommended by the International Commission on Radiological Protection (ICRP) issued in 1991- **28 years ago**.

113. Holtec's assumed dose ignored new and significant information. The National Academies BEIR VII report (2006),[112] the most recent report from the National Academies, found far greater health impacts than the 1991 ICRP.

114. BEIR VII found mortality rates for women from exposure to radiation were 37.5 % higher than a BEIR 1990 report and that the impact of allowable radiation standards on workers was twice that estimated in 1991.

115. Allowable dose during decommissioning must be reduced to reflect BEIR VII, new and significant information supported by the Commonwealth,

116. BEIR VII lifetime risk model predicts that approximately **1 person in 100 would be expected to develop cancer (solid cancer or leukemia) from a dose of 0.1 Sv [10,000 millirem] above background**" (BEIR VII, p. 8) shows the risk from a lifetime (70 year) exposure to various levels of radiation. Exposure to 25 millirem/year equates to a lifetime cancer risk of 175/100,000; whereas a 10 millirem/year equates to a lifetime cancer risk of 70/100,000-a significant difference when considering that EPA permits only 1 in 100,000.

117. Holtec does not describe, as it should, how it will assess dose. Will it use the Resident Farmer's Model, supported by the Commonwealth? Will it use the Basement Inventory Model for structures left below ground, as agreed upon for example at Vermont Yankee? Both models are most protective of public health and safety.

[112] https://www.nap.edu/catalog/11340/health-risks-from-exposure-to-low-levels-of-ionizing-radiation

Likely Adverse Health Impacts Expected in Special Pathway Receptor Populations and In the General Public

118. Holtec's PSDAR said: "Potential impacts to minority and low-income populations would mostly consist of radiological effects. Based on the radiological environmental monitoring program data from PNPS, the SEIS determined that the radiation and radioactivity in the environmental media monitored around the plant have been well within applicable regulatory limits. As a result, the SEIS found that no disproportionately high and adverse human health impacts would be expected in special pathway receptor populations (i.e., minority and or low-income populations) in the region as a result of subsistence consumption of water, local food, fish, and wildlife." (LTA, 5.1.13 Environmental Justice)

119. Discussed in the foregoing, the NRC's Groundwater Contamination (tritium) at Nuclear Plants Task Force Final Report, September 1, 2006[113] 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," (LLFT Executive Summary ii), showing the SEIS does not bound the environmental impacts and that a site assessment and NEPA analysis are required.

Spent Fuel Unlikely to Leave Site by 2062

120. Holtec assumes "DOE will commence acceptance of PNPS's spent fuel in 2030 and, assuming a maximum rate of transfer described in the DOE Acceptance Priority Ranking &

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

Annual Capacity Report (Reference 10), the spent fuel is projected to be fully removed the Pilgrim site in 2062, consistent with the current DOE spent fuel management and acceptance strategy (References 9 and 10)." DCE, p. 23.78.

121. DOE's January 2013 *Strategy for The Management and Disposal of Used Nuclear Fuel and High -Level Radioactive Waste*. ("DOE Strategy"). [114] 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). It does even try to guess by when an interim or geologic repository might actually exist.

122. DOE qualifies its statement by saying, "With *appropriate authorizations from Congress*," Holtec does not, but should. There has been no enabling legislation in Congress.

123. There is significant opposition to both Holtec's planned interim site in New Mexico and ISP's in West Texas. Yucca has made no progress; there are hundreds of contentions opposing it,[115] along with anticipated lawsuits along transportation routes- from cities, states, environmental groups, such as NIRS[116]

124. Nuclear waste may be stored indefinitely. A site assessment and NEPA need to analyze this likelihood**.**

125. NRC's 2014 Continued Storage Rule discussed onsite storage for 100 years[117] that would be until 3019 for Pilgrim, 57 years longer than Holtec presumed; or indefinitely.

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

115 http://www.state.nv.us/nucwaste/licensing/Contentions_NV.pdf.

116 Civilian Nuclear Waste Disposal, Congressional Research Service, Sept 6, 2018. https://fas.org/sgp/crs/misc/RL33461.pdf); www.NIRS.org

117 https://www.nrc.gov/waste/spent-fuel-storage/wcd.html

Radiological Accidents

126. Radiological accidents are neither remote, speculative nor worst case scenarios; instead they are reasonably foreseeable.

127. HDI (PSDAR, 5.19) concludes that the impacts of PNPS decommissioning on radiological accidents are small and are bounded by the previously issued outdated GEIS. NRC staff concluded in the SEIS that "there are no impacts of severe accidents beyond those discussed in the GEIS." (SEIS 5.1.2). Showing the SEIS does not bound the environmental impact, discussed below.

128. The GEIS was published in 2002 and is outdated. [118] For example, the BEIR VII Report was not published

129. The GEIS was also flawed. In assessing offsite related accidents, the GEIS only considered: seismic events, aircraft crashes (not small aircraft, that pose the more realistic and serious threat), tornadoes with high winds; and fuel related accidents-fuel drops and loss of water, ignoring the greatest danger the partial loss water in the spent fuel pool.

130. The GEIS and SEIS both ignore the escalating terrorist threat with US infrastructure, including nuclear reactors as targets. Both predate awareness of an increased threat from cyber-attacks,[119] drones, and electromagnetic attacks.[120] For example, while reactor safety systems are more or less isolated from an outside cyberattack, a hack knocking out the electrical grid system would shut down power to all reactor safety systems. On-site emergency power

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[118] Comments on The US Nuclear Regulatory Commission's Waste Confidence Generic Environmental Impact Statement, Dr. Gordon Thompson, December 19, 2013.

[119] December 15, 2017, NRC issues license amendment to Pilgrim to change the implementation date for cyber security *upgrades from December 15, 2017 to December 31, 2020 – after Pilgrim is closed.*

[120] ***Electromagnetic Defense Task Force*** (***EDTF***): ***2018 Report***. (Source: US Air Force's Air University; issued Nov 28, ***2018***). From 20–22 August ***2018***, Air University Website, LeMay Papers http://www.defense-aerospace.com/articles-view/release/3/198020/report-highlights-gaps-in-us-electro_magnetic-capabilities,

generators are then vulnerable to insider and armed assault seeking to cause a meltdown. Loss of electric grid may disenable security cameras.

131. The GEIS and SEIS incorrectly assert that the environmental impact of accident-induced or attack-induced pool fires is SMALL. That assertion is incorrect. The environmental impact is LARGE due to the large inventory of radionuclides in the pool.

132. Perhaps because Pilgrim's ISFSI did not yet exist, the GEIS and SEIS totally ignore ISFSI radiological accidents. The casks are vulnerable to attack and releases from cracks caused by age, corrosion, manufacturing defects. Each cask contains a huge amount of radioactivity and each cask contains >1/2 the Cesium-137 released at Chernobyl. The environmental impact is LARGE.

133. The GEIS and SEIS use an inappropriate arithmetic definition of radiological risk, probability times consequences. Holtec's and the GEIS' environmental impact determination with respect to severe accidents, is a risk assessment - the product of the probability and the consequences of an accident. This means that a high consequence low-probability events, like a severe accident, will result in a small impact determination, because the probability is determined to be low so no matter how severe the consequences they will be trivialized.

134. The incomplete and outdated GEIS and SEIS themselves make clear that a site assessment and NEPA analysis are required.

Spent Fuel Pool Accidents Ignored by the GEIS, SEIS and Holtec - Examples

135. **Fuel Handling Accidents**: Accidents can and do happen, even with single-proof cranes. For example at Vermont Yankee (May 2008)[121] . Another mishap or near-miss failure with a

[121] https://www.reformer.com/stories/nrc-reviews-vy-safety-system-after-crane-failure,65923

single-proof crane occurred at Palisades March 18, 2006 attirbutable to worker error[122]. Human error, either in operations or manufacturing, is not considered, as it needs to be, in the GEIS, SEIS or by Holtec

136. Canister Drop in Pool: If a cask is dropped in the pool and the pool floor is breached, there are many safety-related components located on the floors below the spent fuel pool which could be disabled that could simultaneously initiate an accident and disable accident mitigation equipment. If a hole is punched in the pool floor or walls and water is lost simply to the top of the assemblies, a pool fire will likely follow.

137. A canister drop can lead to a crack in the canister- especially a concern with HBU fuel. Each canister contains over ½ the Cesium-137 released at Chernobyl.

138. **Partial drain-down**: The GEIS did not recognize different consequences of both a full drain-down and a partial drain-down. This is an important omission because total drainage of the pool is not the most severe case of water loss. In a partial drain-down the presence of residual water would block air convection, e.g., by blocking air flow beneath the racks.[123] Previously, in filings made during a 2002 license-amendment proceeding, NRC staff assumed that a fire would be inevitable if the water fell to the top of the racks.

139. Pool Fire Ignition: A 10-hour minimum delay time for BWR SNF aged 10 months, as assumed by Holtec, is potentially plausible. But that is not the whole story. For example, an attack scenario could cause partial drain-down and a local radiation field precluding access; and a fuel handling accident during transfer from pool to dry casks - such as a cask drop.

140. Mitigation: Contrary to NRC's and Holtec's current estimate, 10 hours is not a guaranteed enough time to put out a spent fuel fire. An attack scenario could rapidly cause partial drain-

[122] https://www.nirs.org/press/03-20-2006/
[123] http://www.environmental-defense-institute.org/publications/Cover.Ltr.Thompson.NRC.SNF.Short.pdf

down and result in a local radiation field that precludes access to the fire. There is no basis for assuming that a site's Flex program to provide supplemental water will be sufficient.

141. These must be considered in a new site assessment and NEPA analysis.

ISFSI Accidents the GEIS, SEIS and Holtec Ignore

142. Holtec assumes that, "No contamination or activation of the ISFSI pads is assumed. As such, only verification surveys are included for the pad in the decommissioning estimate." (PSDAR, pg.,25). Holtec does not consider, as a site assessment and NEPA analysis should, something going wrong- acts of malice or leak from a crack. A new site assessment and NEA analysis is required.

Vulnerability Pools and ISFSI to Acts of Malice

143. Reactors make ideal targets for outside or inside attackers for the simple reasons that they contain large amounts of radioactivity that could create severe impacts, and their defense is "light" in a military sense.

144. The threat against nuclear power plants is real. According to the 9/11 Commission report, the Sept. 11, 2001 terrorists initially considered attacking a nuclear power reactor.[124] According to a new report "Protecting U.S. Nuclear Facilities from Terrorist Attack: Re-assessing the Current 'Design Basis Threat' Approach,"[125] prepared under a contract for the Pentagon by the Nuclear Proliferation Prevention Project (NPPP) at the University of Texas at Austin's LBJ School of Public Affairs finds that none of the 104 commercial nuclear power reactors in the United States is protected against a maximum credible terrorist attack, such as

[124]http://www.resilience.org/stories/2004-07-25/911-report-reveals-al-qaeda-ringleader-contemplated-ny-area-nuclear-power-plant-p

[125] http://sites.utexas.edu/nppp/files/2013/08/NPPP-working-paper-1-2013-Aug-15.pdf

the one perpetrated on September 11, 2001, nor against airplane attacks, nor even against readily available weapons such as rocket propelled grenades and 50-caliber sniper rifles.

145. The design of GE BWR Mark I reactors like Pilgrim makes those reactors highly vulnerable to attack because their spent fuel pools are in the top floor of the reactor, outside primary containment with a light roof structure overhead

146. Pilgrim's spent fuel when removed from inside the reactor is placed in thin-walled dry casks. The casks are stacked vertically out in the open making them vulnerable to attack. Each cask contains about ½ the Cesium-137 released during the Chernobyl accident.

147. Pilgrim's spent fuel when removed from inside the reactor is placed in thin-walled dry casks. The casks are stacked vertically out in the open making them vulnerable to attack. Each cask contains about ½ the Cesium-137 released during the Chernobyl accident.

1 4 8 . Dr. Gordon Thompson also analyzed the impact of a shaped charge as one potential instrument of attack.[30] The analysis shows that the cylindrical wall of the canister is about 1/2 inch (1.3 m) thick, and could be readily penetrated by available weapons. The spent fuel assemblies inside the canister are long, narrow tubes made of zirconium alloy, inside of which uranium oxide fuel pellets are stacked. The walls of the tubes (the fuel cladding) are about 0.023 inch (0.6 mm) thick. Zirconium is a flammable metal.

[30] Gordon R. Thompson, *Environmental Impacts of storing Spent Nuclear Fuel and High- Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Waste Confidence Decision and Environmental Impact Determination* (Cambridge, Massachusetts: Institute for Resource and Security Studies, 6 February 2009). Tables also in Declaration of 1 August 2013 by Gordon R. Thompson: Comments on the US Nuclear Regulatory Commission's Draft Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a US Mark I Boiling Water Reactor

149. **Table 7-7: Performance of US Army Shaped Charges, M3 and M2A3**

Target Material	Indicator	Type of Shaped Charge	
		M3	M2A3
Reinforced concrete	Maximum wall thickness that can be perforated	60 in	36 in
	Depth of penetration in thick walls	60 in	30 in
	Diameter of hole	• 5 in at entrance • 2 in minimum	• 3.5 in at entrance • 2 in minimum
	Depth of hole with second charge placed over first hole	84 in	45 in
Armor plate	Perforation	At least 20 in	12 in
	Average diameter of hole	2.5 in	1.5 in

Notes: (a) Data are from: Army, 1967, pp 13-15 and page 100. (b) The M2A3 charge has a mass of 12 lb, a maximum diameter of 7 in, and a total length of 15 in including the standoff ring. (c) The M3 charge has a mass of 30 lb, a maximum diameter of 9 in, a charge length of 15.5 in, and a standoff pedestal 15 in long.

150. **Table 7-8: Types of Atmospheric Release from a Spent-Fuel-Storage Module at an ISFSI as a Result of a Potential Attack**

Type of Event	Module Behavior	Relevant Instruments and Modes of Attack	Characteristics of Atmospheric Release
Type I: Vaporization	• Entire module is vaporized	• Module is within the fireball of a nuclear-weapon explosion	• Radioactive content of module is lofted into the atmosphere and amplifies fallout
Type II: Rupture and Dispersal (Large)	• MPC and overpack are broken open • Fuel is dislodged from MPC and broken apart • Some ignition of zircaloy fuel cladding may occur, without sustained combustion	• Aerial bombing • Artillery, rockets, etc. • Effects of blast etc. outside the fireball of a nuclear weapon explosion	• Solid pieces of various sizes are scattered in vicinity • Gases and small particles form an aerial plume that travels downwind • Some release of volatile species (esp. cesium-137) if incendiary effects occur

Type III: Rupture and Dispersal (Small)	• MPC and overpack are ruptured but retain basic shape • Fuel is damaged but most rods retain basic shape • No combustion inside MPC	• Vehicle bomb • Impact by commercial aircraft • Perforation by shaped charge	• Scattering and plume formation as for Type II event, but involving smaller amounts of material • Little release of volatile species
Type IV: Rupture and Combustion	• MPC is ruptured, allowing air ingress and egress • Zircaloy fuel cladding is ignited and combustion propagates within the MPC	• Missiles with tandem warheads • Close-up use of shaped charges and incendiary devices • Thermic lance • Removal of overpack lid	• Scattering and plume formation as for Type III event • Substantial release of volatile species, exceeding amounts for Type II release

151. **Types of Atmospheric Release from a Spent-Fuel-Storage Module at an ISFSI as a Result of a Potential Attack**

- One scenario for an atmospheric release from a dry cask would involve mechanically creating a comparatively small hole in the canister. This could be the result, for example, of the air blast produced by a nearby explosion, or by the impact of an aircraft or missile. If the force was sufficient to puncture the canister, it would also shake the spent fuel assemblies and damage their cladding. A hole with an equivalent diameter of 2.3 mm would release radioactive gases and particles and result in an inhalation dose (CEDE) of 6.3 rem to a person 900 m downwind from the release. Most of that dose would be attributable to release of two-millionths (1.9E-06) of the MPC's inventory of radioisotopes in the "fines" category.
- Another scenario for an atmospheric release would involve the creation of one or more holes in a canister, with a size and position that allows ingress and egress of air. In

addition, this scenario would involve the ignition of incendiary material inside the canister, causing ignition and sustained burning of the zirconium alloy cladding of the spent fuel. Heat produced by burning of the cladding would release volatile radioactive material to the atmosphere. Heat from combustion of cladding would be ample to raise the temperature of adjacent fuel pellets to well above the boiling point of cesium.

152. Pilgrim's ISFI is being moved to higher ground to a location very close to Rocky Hill Road, a public thoroughfare. Most of the vegetation was removed to the street. A site and NEPA analysis should analyze its vulnerability.

Casks may corrode and leak – especially over a long period of onsite storage

153. Casks may remain onsite indefinitely subjected at Pilgrim, for example, to salt induced stress corrosion cracking and threatened by sea level rise. The thin (0.5") stainless steel canisters crack may crack within 30 years. No current technology exists to inspect, repair, or replace cracked canisters. With limited monitoring, we will only know after the fact that a cask has leaked radiation. [126]

154. NRC's Mark Lombard stated that there is no technology to find cracks or judge its depth in Holtec Casks[127]. (October 6, 2015)

155. Dr. Kris Singh said that it is not feasible to repair Holtec's steel canisters. (October 14, 2014).[128]

156. Holtec provides no information on Pilgrim's cask warranty. From San Onofre we understand a cask is guaranteed for manufacturing defects for 25 years and no warranty for corrosion.

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[126] San Onofre Dry Cask Storage Issues analyses at:
https://sanonofresafety.files.wordpress.com/2011/11/drycaskstorageissues2014-09-23.pdf

[127] (https://www.youtube.com/watch?v=QtFs9u5Z2CA&t=17s)

[128] (https://www.youtube.com/watch?v=QtFs9u5Z2CA&t=17s)

High Burnup Fuel (HBU)

157. Pilgrim has approximately 35% HBU; yet the NRC is just starting a test to see whether the casks can handle it, with results not in until 2027

158. NRC Meeting Presentation Slides Dry Storage & Transportation of High Burnup, 9/6/18 meeting, slides 14 & 15: NRC said that storage and transportation of HBU is safe, providing no technical bases, for 60 years – no guarantee for longer storage when fuel may still be onsite.

Consequences of a spent fuel pool fire or cask rupture.

159. The GEIS, SEIS and Holtec minimize the potential consequences of a spent fuel pool fire or a cask rupture. The amount of radiation released likely would far exceed the EPA's one rem release limit,

160. Studies of the consequences of a spent fuel pool fire show huge, potential consequences, ignored by Holtec and the documents Holtec relies on.

- 2016 Princeton Study: A major Spent Fuel Pool fire could contaminate as much as 100,000 square kilometers of land (38,610 square miles) and force the evacuation of millions.[129]
- 2013 NRC Study: A severe spent fuel pool accident would render an area larger than Massachusetts uninhabitable for decades and displace more than 4 million people.[130]
- 2006 Massachusetts Attorney General Study: $488 Billion dollars, 24,000 cancers, hundreds of miles uninhabitable[131]

[129] Frank N. von Hippel, Michael Schoeppner, "Reducing the Danger from Fires in Spent Fuel Pools," Science & Global Security 24, no.3 (2016): 141-173 http://scienceandglobalsecurity.org/archive/sgs24vonhippel.pdf;Richard Stone, "Spent fuel fire on U.S. soil could dwarf impact of Fukushima," *Science*, May 24, 2016. (NRC variable at: http://www.sciencemag.org/news/2016/05/spent-fuel-fire-us-soil-could-dwarf-impact-fukushima

[130] Consequence Study of a Beyond Design-Basis Earthquake Affecting the Spent Fuel Pool for A U.S. Mark I Boiling Water Reactor (October 2013) at 232 (Table 62) and 162 (table 33), Adams Accession NO ML13256A342)

[131] The Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene With respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plants Operating License and Petition for Backfit

161. Dry Cask: A typical cask would contain 1.3 MCi of cesium-137, about half the total amount of Cesium-137 released during the Chernobyl reactor accident of 1986. Most of the offsite radiation exposure from the Chernobyl accident was due to Cesium-137. Thus, a fire inside an ISFSI module from a terrorist attack or significant rupture of the cask could cause significant radiological harm[132] and huge expense.

Holtec's LTA and previous environmental impact statements ignore potential costs from fires in structures, systems and components containing radioactive and hazardous material.

162. There is a serious concern about fire protection for the structures, systems, and components containing radioactive and hazardous materials in storage. Capabilities to monitor for and respond to these kinds of toxic emergencies are not addressed by Holtec. Fire in a building would result in increase in mixed waste impacting worker and public health.

163. The documents that Holtec relies upon, are outdated and factually incorrect. They do not bound environmental impact.

Emergency Planning

164. The risk remains, described in foregoing. 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

Order Requiring New Design features to Protect Against Spent Fuel Pool Accidents, Docket No. 50-293, May 26, 2006 includes a Report to The Massachusetts Attorney General On The Potential Consequences Of A Spent Fuel Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant, Jan Beyea, PhD., May 25, 2006 (NRC RC Electronic Hearing Docket, Pilgrim 50-293-LR, 2—6 pleadings, MAAGO 05/26 (ML061640065) & Beyea (ML061640329)

[132] Environmental Impacts of Storing Spent Fuel and High-Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Nuclear Waste Confidence Decision and Environmental Impact Determination, Gordon Thompson, February 6, 2009; Comments on the US Nuclear Regulatory Commission's Draft Consequence Study of a Beyond Design Basis Earthquake Affecting Spent Fuel Pool
for a US Mark 1 Boiling Water Reactor, Gordon Thompson, August 1, 2013, pg., 30

"larger scale" state resource scenarios. (John Priest Testimony, Commonwealth's Petition)

165. 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. (John Priest Testimony, Commonwealth's Petition)

166. A timely evacuation would not be possible, absent funding for training and equipping emergency personnel and institutions- such as nursing homes, hospitals, group homes, schools etc.

167. There is no reasonable assurance of mitigating an accident, especially after a successful terrorist attack resulting in a quick and large radiation field.

168. 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.

Without a new Site assessment & NEPA analysis, we cannot determine what contamination needs remediation and measures must be taken to mitigate future contamination

169. Contrary to Holtec's apparent assumptions, the Pilgrim site is not "clean."

170. Holtec's previous environmental impact statements do not adequately consider the generation and storage of non-radiological contaminants both as currently existing and created during decommissioning of PPS and the continued operation and decommissioning of the ISFSI.

171. Holtec's previous environmental impact statements do not adequately consider the existence of unidentified or inadequately identified, characterized or quantified, radiological and non-radiological contamination.

172. Holtec's previous environmental impact statements do not adequately consider known and unknown contamination at Pilgrim resulting from previously identified tritium and other leaks, buried hazardous waste, opening with bad fuel and no filtration and blowing its filters in 1982.

173. Holtec's previous environmental impact statements do not adequately considered the possibility of site-specific impacts resulting from the plant's close proximity to residential neighborhoods (and potential airborne asbestos and lead contamination, as well as potential impacts from a radiological incident)

174. Holtec has provided no identification, characterization and quantification of species that may become listed as endangered or threatened in the next 100 or more years;

175. Climate change is expected to cause sea level rise and increases in the number and severity of storms and flooding. Holtec's previous environmental impact statements do not adequately consider this.

176. Holtec's previous environmental impact statements do not adequately consider the unique environmental and economic impacts related to the length of indefinite spent fuel storage.

177. Holtec's previous environmental impact statements do not adequately consider likely adverse health impacts expected in special pathway receptor populations and for that matter in the general public

178. Holtec's LTA incorrectly assumed and concluded that the environmental impacts associated with planned PNPS site specific decommissioning activities are bounded by the previously issued environmental impact statement." (Holtec PSDAR, 5.1)

179. Holtec's assumed radiological occupational and public dose are based on outdated documents, and are inaccurate

180. Holtec's LTA and previous environmental impact statements do not adequately consider potential radiological incidents at the site, including environmental impacts from the storage of spent nuclear fuel in both the pool and on the ISFSI that also includes impacts resulting from the possibility of terrorist attack.

181. Holtec's LTA and previous environmental impact statements do not adequately consider potential environmental effects of continued storage of spent nuclear fuel, including the possibility of indefinite storage onsite and the possibility of a terrorist attack on stored spent nuclear fuel.

182. Holtec's LTA and previous environmental impact statements do not adequately consider the possibility of accidents during transfers of spent nuclear fuel from the spent fuel pool to dry casks and from old dry casks to new dry casks or transfer have not been adequately considered

183. Holtec's previous environmental impact statements ignore potential costs from fires in structures, systems and components containing radioactive and hazardous material.

184. The license transfer agreement raises significant questions with respect to safety hazards and whether the health and safety of the public will be affected.

185. The LTA has environmental effects that may be major and are subject to NRC control.

A lack of sufficient funds to carry out decommissioning could result in significant adverse health, safety and environmental impacts, and would increase the need for an updated site assessment and environmental impact statement.

186. The NRC agrees that a shortfall in decommissioning funding would place public health, safety, and the environment at risk.

187. An updated site assessment and environmental impact statement is essential to reduce risks to the public health, safety and the environment.

188. An updated site assessment and environmental impact statement must consider both current and future conditions at Pilgrim, and whether Holtec Pilgrim and HDI are financially capable of dealing with potential adverse health, safety and environmental impact.

189. An updated site assessment and environmental impact statement must also consider the reasons that PNPS is now, and at least since September of 2015 has been, in the NRC's lowest category of operating reactors, Category 4.

190. An updated site assessment and environmental impact statement would show and confirm that Holtec has not adequately considered the potential environmental impacts of decommissioning, or the costs of mitigating the potential impacts that an updated site assessment and environmental impact would show.

191. An updated site assessment and environmental impact statement would show and confirm that the funds in Pilgrim's Decommissioning Trust Fund, or otherwise available to Holtec-

Pilgrim and HDI are not sufficient to mitigate the potential health, safety and environmental impacts of decommissioning.

192. An updated site assessment and environmental impact would show and confirm potential costs that the Decommissioning Funding Cash Flow Analysis in Holtec's CDE does not consider.

193. An updated site assessment and environmental impact would show and confirm that costs reflected in Holtec's LTA and Cash Flow Analysis rest on incorrect assumptions.

An updated site analysis or environmental impact statement would show and confirm that decommissioning costs will rise faster than inflation.

194. An updated LTA and site assessment and environmental impact statement would show and confirm that the Decommissioning Funding Cash Flow Analysis in Holtec's CDE incorrectly assumes that decommissioning costs will not increase faster than inflation.

195. An updated LTA and site assessment and environmental impact statement would show and confirm that the rates of increase in decommissioning cost are, and will be, higher than general inflation.

196. An updated LTA and site assessment and environmental impact statement would show and confirm that, as the NRC (NRC Questions and Answers on Decommissioning Financial Assurance) has found:

d. The NRC formulas represent the cost to decommission today, not in the future. Id.

e. Due to rising costs, the future value of decommissioning will be much larger than the NRC formula calculated today.

f. 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.

g. The rates of increase in decommissioning cost are higher than general inflation.

197. An updated LTA and site assessment and environmental impact statement would show and confirm that the NRC findings that increases in decommissioning costs are higher than inflation:

h. As shown by Callan's 2015 Nuclear Decommissioning Funding Study, total decommissioning cost estimates rose 60% between 2008 and 2014. Callan, 2015 Report; and rose approximately 11% from the previous year.

i. As shown by Callan's 2018 Nuclear Decommissioning Funding Study, decommissioning costs increased at an annual rate of about 5.8 percent between 2008 and 2016, and total estimated decommissioning costs for all U.S. reactors has increased from $55.1 billion in 2008 to 88.1 billion in 2017 – i.e., by about 60% over the ten-year period.

An updated site analysis or environmental impact statement would show and confirm that Holtec Pilgrim and HDI do not have sufficient assets.

198. An updated LTA and site assessment and environmental impact statement would show and confirm that the only significant asset of Holtec Pilgrim and HDI is the Pilgrim Decommissioning Trust Fund.

199. An updated site analysis or environmental impact statement would show and confirm that the assets of Holtec Pilgrim and HDI are insufficient to cover costs of dealing with the environmental impacts

200. An updated site analysis or environmental impact statement would show and confirm that the assets of Holtec Pilgrim and HDI are insufficient to pay the decommissioning costs outlined in Holtec's LTA. For example,

201. An updated updated site analysis or environmental impact statement would show and confirm that the Pilgrim Decommissioning Trust Fund does not provide an appropriate basis to show that Holtec Pilgrim and HDI are financially qualified to accomplish the decommissioning or avoid placing the place public health, safety, and the environment at risk. For example:

- No Holtec entity except Holtec Pilgrim and HDI has any financial responsibility.
- There is no Parent Company Guarantee.
- Neither Holtec Pilgrim nor HDI has agreed to put any monies recovered from DOE into the Decommissioning Trust Fund.
- Because Pilgrim is "merchant plant" ratepayers cannot be required.to pay post-closure costs that Holtec Pilgrim and HDI have insufficient assets to pay.

202. An updated site analysis or environmental impact statement would show and confirm that the neither Holtec Pilgrim nor HDI is financially responsible.

203. An updated site analysis or environmental impact statement would show and confirm that Holtec's projected contingency allowance is not sufficient.

An updated site analysis or environmental impact statement would show and confirm that Holtec has not considered potential significant costs

204. An updated site analysis or environmental impact statement would show and confirm that Holtec's cost estimates ignore the cost of managing Low Level Radioactive Waste or its environmental impact.

205. An updated site analysis or environmental impact statement would show and confirm that Holtec's estimates do not consider costs likely to result from climate change impacts on the site, or the environmental impacts of climate change.

206. An updated site analysis or environmental impact statement would show and confirm that Holtec's costs estimates ignore both the environmental impacts of radiological accidents and the costs of mitigating radiological accidents.

207. An updated site analysis or environmental impact statement would show and confirm that Holtec's estimates do not consider ignore both potential costs from fires in structures, systems and components containing radioactive and hazardous material, and their related costs.

208. An updated site analysis or environmental impact statement would show and confirm that Holtec's cost estimates do not adequately increased costs for overhead and project management. resulting from consider delays in the work schedule.

209. An updated site analysis or environmental impact statement would show and confirm that Holtec's costs estimates do not include the funds that will be required for dealing with environmental impacts.

210. An updated site analysis or environmental impact statement would show and confirm that neither the economic impacts of decommissioning nor their resulting costs are "bounded" by the previously filed environmental impact statements.

211. An updated site analysis or environmental impact statement would show and confirm that it is unlikely that DOE will remove all spent fuel from the Pilgrim site by 2063. Holtec has not provided a sufficient or satisfactory basis for its assumption that DOE will do so.

212. An updated site analysis or environmental impact statement would show and confirm that nuclear waste may be stored at Pilgrim indefinitely.

213. An updated site analysis or environmental impact statement would show and confirm that Holtec's cost estimates do not consider costs of spent fuel management after 2063.

214. An updated site analysis or environmental impact statement would show and confirm that Holtec's cost estimates do not consider costs of maintaining security at the site after 2063.

215. An updated site analysis or environmental impact statement would show and confirm that Holtec will be required to continue paying ISFSI maintenance and security as long as spent fuel is on site.

216. An updated site analysis or environmental impact statement would show and confirm that Holtec's cost estimates do not consider the lack of funding for the construction of a Dry Fuel Transfer Station to move spent fuel into new dry casks, or for the purchase of new casks and labor and material costs to transfer spent nuclear fuel into new casks.

217. An updated site analysis or environmental impact statement would show and confirm that Pilgrim's the dry casks of spent nuclear fuel will have to be repacked before they can be

218. An updated site analysis or environmental impact statement would show and confirm that Holtec's assumed socioeconomics costs of decommissioning are outdated and incorrect.

219. An updated LTA and site analysis or environmental impact statement would show and confirm that Holtec's cost estimates do not consider pending state-law requirements that will decrease funds available for radiological decontamination.

220. An updated LTA and site analysis or environmental impact statement would show and confirm that Holtec's cost estimates do not consider DTF funds that would not be available if NRC does not grant Holtec's exemption request to use the DTF for spent fuel management costs and site remediation.

221. An updated LTA and site analysis or environmental impact statement would show and confirm that pending Massachusetts state-law requirements would decrease funds available for radiological decontamination.

222. An updated LTA and site analysis or environmental impact statement would show and confirm that exemption requests filed by Entergy may not be transferable to Holtec.

223. An updated site analysis or environmental impact statement would show and confirm that the proposed license transfer and PSDAR will lead to a shortfall in the amount of funding available to fully and safely decommission and radiologically decontaminate Pilgrim and manage its spent nuclear fuel. Any such shortfall could place public health, safety, and the environment at risk.

224. An updated site analysis or environmental impact statement would show and confirm that Holtec Pilgrim's and HDI's lack of sufficient decommissioning funds increases the need for such an updated site analysis and environmental impact statement.

225. The proposed license amendment does not simply confirm Pilgrim's current licenses.

226. The proposed license amendment requires the NRC to find that "Holtec Pilgrim LLC is financially qualified" and that Holtec Decommissioning International is both "technically and financially qualified."

227. The proposed license amendment deletes the requirements that Pilgrim's owner "provide decommissioning funding assurance of no less than $396 million," provide a Provisional Trust

fund in the amount of "$70 million," and "have access to a contingency fund of not less than fifty million dollars."

228. The proposed license agreement deletes the requirement that the Decommissioning Trust agreement prohibit investments in the Pilgrim Owner's parent company.

The License Transfer Application cannot be approved until:

1. Holtec has conducted a new and comprehensive site assessment;
2. Holtec has submitted the Supplement to Applicant's Environmental Report required by 10 CFR 51.53(d);
3. The updated and accurate environmental report and the environmental review required by NEPA and NRC regulations have been completed,
4. Holtec has revised and updated its application to reflect the actual conditions at Pilgrim, and revised its PSDAR and DCE decommissioning estimates to reflect these conditions and the required environmental reports.

CONCLUSION

For the reasons stated, Holtec's License Transfer Application should be denied in order to protect public health, safety, the environment and the Commonwealth's pocket book.

Respectfully submitted on March 4, 2019,

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