PILGRIM WATCH
Pilgrim Risks: Accidents and Daily Operations
Spring 2014

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PILGRIM WATCH – SPRING, 2014
Risks: Accident and Daily Operations

Pilgrim Station
Type: Boiling Water Reactor, General Electric Mark I.
Size: 690 MWE
Ordered: 08/07/65
Cost Construction: about $200 million
Opened: 12/09/72
Original License Expired: June 8, 2012
Re-License Application: Filed January 2006 to extend operations to June 8, 2032-application granted May 29, 2012- despite unresolved filings before the NRC

Pilgrim: How Boiling Water Reactors Work

In a typical commercial boiling-water reactor, (1) the core inside the reactor vessel creates heat, (2) a steam-water mixture is produced when very pure water (reactor coolant) moves upward through the core, absorbing heat, (3) the steam-water mixture leaves the top of the core and enters the two stages of moisture separation where water droplets are removed before the steam is allowed to enter the steam line, and (4) the steam line directs the steam to the main turbine, causing it to turn the turbine generator, which produces electricity. The unused steam is exhausted into the condenser where it is condensed into water. The resulting water is pumped out of the condenser with a series of pumps, reheated and pumped back to the reactor vessel. The reactor’s core contains fuel assemblies that are cooled by water circulated using electrically powered pumps. These pumps and other operating systems in the plant receive their power from the electrical grid. If offsite power is lost emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators. Other safety systems, such as the containment cooling system, also need electric power. Boiling-water reactors contain between 370-800 fuel assemblies, Pilgrim’s 580. See also an animated diagram.
**ACCIDENTS**

**Introduction: Fukushima Could it happen here?**

*Fukushima: the Story of a Nuclear Disaster* by David Lochbaum, Edwin Lyman, Susan Q. Stranahan and the Union of Concerned Scientists, 2014\(^1\) concluded that,

A Fukushima-type nuclear disaster could happen in the U.S. Fukushima wasn’t a “Japanese” nuclear accident—it was an accident that happened to occur in Japan. In fact, if exposed to similarly complex challenges, all 100 operating reactors in the United States would likely have similar outcomes. Worse, Japanese and U.S. regulators share a mindset that severe, supposedly “low probability” accidents are unlikely and not worth the cost and time to protect against. Fukushima showed that unlikely events do occur.

Nuclear power can be safer—but U.S. regulators aren’t doing their job: Despite a long history of complacency and underestimating risks, the U.S. agency charged with nuclear power—the Nuclear Regulatory Commission (NRC)—could heed the lessons of Fukushima and improve U.S nuclear safety. Unfortunately, the NRC hasn’t learned Fukushima’s lessons—and U.S. nuclear power plants aren’t as safe as they could and should be.

**Pilgrim is the same design as the Fukushima reactors and shares its flaws.**

**Recent History**

- **2011: Pilgrim had two “near misses”**\(^2\). A “near miss” raises the risk of damage to the reactor core and thus to the safety of workers and the public.

<table>
<thead>
<tr>
<th>Reactor and Location</th>
<th>Owner</th>
<th>Highlights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilgrim Plymouth, MA</td>
<td>Entergy</td>
<td>SIT: Security problems prompted the NRC to conduct a special inspection. Details of the problems, their causes, and their fixes are not publicly available.</td>
</tr>
<tr>
<td>Pilgrim Plymouth, MA</td>
<td>Entergy</td>
<td>SIT: When restarting the reactor after a refueling outage, workers overreacted to indications that the water inside the reactor was heating up too rapidly, and lost control of the reactor. The plant’s safety systems automatically kicked in to shut down the reactor.</td>
</tr>
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\(^2\) The NRC and Nuclear Power Plant Safety in 2011: Full Report, Living on Borrowed Time, Union Concerned Scientists, pg.,8
- **2012**: Pilgrim re-licensed to operate to 2032

- **2013**: Pilgrim’s performance rating by NRC dropped due to multiple shutdowns and complications placing it among 22 reactors in the country requiring more oversight.

- **2014**: NRC lowers Pilgrim’s performance to degraded and increases oversight. Pilgrim joins 7 other U.S. plants marked “degraded.”

Fukushima’s first-day plume superimposed over Pilgrim. Subsequent wind shifts spread the plume further afield.

**ACCIDENT RISKS**
1. SPENT FUEL STORAGE- POOL FIRES

The diagram below shows the inside of Pilgrim, and other GE Mark I BWR reactors, including the location of the spent fuel pool.

Diagram of GE Mark I Reactor Buildings and Elevated Radioactive Fuel Storage Pool

- Gap between lidg and fuel pool walls
- Light Weight Roof and Wall Structure
- Fuel Pool
- 2 Ft Thick Outer Reinforced Concrete Reactor Silo Wall
- 5 Ft Thick Inner Reinforced Concrete Pool Wall
- Pressure suppression cooling pool (coolwell)

Risks

Location Pool & High-density Pool Storage: Pilgrim’s spent fuel pool is located outside primary containment, in the upper floor of the reactor with a thin roof overhead making it vulnerable to an air attack, even from a small plane. The pool is densely packed. It was designed to store 880 assemblies, each assembly contains many fuel rods. Because reprocessing was banned by President Carter and there is no offsite national repository as planned, NRC gave Pilgrim approval to store 3,859 assemblies in the same place. In 2013 Pilgrim had 3,279. Years ago, rules required plant owners to maintain space in their spent fuel pools to allow for a full core offload but this requirement was eliminated about 15 years ago. The assemblies are packed in a tight framed configuration placing us at risk of an uncontrolled fire. A fire can occur if the coolant water drops to the top of the assemblies from acts of malice, human or mechanical error.

Consequences of a spent fuel pool fire would be unimaginable.
MA Attorney General’s 2006 Analysis

- Based on a 2006 analysis for the Massachusetts Attorney General, the offsite consequences in the event of water loss and a pool fire could be as much as $488 Billion dollars, 24,000 cancers and contamination hundreds of miles downwind.³
- Much of the damage from a pool fire is due to the release of Cesium-137.
- Also, to make the risk meaningful, compare the inventory of Cs-137 in Pilgrim’s pool and what was released at Chernobyl. Chernobyl = 2,403,000 curies Cs-137; Pilgrim’s pool = 44,010,000 curies Cs-137; Pilgrim’s Core= 5,130,000 curies Cs-137. A recent 2012 GAO Report⁴ supports the foregoing consequence discussion.

NRC’s Consequence Study Of A Beyond Design-Basis Earthquake Affecting The Spent Fuel Pool For A U.S. Mark I Boiling Water Reactor (October 2013)⁵

- NRC’s study of spent fuel storage at Peach Bottom, a reactor in Pennsylvania, showed that if even a small fraction of the inventory of a Peach Bottom reactor pool were released to the environment in a severe spent fuel pool accident, an average area of 9,400.00 square miles (Massachusetts = 6,692.824 square miles) would be rendered uninhabitable for decades, displacing as many as 4.1 million people (MA population=6,692,824).

Electric Power Required to Operate Safety Systems: Safety systems are dependent on electricity needed to cool, maintain or makeup water in the spent fuel pool. Electric power is not assured.

Pool Instrumentation: Currently there is no instrumentation in the pools to measure water level and temperature. The NRC Post Fukushima Order (EA-12-051, March 12, 2012) only required pool instrumentation to measure water level, not temperature, and gave licensees until two refueling cycles after submittal of the integrated plan or by December 31, 2016 – whichever comes first- to implement the order.

Measures to Reduce Risk

³ 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 Electronic Hearing Docket, Pilgrim 50-293-LR, 2—6 pleadings, MAAGO 05/26 (ML061640065) & Beyea (ML061640329)
⁵ 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)
Return pool to low density, open-frame design so that if the water drops there can be air convection to prevent an immediate fire and allow time to fix the coolant water problem. Place the rest of the assemblies more than 5 years out of reactor, when they are thermally cool enough, in hardened, dry cask storage onsite until an acceptable offsite solution is provided. Casks are much safer because they do not require mechanical parts or human intervention to function.

Entergy - No Plan To Go To Safer Expedited Transfer Of Assemblies From Pool To Dry Casks

Entergy must go to cask storage in 2015 because the pool is at its maximum capacity. Entergy, like other licensees, only plans to remove the required number of assemblies from the pool to cask storage in order to squeeze in the next core offload- keeping the pool tightly packed and placing the public at risk.

Why? Finances: The decision not to go to expediated transfer of assemblies more than 5 years out of reactor is a financial decision - not a decision based on public safety. Casks cost about $1.5 million each; each cask’s maximum capacity is approximately 62 assemblies. Some casks hold more or less depending on the age and composition of the fuel. Unloading the pool entails additional costs - building a pad for the casks and labor to unload. Availability of casks is not a problem; there is sufficient capacity to produce enough casks to meet projected need.

Entergy is focused on the bottom line (especially in the deregulated market with prices set by cheaper electric generators, natural gas) and unless required to do so will not voluntarily draw down its operating budget to return the pool to its far safer low-density design. NRC has shown no willingness to require licensees to do so, despite the lessons learned from Fukushima where the casks survived the earthquake and tsunami just fine but not the pool. Fukushima Daiichi’s Unit 4 reactor exploded opening the pool to the environment and what is left of the reactor leans precariously to the side.
**Is Expedited Transfer More Expensive?** The short answer is that it shouldn't be. All spent fuel generated in the past and for the foreseeable future will eventually be transferred to dry casks located at reactor sites or centralized facilities. The only question is when.

The total number of casks and size of the related facilities will be the same, whether or not transfer to dry casks is expedited or dragged out. Again, the only question is when the casks and pads be built. There is no reason to think they will be cheaper 10-30 years from now.

**Some Potential Sources of Funding:** The Key Question is: Where is the money going to come from? There are three "possibilities" - but only one of which has any likelihood of succeeding

**Options 1 - Licensees Voluntarily Pay For Expedited Transfer Out Of Operating Income**
The probability of this happening is zero. Licensees may have to spend for some pre-decommissioning transfer because there is no more room in the pool. I see no chance that industry would agree to use operating income for this purpose. Industry's obvious preference is to postpone transfer until it can use its decommissioning fund - money already set aside.

**Option 2- Congress Amends The Nuclear Waste Policy Act That Is Now Restricted To Creating A Permanent Repository - To Do One Of The Following**

(a) Allow use of funds that now are restricted to creating a repository – by 2012, there was approximately $25.4 billion collected in fund leaving $15.1 billion unspent; or  
(b) Add an additional user fee per kWh - 0.1 cents per nuclear kWh would generate an additional $750 million per year that in 5-10 years could pay the $3.7 to $7 billion estimated to transfer 35,000 tons of fuel into dry storage.6

The probability of this happening is not much greater than zero. There is intense pressure on Congress and NRC to find an offsite repository, especially from owners of decommissioned reactors (Ct Yankee, Maine Yankee, Yankee Atomic etc) and from citizens concerned about leaking from former re-processing

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sites such as West Valley. It seems unlikely that Congress will divert offsite repository funds. It also seems unlikely that Congress will create a new fee to be paid by customers.

Option 3– NRC Orders Licensees To Expedite Transfer And Allows Them To Use Decommissioning Trust Fund During Operations To Do So, As Permitted Under (10 CFR 50.82(A)(8)(i)(a))

The probability of this happening is greater than other options. The NRC has the authority to do this. It has already set the precedent by approving use of the decommissioning the fund for spent fuel management during operations.

This option provides that all parties have something to gain. NRC: Taking this significant positive safety step (Option 3), would allow NRC to better satisfy its AEA obligation to protect public health, safety & property- provide defense in depth. It could also go a long way towards reducing the perception that the NRC cares far more about industry’s finances than the public’s interest. Industry gains financially by this option because: (a) Using decommissioning funds for transfer to dry casks during operations would keep that cost out of operating budgets. (b) Less money would have to be spent (out of operating budgets) to address periodic NRC safety requirements regarding spent fuel pool storage. For example to respond to Boraflex degradation, the NRC is requiring adding criticality alarms and more frequent water testing; Turkey Point recently spent $65,000 for alarms. These expenses would be moot if thinned pools. Money now spent to lobby against any "new" NRC requirement (or to avoid/delay implementing them) could be reduced. (c) There should be a significant reduction in legal risks and costs. In particular, industry’s perceived "need" to bring suit to recover SPF management costs from DOE for not providing a repository as promised would be essentially gone. Public gains: Would see a significant reduction is risk to its health, safety and property and a reduction in risk to national security. Nation gains: Would avoid or reduce the Government's (i.e., the taxpayer's) costs of future litigation. To date, the industry has filed dozens of lawsuits, $6.4 billion in total claims, according to figures maintained by the Department of Justice. The government has already paid out $956 million. It’s also spent nearly $170 million simply defending itself against the claims. Department of Energy statistics show that new lawsuits and other costs could eventually push the government's legal liability to $16.2 billion

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7 10 CFR 50.82(a)(8)(i)(A) Decommissioning trust funds may be used by licensee if-- (A) The withdrawals are for expenses for legitimate decommissioning activities consistent with the definition of decommissioning in § 50.2; (B) The expenditure would not reduce the value of the decommissioning trust below an amount necessary to place and maintain the reactor in a safe storage condition if unforeseen conditions or expenses arise and; (C) The withdrawals would not inhibit the ability of the licensee to complete funding of any shortfalls in the decommissioning trust needed to ensure the availability of funds to ultimately release the site- terminate the license.

8 NRC Decommissioning includes activities that reduce residual radioactivity to permit release property & termination license following shutdown (10 CFR 50.2) and excludes spent fuel management (10 CFR 50.54 (b)(b). Nevertheless, NRC has approved requests for exemptions. 5 years prior to license termination or 2 years after permanent shutdown, licensees submit to NRC both its spent fuel management plan (10 CFR 50.54 (b)(b)) and funding program & decommissioning cost estimates (10 CFR 50.75 (f)(3)). Some licensees, such as Pilgrim and Vermont Yankee, asked NRC for an exception in accordance with 10 CFR 50.12 from the requirements of 10 CFR 50.82(a)(8)(i)(A) to use the DTF for spent fuel management expenses. In both cases NRC approved the exception finding a sufficient amount of funds in the decommissioning trust fund and granted the exception. Pilgrim Watch filed a FOIA (Feb 27, 2013) asking for a record of U.S. licensee requests for exemptions and NRC’s responses. NRC’s response is pending.

This should be a no-brainer. It is a clear "win-win-win."

Once again, the real issue is that the cost of transfer to dry casks must be paid for sometime - the only question is when? There is one sane answer – now. It will reduce significant risk. It is in everyone’s interest.

**NRC - No Plan To Require Safer Expedited Transfer of Assemblies From Pool To Dry Casks**

NRC Proposed Waste Confidence Rule –Continued Storage Spent Nuclear Fuel [RIN 3150-AJ20-NRC 2012-0246], December 20, 2013, likely to be finalized by the end of the year, improperly finds that spent fuel assemblies are safe in either the pool or dry casks for 60 years after the end of the license. In Pilgrim's case to 2092 when the spent fuel pool and its supporting structures are 120 years old. During the subsequent 300 years, the NRC finds that the spent fuel assemblies may be safely kept in dry casks onsite and the dry cask pad and casks changed every 100 years. After that, the dry casks may remain onsite indefinitely until an offsite storage facility is available.

**Entergy’s Plan for Dry Cask Storage**

**Casks:** Entergy will use Holtec Hi-Storm 100 casks to store between 30 and 40 dry casks filled with highly radioactive spent fuel assemblies. The casks will be placed on a concrete storage pad 52’ x 238.5’ located about 100 yards from the shore. The pad will eventually hold nearly 100 dry casks. The casks will be onsite for a long time - according to the NRC, perhaps for 300 years or more.

![Diagram of Dual Purpose Storage Cask](image)

Although dry cask storage is safer than pool storage, there is a right way and wrong way to do it. If the Commonwealth’s Land Court rules that the Town of Plymouth did not follow its zoning regulations by not requiring a special permit to build Pilgrim’s dry cask pad, then the ZBA will require a special permit for the pad. Granting a special permit requires a public hearing and allows the town to add conditions.

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10 Pilgrim’s dry cask storage pad: slab/pad elevation=25.25”; bottom of pad elevation=22.25”; slab thickness=3.00”; bottom of compacted structural fill elevation=19.25”; compacted structural fill debth=3.00’ (Stone & Webster (large) Plan C1916 SH 14, Rev.0, Stamped by PE 9/13/12
The Right Way To Store Dry Casks & Entergy’s Way

**Security:** Terrorism is a real threat and Entergy’s security plan is the wrong way.

- **Entergy’s Plan—the Wrong Way**
  - Candlepin bowling for terrorists
- **The Right Way**
  - Disperse and Berm on Entergy’s 1600 acres

**Monitoring:** Dry casks are prematurely degrading from moisture, especially in marine environments (NRC Notice 2013).

- **Entergy’s Plan, the wrong way:** NRC does not require, and no evidence Entergy plans, to install monitors over the casks to measure heat and radiation.
  - The right way is to install monitors to measure temperature and radiation release; establish protocol for notifying State and local community; and require Entergy to provide funding to State and local community for oversight required.

**Prevent Blockage Air Ventilation Vents:** Casks have air holes at bottom and top of casks. If the holes are blocked by ice or debris cooling will not occur.

- **Entergy’s Plan, the wrong way,** will not put in place any mitigation to prevent blockage.
  - The Right Way, is to provide mitigation necessary to prevent blockage - such as placing casks inside an enclosed building, install an overhead roof, and assure in the design that there is drainage around each cask.

**What If Casks Need Replacement - Overpacks:** If casks degrade or the type of cask required for transportation or permanent disposal changes, a spent fuel pool will be needed to replace the cask. This would present a problem at Pilgrim when the reactor, housing the spent fuel pool, is decommissioned but the fuel remains onsite before an offsite repository is available – decades.

- **Solution:** If it is necessary to add another over-pack, there should be a spare onsite or, at the very least, evidence provided that Entergy has spares at a regional site so the spare over-pack can be delivered within 5-6 hours. Neither assurance was provided to citizens at Entergy’s Vermont Yankee reactor. We have no idea what plan Entergy has a Pilgrim.
Climate Change/Sea Level Rise: The problem is that NRC says that casks may remain onsite up to 300 years and future sea level rise is accelerating due to climate change along with storm surges on top of the elevated sea level causing flooding.

Entergy plan, the wrong way, is to place the casks close to the shore, about 100 yards distant.

The right way is to place casks away from Cape Cod Bay and elevated to avoid flooding. Pilgrim owns 1600 acres, most well above sealevel. We must plan conservatively. Since 1938, there have been at least 3 storms with 11+ ft. surges. Each would flood >25 ft. above MSL. The casks may be there for hundreds of years. Entergy owns more than 1500 acres at Pilgrim and has plenty of room to put the casks in a safer location. Simply moving the pad a few feet west would be a big improvement. (Reference: Pine DuBois, Jones River Watershed, Kingston MA)

Vulnerability = 15 ft surge on a 2 ft tide = 17 ft storm tide + 10 ft waves = 27 ft above MSL

Electricity – Necessary to Operate Safety Systems in Pool

The July 2011 NRC Task Force on Lessons Learned From Fukushima directed the staff to do the following: order licensees to provide safety-related ac electrical power for the spent fuel pool makeup system; and order licensees to revise their technical specifications to address requirements to have one train of onsite emergency electrical power operable for spent fuel pool makeup and spent fuel pool instrumentation when there is irradiated fuel in the spent fuel pool, regardless of the operational mode of the reactor. These are plans to reduce risk. At present, there is no indication if the recommendations will be meaningfully implemented in a timely manner? Plans do not make us safe now.

Instrumentation: NRC’s Post Fukushima Order (EA-12-051) only requires instrumentation for water level, not temperature and gives licensees too generous a time to implement the Order. NRC has not completed its functional and programmatic requirements or quality assured standards.

Selected Resources:
Massachusetts Attorney General Request for Hearing ML061640065 (May 26, 2006); Improving spent fuel Storage at Nuclear Reactors,


Blue Ribbon Commission on America’s Nuclear Future in 2010 http://cybercemetery.unt.edu/archive/brc/20120620211605/http:/brc.gov/


• EA-12-051 Adjudication Proceeding http://adams.nrc.gov/ehd/ All Power reactors EA-12-050 & EA-12-051

• A Petition for Rulemaking filed by Diane Curran , as well as Mindy Goldstein of the Emory U. Turner Environmental Law Clinic, to the U.S. Nuclear Regulatory Commission (NRC) on February 2014. The Petition seeks to re-open the License Renewal GEIS (Generic Environmental Impact Statement), in order to consider new and significant information about irradiated nuclear fuel storage impacts that was generated by the NRC Staff during the Expedited Spent Fuel Transfer proceeding, carried out under NRC’s Fukushima "Lessons Learned" activities. Curran and Goldstein filed the Petition on behalf of three dozen environmental groups, including

2. CONTAINMENT FAILURE: VENT & HYDROGEN EXPLOSIONS

Risk Containment Failure - Inherent In Design

Pilgrim is the same design as the failed Fukushima reactors – GE Mark I Boiling Water Reactors (BWRs). Almost forty years ago, the NRC identified a serious design flaw in these reactors – the containment is too small so that in certain accident scenarios the containment would fail in the event of pressure build up. Fukushima demonstrated in real-time that this was true-Units 1, 2, and 3 exploded.

The lack of containment integrity of the GE Mark I was recognized as early as 1972. Dr. Stephen Hanauer, an Atomic Energy Commission safety official recommended that the Mark 1 pressure suppression system be discontinued and any further designs not be accepted for construction permits. Hanauer’s boss, Joseph Hendrie (later an NRC Commissioner) essentially agreed with Hanauer, but denied the recommendation on the grounds that it could mean the end the nuclear power industry in
the U.S.\footnote{Copies of the three original AEC memos, including Hendrie's, November 11, 1971: outlines problems with the design and pressure suppression system containment; September 20, 1972: \url{http://adams.nrc.gov/ehd/EA-12-050 responds that U.S. stop licensing reactors using pressure suppression system}; September 25, 1972: \url{http://adams.nrc.gov/ehd/EA-12-051 responds that U.S. stop licensing reactors using pressure suppression system}; Joseph Hendrie (top safety official at AEC) agrees with recommendation but rejects it saying it "could well mean the end of nuclear power..." All Power reactors EA-12-050 & EA-12-051, Pilgrim Watch Pleading, Exhibit 3} An NRC analysis of the potential failure of the Mark I under accident conditions concluded in a 1985 report that, “Mark I failure within the first few hours following core melt would appear rather likely." In 1986, Harold Denton, then the NRC's top safety official, told an industry trade group that, "The Mark I containment, especially being smaller with lower design pressure, in spite of the suppression pool, if you look at the WASH-1400 safety study, you'll find something like a 90% probability of that containment failing.\footnote{"Reactor design in Japan has long been questioned," NYT, March 15, 2011, Tom Zeller referencing “Denton Urges UNRC to Settle Doubts About Mark I Containment,” Inside NRC, McGraw-Hill, Vol. 8, No. 12, June 9, 1986.} Fukushima proved that these estimates were about right.

**Direct Torus Vent (DTV)**

To protect the Mark I containment from a likely total rupture, NRC advised venting high pressure build up. As a result, an industry workgroup designed and installed the "direct torus vent system" at all Mark I reactors, beginning with Pilgrim. However the NRC recognized that the vent was not full-proof. During some ATWS (anticipated transient without scram) events, the pressure in the containment will rapidly increase. Venting pressure could be reached in a matter of minutes rather than hours. Therefore venting may not prevent containment failure because of the high containment pressurization rate but it was thought it would provide additional time to scram the reactor and delay the core melt\footnote{Chairman Kenneth M. Carr, Responses to Concerns raised by W.R. Griffin, June 21, 1990, Enclosure 2, Response to Question 2, page 5. All Power reactors EA-12-050 & EA-12-051, Pilgrim Watch Pleading, Exh.,5}.

Operated from the control room, the DTV is a reinforced pipe installed in the torus and designed to release radioactive high pressure steam generated in a severe accident by allowing unfiltered radioactive release directly to the atmosphere through the vent stack. Reactor operators have the option whether to open the vent in order to, what was believed pre-Fukushima, "save the containment," or when to keep it closed in order not to unnecessarily expose the public and the environment to unknown amounts of harmful radiation.
DTV Not Passive: As a result of GE's design deficiency, the original design for a passive containment system was compromised in favor of a system that relied entirely on human control, despite all the associated risks of error and technical failure. A rupture disc at the beginning of the vent (not end as in the present design) would solve that problem. Also the design could be adjusted to allow venting at a lower pressure by adding some piping to allow by-passing the rupture disc.

DTV Not Filtered: The design was further compromised by the NRC's now highly-questionable decision not to require that any release be filtered. After the lessons learned from Fukushima, in 2012 the NRC Technical Staff recommended to the NRC Commissioners that they require filters (SECY-12-0157). The staff argued that absence of a filter not only contaminates offsite communities but also had significant negative unintended consequences at Fukushima. The New York Times explained that, “Government officials have also suggested that one of the primary causes of the explosions was a several-hour delay in a decision to use the vents, as Tokyo Electric managers agonized over whether to resort to emergency measures that would allow a substantial amount of radioactive materials to escape into the air.”

NRC Commissioners voted not to require filters despite the facts that: filters are required for normal everyday gaseous released from reactors; design-basis gaseous releases are filtered; yet much larger gaseous releases during severe accident are unfiltered. Sweden, France, Germany, Romania and soon Japan all require filters - but not the United States. A political decision based on saving industry money.

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14 Hidden Dangers: Japanese Officials Ignored or Concealed Dangers, NYT, Hiroko Tabuchi reported from Tokyo, Keith Bradsher from Hong Kong, and Matthew L. Wald from Washington, May 17, 2011.Exh., 7
15 NRC Staff's Post-Fukushima Trip report to learn about other country's DTV's with filters and rupture discs to better advise the NRC Commissioners on what to do here to reduce risk is now publicly available and can be found at NRC's Electronic Library ADAMS, Accession number ML12178A670
How can NRC justify not requiring filtered vent?

Source Slide: Lessons from Fukushima, August 7, David Lochbaum, Union Concerned Scientists

**Scrubbing Capability of Wetwell – no excuse not to filter:** U.S. report from 1988 entitled “Filtered venting considerations in the United States” writes: Within the United States, the only commercial reactors approved to vent during severe accidents are boiling water reactors having water suppression pools. The pool serves to scrub and retain radionuclides. The degree of effectiveness has generated some debate within the technical community. The decontamination factor (DF) associated with suppression pool scrubbing can range anywhere from one (no scrubbing) to well over 1000 (99.9 % effective). This wide band is a function of the accident scenario and composition of the fission products, the pathway to the pool (through spargers, downcomers, etc.), and the conditions in the pool itself. Conservative DF values of five for scrubbing in MARK I suppression pools, and 10 for MARK II and MARK III suppression pools have recently been proposed for licensing review purposes. These factors, of course, exclude considerations of noble gases, which would not be retained in the pool. (Emphasis added)

The decontamination factor of 5 for the Mark I containment (as used in units 1 through 5 of Fukushima Daiichi and the 23 in the U.S. including Pilgrim) means that 80% of the radioactive substances (excluding noble gases) is retained, while 20% is released. The FILTRA system installed at 10 Swedish nuclear power plants and one in Switzerland is designed to ensure that in a severe accident 99.9% of core inventory is retained in the containment or the filters.

The difference between releasing up to 20% versus 0.1% is huge; it means up to 200 times more radioactivity is released in the system defended by TEPCO and U.S. BWR Mark I operators (including Entergy) versus the enhanced system used in Europe and commercially available worldwide.

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**Backpressure - No excuse not to filter:** Industry has argued that filters would be dangerous due to backpressure. Not so. Their argument is about saving money, not safety. Backpressure is an issue, but not an obstacle. Backpressure is an issue that is repeatedly faced at nuclear reactors, and successfully managed. It is true that installing filters in the torus vent lines will cause higher pressure inside containment than if no filters were present; but, this is not a “show-stopper.” Now, operators are instructed to open the torus vents when containment pressure reaches (x) pounds per square inch (psi). At (x) psi, the opened torus vents keeps the containment pressure below the value that could cause it to catastrophically fail. When the properly designed filters are installed in the torus vent lines, the procedures may need to be revised to guide the operators to open the vent valves at (y) psi (with y psi likely being slightly below x psi to accommodate the backpressure from the filters). With a properly designed filter, the pressure reduction - if any - will be negligibly small. Therefore, the only reason that a filter could not be installed in the torus vent line is incompetence (capable engineers are unavailable) or cheapness (funds for the capable engineer or their designs is unavailable). We have the skill set to design such a filter system. We simply need the spine to make it happen; we trust NRC will have the spine after Fukushima.

**Lessons from Fukushima:** Pilgrim assumes that the DTV would work, and that theoretical assumption was the underpinning of its assumed probabilities in accident sequences. But this supposed fix was “shown” only by theoretical analysis. The only real tests of the DTV – Unit 1, Unit 2, and Unit 3 at Fukushima, March 2011 – all failed. Three out of three failures is not a good score. The new and significant information concerning the likely failure of the DTV to prevent containment failure that now must be considered includes:

a) Properly trained operators decided not to open the DTV when they should have because they feared the effects offsite of significant unfiltered releases;
b) When the operators finally decided to open the DTV, they were unable to do so;
c) The failure of the DTV to vent led to containment failure/explosions that resulted in significant ongoing offsite consequences.

**Japan is installing filtered vents in its reactors joining other nations around the world. The U.S are outliers.**

**Multiple Designs that Reduce Risk Available Today**

One example: Westinghouse FILTRA-MVSS (multi-venturi scrubber system) is described as a passive, self-regulating system for filtered pressure relief of BWR/PWR reactor containments. The system is

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17 [http://www.westinghousenuclear.com/Products__&_Services/docs/flysheets/NS-ES-0207.pdf](http://www.westinghousenuclear.com/Products__&_Services/docs/flysheets/NS-ES-0207.pdf)
passively actuated by means of a rupture disc. A typical design basis for the system is a total loss of AC
tower for 24 hours leading to loss of core cooling ability. This includes a total loss of electrical power
from both the external grid and all plat-specific power back-up systems, as well as loss of steam turbine-
driven core cooling pumps. It says that

It is designed on Swedish regulations requiring 99.9 % of the core inventory of radioactivity (excluding
noble gasses) be retained in the containment or filtered in case of venting; and it has high
decontamination factors for gas -carried particles, aerosols and elemental iodines. It is fully passive for
at least 24 hours after initial venting and requires no startup time.

For a BWR, the FILTRA-MVSS would be connected to the hardened vent. The filter consists of several
filtration steps, all of which are contained in the tank: the multi-venturi scrubber, a water pool, a
moisture separator, and finally an optional metal fiber filter.

Westinghouse’s Filtra-MVSS is installed in 10 Swedish reactors and one Swiss reactor; they describe its
benefits as:

- Passive design for at least 24-hours-no operator action required to activate system
- Very high removal efficiencies:
  - Aerosols > 99.00 % decontamination factor (D) > 10,000 with optional fiber filter for smallest particles
  - Elemental Iodine> 99.99% (DF> 10,000)
  - Organic Iodine: > 80% (DF>5)
  - Same DF for all flow rates
- Designed all seismic loads
- Designed wide range postulated accidents
- Ability to avoid and cope with oxyhydrogen combustion
- May be used in feed-and-bleed mode for long-term core cooling

NRC Determined Second Vent Needed (Ea-13-109 revised EA 12-050)

NRC issued a new order to install a second vent June 6, 2013 because in a severe accident with
core melt the wetwell vent (ordered by the Commission in EA-12-050) would be inoperable. EA-13-109
does not require operators to fix the identified safety issues until more than six years from now, as late
as June 30, 2019. We believe that the NRC cannot pretend to satisfy its AEA obligation to protect the
public health and safety now by allowing Pilgrim, and logically by extension reactors of like design, to
operate - for at least six years - until EA-12-050 provisions, as revised by EA-13-109, and EA-13-109
might finally be fully implemented.

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18 EA-12-050, modified by EA-13-109, does not have to be implemented until “startup from the second refueling
outage that begins after June 30, 2014 or June 30, 2018, whichever comes first.” (Order, 11); EA—13-109 ’Phase-2
drywell vent system or” development of a reliable containment venting system strategy that makes it unlikely that
a licensee would need to vent from the containment drywell during severe accident conditions” (Order, 9,
emphasis added ) is “no later than startup from the first refueling outage that begins after June 30, 2017, or June
30, 2019.
During severe accidents involving molten core debris breaching the reactor vessel, mitigating strategies include injecting water into the containment to help prevent drywell liner melt-through, which would result in a release pathway directly into the reactor building. However, water injection can eventually increase the water level in the suppression pool to a point where venting from the wetwell would no longer be possible. Without venting containment pressure could continue to increase, threatening containment failure.” (EA-13-109, 7; Emphasis added)

Hydrogen Explosions

Hydrogen explosions were supposed to be avoided by inerting with nitrogen, but its effectiveness was shown to be limited at Fukushima. The NRC Task Force July 12 Report on lessons Learned from Fukushima reported that venting is the key.

The method of combustible gas control in BWR Mark I and Mark II containments (i.e., containment inerting with nitrogen) will prevent hydrogen fires or explosions as long as containment remains isolated, but it will not eliminate the hydrogen resulting from an accident damaging the core.

This means that in a BWR Mark I or Mark II containment, the hydrogen must be kept in containment by controlling containment pressure without venting (i.e., through heat removal from the containment when possible) or by venting to a safe location.

Venting serves a dual function: overpressure protection & venting of hydrogen: Enhancing the containment venting capabilities for Mark I and Mark II containments, while primarily intended for overpressure protection, would also provide for the reliable venting of hydrogen to the atmosphere. These two steps would greatly reduce the likelihood of hydrogen explosions from a severe accident. [NRC Task Force Report, pg., 42, emphasis added]
Resources, Hydrogen: Mark Leyse, Petition for Rulemaking that discusses among other things that US simulations of hydrogen explosions in severe accidents are very crude compared to the European simulations – link to PRM-50-103: http://pbadupws.nrc.gov/docs/ML1130/ML11301A094.pdf

3. PILGRIM- ELECTRIC RELIABILITY

Reliability Offsite Power: Pilgrim’s Buried Electric Cables Not Qualified For Moisture

Risk: Most safety systems at Pilgrim, and all nuclear reactors, depend on electrical power to perform their function to prevent major accidents. Electric power travels over miles of submerged electric cables not qualified for a wet environment. Most electrical cables at Pilgrim have been exposed to significant moisture over the past 40 years from snow, rain, and salt. Pilgrim is located on low land directly beside Cape Cod Bay. For example, evidence of water was provided in a NRC inspection (April 2010) of 3 manholes. It reported (2) were periodically submerged or partially submerged and the other always submerged. A recent NRC report indicated an increasing trend in underground cable failures, and the predominant contributing factor was submergence or moisture intrusion that degraded the insulation.

Solution to Reduce Risk: Require replacing electric cables that may be subject to submergence with ones qualified for a wet environment; or require a more robust inspection program. Currently: only cables 400 V or more are tested for cable insulation degradation once every six years; the inspection program is silent on the size of the sample required and what is required if deterioration is found; no baseline inspection before license renewal; and only one inspection each year for water collection in cable manholes and conduits.

Reliability Backup Power

In the U.S., nuclear power plants are required to have emergency diesel generators with sufficient fuel to last 7 days, and battery capacity that can further run for 4-8 hours (depending on the reactor) in the event the diesel generators fail.

Diesel Generators: Pilgrim has two backup air-cooled diesel generators located in a building between the main reactor and the Bay and another closer to Rocky Hill Road. The oil tanks are buried so that there is risk of corrosion and in a flood surge contamination of the oil with seawater. Congressman Markey recommended legislation to increase oil supply from 7 to 14 days.

Battery backup: Pilgrim has two switch trains one at elevation 3 feet and another at 37 feet to provide power for 8 hours. Congressman Markey filed legislation to increase backup power to 72 hours.

Resources

4. **SECURITY**

The terrorist threat did not end after 9/11; acts of malice can occur at random from other parties – example, Timothy McVey the Oklahoma Bomber. Nuclear reactors are pre-deployed nuclear weapons capable of unimaginable destruction to lives, property and our economy. **How secure is Pilgrim?**

<table>
<thead>
<tr>
<th>Mode Of Attack</th>
<th>CHARACTERISTICS</th>
<th>PRESENT DEFENSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commando-style</td>
<td>• Could involve heavy weapons/sophisticated tactics</td>
<td>Alarms, fences, lightly-armed guards, with offsite backup</td>
</tr>
<tr>
<td>by land</td>
<td>• Attack requiring substantial planning and resources</td>
<td></td>
</tr>
<tr>
<td>Commando-style</td>
<td>• Could involve heavy weapons/sophisticated tactics</td>
<td>500 yard no entry zone – marked by buoys – simply, “no trespassing” signs</td>
</tr>
<tr>
<td>by water</td>
<td>• Could target intake canal</td>
<td>Periodic Coast Guard surveillance by boat or plane</td>
</tr>
<tr>
<td>Land-vehicle</td>
<td>• Readily obtainable</td>
<td>Vehicle barriers at entry points to Protected Area</td>
</tr>
<tr>
<td>bomb</td>
<td>• Highly destructive if detonated at target</td>
<td></td>
</tr>
<tr>
<td>Anti-tank missile</td>
<td>• Readily obtainable</td>
<td>None if missile is launched from offsite</td>
</tr>
<tr>
<td>• Highly destructive at point of impact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial aircraft</td>
<td>• More difficult to obtain than pre-9/11</td>
<td>None</td>
</tr>
<tr>
<td>• Can destroy larger, softer targets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explosive-laden</td>
<td>• Readily attainable</td>
<td>None</td>
</tr>
<tr>
<td>smaller aircraft</td>
<td>• Can destroy smaller, harder targets</td>
<td></td>
</tr>
<tr>
<td>10-kilotonne</td>
<td>• Difficult to obtain</td>
<td>None</td>
</tr>
<tr>
<td>nuclear weapon</td>
<td>• Assured destruction if detonated at target</td>
<td></td>
</tr>
</tbody>
</table>

**Risk:** The above table makes clear that Pilgrim is vulnerable from the air and water. Pilgrim’s spent fuel pool location makes it especially vulnerable to attack – all the more reason to get its pool back to a low-density, open-frame design. Casks can be hardened; and if the pool is successfully attacked so that the water drops to the tops of the assemblies or more and there is a pool fire, less contamination will be released offsite than would be the case today.
5. AGE RELATED DEGRADATION

Pilgrim received its permit for construction in 1967. It was originally licensed for 40 years and began operations in 1972. It was re-licensed in 2012 to operate an additional 20 years until 2032. The Union of Concerned Scientists summarized how getting old is one of the reasons safety margins can decrease or disappear over time.\(^\text{19}\)

The bathtub curve shown below shows that wear-out failures can cause the overall failure rate to increase. As a result, considerable resources and attention are devoted to monitoring the condition of nuclear plant components and replacing or repairing them as required before aging degradation compromises safety margins.

Earlier this year, the NRC’s Operating Experience Branch released a report following its review of data from 2007 to 2011, inclusive. The NRC staff reviewed records such as findings by NRC inspectors and Licensee Event Reports (LERs) submitted by plant owners. Among the NRC’s key findings:

- “Since 2009, there is a notable increase in the number of inspection findings and LERs involving highly reliable components whose failure was attributed to age degradation after being in service for over 15 years.”
- “It is interesting to note that in more than 75 percent of the 105 datum that were reviewed, it was determined that the System, Structure, or Component (SSC) either exceeded its recommended service life or was effectively run-to-failure. Thus, it is reasonable to question the oversight effectiveness of the baseline inspection program in this area.”
- “About 40 percent of the 77 inspection findings were also Appendix B related findings, but only seven were cited against Criterion III, Design Control. Appendix B, Criterion III required licensees to verify or check the adequacy of design if safety-related equipment will remain in service beyond its qualified life. Thus, with greater than two-thirds of findings and events involving SSCs left in service

\(^{19}\) Nuclear Plants and Nuclear Excuses: this is Getting Old, David Lochbaum, February 25, 2014 Fission Stories #157 http://allthingsnuclear.org/nuclear-plants-and-nuclear-excuses-this-is-getting-old/
well beyond expected service life, it is reasonable to question why NRC oversight programs are not more focused on aging management of active SSCs.”

NRC’s report identified the inability of plant owners to prevent age-related failures coupled with the NRC’s inability to adequately enforce the regulatory requirements being violated.

That the NRC was inadequately enforcing regulatory requirements was documented in an audit report released on October 28, 2013, by the NRC’s Office of the Inspector General (OIG). OIG audited the NRC’s oversight of active component aging. (Active components are valves, motors, fans, electrical relays, etc., whereas passive components include pipes, supports, and tanks.)

OIG’s conclusion was critical:

“The NRC’s approach for oversight of licensee’s management of active component aging is not focused or coordinated. This has occurred because NRC has not conducted a systematic evaluation of program needs for overseeing licensees’ aging management for active components since the establishment of the Reactor Oversight Process (ROP) in 2000, and does not have mechanisms for systematic and continual monitoring, collecting, and trending of age-related data for active components. Consequently, NRC cannot be fully assured that it is effectively overseeing licensees’ management of aging active components.”

Pilgrim is old and has been headed in a downward spiral throughout 2013. NRC requires licensees to send information to NRC about certain "reportable events" that occur at their facility. Pilgrim had 20 event reports in 2013 more than any other plant in the country. About half of the reports were due to equipment problems. The shutdowns and required event reports are clear signs that Entergy is not making the necessary investments in personnel (laid off workers) and maintenance that are needed to safely run this old reactor. Why? Because in Massachusetts’ deregulated market, Pilgrim cannot compete with cheaper sources of electricity, mainly natural gas. Hopefully NRC actually will keep a close eye on Pilgrim because we are at increased risk if aging safety components simply are ignored.

6. EMERGENCY PLANNING

The recent events in Japan remind us that while the likelihood of a nuclear power plant accident is low, its potential consequences are grave. An accident like Fukushima could happen here. An equipment

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20 **Fukushima raised baseline > 10 times - from 1 event per 31,000 RY to 1 event per 2,900 RY:** The NRC’s current baseline estimates that there may be one Core Damage Event per 31,000 RY (years of reactor operation). Fukushima raised the number of actual core damage events at Generation II commercial reactors in the last 34 years to five - TMI, Chernobyl and Units 1 though 3 at Fukushima. Based on this actual experience, the likelihood of a significant accident core melt in any given year is about 1 in 7 years.

**The chance of a GE Mark I Boiling Water Reactor like Pilgrim self-destructing** with massive offsite contamination is about 1 in 8. This statement is based on the real-world experience of four such reactors having self-destructed in Japan (out of 33 ever built). each failed due to a loss of offsite power (which doesn’t require a tsunami), a situation they were designed to accommodate. Three suffered complete meltdowns, one (with no fuel in the reactor) had a series of severe explosions; it may be the greatest threat of all.
malfunction, fire, human error, natural disaster or terrorist attack could—separately or in combination—lead to a nuclear crisis. Therefore emergency procedures are important and as shown below need to be significantly improved. NRC and FEMA are in charge of planning, they set the standards; however the Commonwealth has the ability to require more conservative measures. To date, they have not done so. Example: Town of Duxbury Radiological Emergency Plan and Standard Operating Guidelines (SOGs) at http://www.town.duxbury.ma.us/Public_Documents/DuxburyMA_EMA/index

Public Risk from Inadequate Plans, examples:

Size of Emergency Planning Zone (EPZ): There are two emergency planning zones (EPZs) around each nuclear power plant. The Plume Exposure Pathway EPZ EPZ has a radius of about 10 miles from the reactor site and is divided into sub-areas. Predetermined protective action plans are in place for this EPZ theoretically designed to avoid or reduce dose from potential exposure of radioactive materials. These actions include sheltering, evacuation, and the use of potassium iodide. The ingestion Exposure Pathway EPZ has a radius of about 50 miles from the reactor site. Predetermined protective action plans are in place for this EPZ and are designed to avoid or reduce dose from potential ingestion of radioactive materials. These actions include a ban of contaminated food and water.

There is no escape from the Cape. MEMA's plan for the Cape in the event of a severe accident at Plymouth's Pilgrim reactor is to close the Sagamore Bridge.21 The voters in all 15ape towns by a 2:1 margin approved this statement: “we the people of _________ respectfully request Governor Deval Patrick to call upon the Nuclear Regulatory Commission to uphold their mandate to shut the Pilgrim Nuclear Power Station in Plymouth because the public safety, particularly Cape Cod residents and visitors, cannot be assured.”

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Lessons learned from Fukushima: NRC advised Americans in Japan within 50 miles of Fukushima to evacuate; Tokyo, located about 140 miles south of Fukushima, announced that its tap water is contaminated with radioactive iodine and “hot spots” well beyond 50 miles in Japan has contaminated food and water; yet Pilgrim’s ingestion zone is only 50 miles Japan. Japan is expanding its EPZ, yet the NRC has gone in the opposite direction. NRC and FEMA assume that in a nuclear emergency only those within a 2 miles radius of the plant and those within a narrow pie shaped wedge or keyhole from 2 miles to perhaps 5 miles or at most 10 miles will be required to evacuate (issued December 23, 2011).

We suspect that the likely reasons for NRC’s policy are two-fold. First, reactors were originally built in sparsely populated areas and now the population in those areas has expanded making the infrastructure incapable of evacuating the population in a timely manner. The AP reported that populations within 10 miles of reactors have ballooned to as much as 41/2 times since 1980 and about 40% of the US population live within 50 miles of a reactor, based on the 2010 Census data. Therefore NRC really is saying that if the public cannot evacuate in a timely manner, plans will say that they do not have to. Second, the new policy is in part a public relations ploy to downplay what might happen in order to counter public post-TMI-Chernobyl-Fukushima “jitters” turning public opinion against the industry.

Meteorological Plume Model: Planners incorrectly assume that winds blow in a straight-line and rely on an outdated straight-line Gaussian plume model that is not spatial or temporal. In order for a Gaussian model to be at all meaningful, the essential conditions include: non-zero wind speed; wind direction constant over time in downwind areas; release rate constant over time for the duration of the release; atmospheric stability constant over time in downwind area. But winds are variable especially near large bodies of water, river valleys and varied terrain. Therefore basing protective action calls on a “key-hole” (pictured above diagram) makes no sense and will result in planners issuing the wrong protective action- evacuation into a plume or no protective action call for those actually in a plume.

Notification: (1) Public: Sirens are the primary method of public notification; however they are essentially outdoor warning systems and often cannot be heard above normal ambient noise by people who live and work inside. This is true in cooler climates where houses are insulated and outfitted with storm windows; in hot climates where air conditioners are standard; and in suburban and exurban areas where houses are set back on sizeable lots with generous landscaping that buffers sound. The following systems should be added: rapid dialing systems, electronic reader boards, low frequency dedicated radio capability and EAS be required. (2) Emergency Workers: Currently their radios are not interoperable. They need to be upgraded to today’s microwave technology so that they can talk to one another within the EPZ and to other towns outside for mutual aid.

Potassium Iodide (KI): In a nuclear reactor accident, radioactive iodine is released; it can cause thyroid cancer/disease, and mental retardation in children of exposed pregnant women. Children and infants, including the unborn, are most vulnerable. KI blocks the thyroid with a harmless form of iodine. KI must be taken before or shortly after exposure - within six hours. It does not protect against other harmful radioactive releases or other potential health effects, just as polio vaccines do not protect against cancer - that’s no reason not to get it. One dose of KI protects for 24- hours. KI is FDA approved and stockpiled around the world. Adverse reactions are possible for those who are allergic to iodine – shellfish or salt.

KI is provided by NRC to states that request it for communities within the 10 mile EPZ. However in 2002, Congress passed Section 127 of the Bioterrorism Preparedness and Response Act that extended KI to 20 miles. It has not been implemented for political reasons. Massachusetts passed a bill that offers KI to communities on Cape Cod and Cape Ann. KI should be provided to those within 20 miles, as shown in Japan, and stockpiled in schools, day care centers, camps, shelters, group homes and other public facilities. U.S. Nuclear Regulatory Commission, NUREG/CR 1433 showed that for children, the following dangers may occur from the inhalation of nuclear materials after a massive core-melt atmospheric accident (like Chernobyl).

<table>
<thead>
<tr>
<th>Distance in Miles</th>
<th>Mean Thyroid Dose (rem) for Exposed Children Outdoors*</th>
<th>Probability of Thyroid Damage to Exposed Children Located Outdoors if not Protected by Stable Iodine (like KI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26,000</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>11,600</td>
<td>100%</td>
</tr>
<tr>
<td>10</td>
<td>6,400</td>
<td>100%</td>
</tr>
<tr>
<td>25</td>
<td>2,200</td>
<td>80%</td>
</tr>
<tr>
<td>50</td>
<td>760</td>
<td>26%</td>
</tr>
<tr>
<td>100</td>
<td>200</td>
<td>7%</td>
</tr>
<tr>
<td>150</td>
<td>72</td>
<td>2%</td>
</tr>
<tr>
<td>200</td>
<td>32</td>
<td>1%</td>
</tr>
</tbody>
</table>

Chernobyl: NRC’s NUREG-1623 points out that radioactive iodide can travel hundreds of miles on the winds. An increase in cancer caused by Chernobyl... was detected in Belarus, Russia and Ukraine. Notably, this increase, seen in areas more that 150 miles from the site, continues to this day and primarily affects children who were 0-14 years old at the time of the accident...the vast majority of the thyroid cancers were diagnosed among those living more than 31 miles from the site. The 2001 figures were 11,000 thyroid cancers at 31 miles. The increase in disease was attributed to both inhalation and ingestion of contaminated foods.

World Health Organization: (1999) World Health Organization (WHO) Guidelines for Iodine Prophylaxis following Nuclear Accidents states in its abstract regarding thyroid cancer caused by the Chernobyl disaster:

This increase in incidence has been documented up to 500 km from the accident site. (And therefore) that stockpiling (KI ) is warranted, when feasible, over much wider areas than normally encompassed by emergency planning zones, and that the opportunity for voluntary purchase be part of national plans."
Shadow Evacuation: Currently the Federal government incorrectly assumes that only 20% within the 10-mile EPZ told not to evacuate will do so and again only 20% of those within 10-15 miles from the reactor will evacuate. This assumption was proved false by a 2013 Telephone Survey on Cape Cod\textsuperscript{23} that showed that if potentially affected respondents were asked “would you evacuate” “if they were an incident at the Pilgrim Nuclear Power Station,” 70% (not the 20% assumed by the NRC or the 19% of the ETE) would do so; and if the respondents were told that the Cape is not in the Emergency Evacuation Zone if there were an incident at Pilgrim, 50% said that they would evacuate.

Unless current plans come to grips and plan for and control the likelihood of spontaneous evacuation of the public beyond the federal guidance, those most at risk will be trapped in gridlock.

Transportation For Transportation Dependent (especially school children and elderly): Mobilize busses from outside the impacted area at the Alert, beginning stage of accident; assure that busses housed in a likely-to-be-impacted community are for the exclusive use of that community in a radiological disaster and, not as now, allowed to be directed to another community.

Reception Centers: (1) Location- The key to any site used to for monitor and decontaminate citizens is that it is sufficiently distant from the reactor and placed according to meteorological analysis – in areas likely to be upwind. (2) Capacity- Plans assume that only one in five (20%) will go to the Reception Center and Reception Centers are only equipped with personnel and materials to handle 20%– despite NUREG 0654 (J-12) that states that Reception Centers should be capable of monitoring 100% of the population within 12 hours. This policy leaves 80% without an opportunity to be monitored and decontaminated risking their health and risking spreading contamination to heretofore “clean” areas via contaminated evacuees cars and persons. The 20% policy is based on the number of people who went to a reception center during a Florida hurricane. Public response to hurricanes and nuclear disasters that have no forewarning are very different.

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\textsuperscript{23} KLD MEMO to John Giarrusso (MEMA) from Chris Chaffee (KLD) Regarding the Cape Cod Telephone Survey Results, July 25, 2013
**Shelters:** Equip all shelters in the expanded EPZ with KI and face masks; and educate the public where and how to shelter in the event of a disaster – shelter in an area as distant from the roof as possible and away from all windows, gamma radiation can go through window glass.

**Worker Safety:** Provide all emergency workers with protective gear, dosimetry and KI. Locate the Radiological Emergency Workers Monitoring & Decontamination centers (REWMDS) outside the peak fatal zones – preferably 20-25 miles away. At Pilgrim NPS, the REWNDS is within the “peak injury zone” and close to the “peak fatal zone.” It is located in Carver, directly across the street from the 10-mile demarcation line. It should be moved. There should be more than one center for each EPZ– so that there is an alternative site if the wind is blowing towards one of the centers or access routes clogged with evacuees.

**Exercises:** Add reality to the emergency exercises, for example, by having some drills unannounced, some held during off business hours, and some involving actual drills at schools with the teachers and pupils as is done for fire drills.

The EPA recently issued its Draft Protective Action Guidelines

The Draft PAG provides radiological protection criteria (PAGs and protective actions) for application to all incidents that would require consideration of protective actions, with the exception of nuclear war. It says that the “PAGs are not legally binding regulations or standards and do not supersede any environmental laws.” However state and local responders treat the Manual as the Gospel and this should be recognized. The Draft PAG Manual should make clear, but does not, what specific regulations or standards require. A simple table should be included in the final document laying out side by side the PAGs and all other pertinent standards, as opposed to only footnotes providing links to those standards, as in the draft. The PAG Manual divides into three sections: Early Phase Protective Action Guides; Intermediate Phase Protective Action Guides; and Late Phase Protective Action Guides. EPA’s draft largely provides a broad-brushed description of radiological emergency plans at each stage; and not enough attention is given to what the plans should be in order to reflect lessons learned from Fukushima and to protect public health and the environment. The EPA Draft Manual guidance is inadequate in the following areas: it does not advocate as it should advanced meteorological plume modeling, the importance of real-time offsite radiological air monitors, and enhanced environmental sampling; its dose guidance is not based on the National Academies of Sciences, BEIR VII (see following health section); guidance for Potassium Iodide is incorrect and discourages its use unlike guidance from FDA; and it discussion of cleanup avoids the key questions- wwhat federal agency is in charg, who pays and that cleanup after a large accident is not possible. Comments submitted are available on: http://www.regulations.gov/#!docketDetail;D=EPA-HQ-OAR-2007-0268

### 7. POST-ACCIDENT CLEANUP

No Agreed Upon Cleanup Standard-No Federal Agency In Charge- No Money

The cleanup standard is not yet agreed upon by the responsible federal agencies. The cleanup standard is the driving factor in determining offsite costs. The US Department of Homeland Security has

commissioned studies for the economic consequences of a Rad/Nuc attack. Much more deposition would occur in a reactor accident, magnifying consequences and costs. However there are important lessons to be learned from these studies. Barbara Reichmuth’s study, Economic Consequences of a Rad/Nuc attack: Cleanup Standards Significantly Affect Cost, 2005, provides estimates for different types of areas from farm or range land to high density urban areas. Reichmuth’s study also points out that the economic consequences of a Rad/Nuc event are highly dependent on cleanup standards: “Cleanup costs generally increase dramatically for standards more stringent than 500 mrem/yr.” (Emphasis added)

What agency (NRC, EPA, DHS) is in charge of cleanup after an accident has not been determined, either. Absent a lead agency, cleanup will be delayed becoming more difficult and costly impacting the time the population is displaced and whether recovery and return is possible.

Who pays? Price Anderson, the nuclear industry’s indemnity act, is underfunded and covers only the cost of property damage not cleanup. Real-world experience in Fukushima has made it clear that it is underfunded and it is no surprise because the amount was based on the outdated and flawed Melcor Consequence Computer Code.

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25 Economic Consequences of a Rad/Nuc attack: Cleanup Standards Significantly Affect Cost Barbara Reichmuth, Steve Short, Tom Wood, Fred Rutz, Debbie Swartz, Pacific Northwest National laboratory, 2005
26 Price Anderson is the nuclear industries indemnity or insurance, established by Congress in 1957. The purpose is to indemnify the industry against liability claims in the event of an accident and ensure monies for the public. Act establishes a no fault insurance type system in which the first approximately $12.6 billion (as of 2011) is industry-funded as described in the Act. Any claims above the $12.6 billion would be covered by a Congressional mandate to retroactively increase nuclear utility liability or would be covered by the federal government.
27 The Japanese government has budgeted $14 billion through March 2014 for the cleanup which could take decades. The Japanese Environment Ministry expects the cleanup to generate at least 100 million cubic meters
RISK FROM DAILY OPERATIONS
Radioactive Releases: How Much Is Too Much - How Do We Know?

8. RADIATION & HEALTH

Radiation’s effects on the body:

Radioactive Releases Occur Routinely. It doesn’t take an accident at Pilgrim to release radioactivity into our air, water, and soil. As a matter of routine operation, radiation is released from Pilgrim in the form of liquid, gaseous, and solid radioactive wastes. Solid radioactive wastes include anything from laundry (considered low-level waste) to spent fuel rods (considered high-level waste.)

Radioactivity released includes over 100 different isotopes only produced in reactors and atomic bombs, including Strontium-89, Strontium-90, Cesium-137, and Iodine-131. Humans ingest them either by inhalation or ingestion, through food. Each radionuclide seeks different parts of the human body; iodine seeks out the thyroid gland, strontium clumps to the bone and teeth (like calcium), and cesium is distributed throughout the soft tissues. All are carcinogenic. Each decays at varying rates; for example, iodine-131 has a half-life of eight days, and remains in the body only a few weeks. Strontium-90 has a half-life of 28.7 years, and thus remains in bone and teeth for many years. These radionuclides are different from “background” radiation found in nature in cosmic rays and the earth's surface.

or 130 million cubic yards of soil, enough to fill 80 domed baseball stadiums (Japan decontaminates towns near tsunami-hit nuclear plant, unsure costly effort will succeed, Associated Press, Mari Yamaguchi, March 5, 2012)

28 See Comments by Pilgrim Watch Regarding SECY-12-0110, Consideration of Economic Consequences within the NRC’s regulatory framework: http://www.nrc.gov/reading-rm/doc-collections/commission/slides/2012/20120911/
Background radiation, while still harmful, does not specifically attack the thyroid gland, bones, or other organs.

**Permissible Releases Do Not Mean Safety.** Government regulations allow “permissible” levels of contamination. However, since there is no safe threshold to exposure to radiation, permissible does not mean safe. NRC’s allowable radioactive release dose from a nuclear reactor to members of the public is 100 millirem per year to the total body. The National Academy of Sciences Biological Effects of Radiation (BEIR VII) Report published June 2005 reported that the lifetime fatal cancer risk for 100 mrem/yr is (1) in (175) and the cancer incidence risk is (1) in (100). Pilgrim claims to release a tiny fraction of the permissible dose; if true, why does industry fight changing the standard to a far lower number to better protect public health?

**WHAT INDEPENDENT SCIENTISTS SAY**

**National Academy of Sciences, BEIR VII Report, June 2005**

*No Safe Dose Radiation - Cancer Risks for Women and Children Far Higher Than for Men*

The National Academy of Sciences (NAS) latest report on radiation risk, called the BEIR VII report (“BEIR” stands for the Biological Effects of Ionizing Radiation) was issued June 2005. Its conclusion was simple: No amount of radiation is safe and women and children are the most at risk.

**Women and Children Most at Risk:** The National Academy reported that overall cancer mortality risks for females are 37.5 percent higher than for men, and the risks for all solid tumors (lung, breast, and prostate) are almost 50 percent higher. The differential risk for children is even greater. The same radiation in the first year of life for children produces three to four times the cancer risk as exposure between the ages of 20 and 50. Female infants have almost double the risk as male infants.

**Impact Offspring from Parents Exposure:** While the report states there is no direct evidence of harm to human offspring from exposure of parents to radiation, the committee noted that such harm has been found in animal experiments and that there is “no reason to believe that humans would be immune to this sort of harm.” This should be of concern to nuclear worker’s families.

**Heart Disease and Stroke:** The National Academy stated that No amount of radiation exposure is safe; and noted that relatively high levels of radiation exposure increase risk not only of cancer but also of heart disease and stroke.

**What does this mean for us?** The Federal Government’s “permissible” maximum radiation dose for members of the public exposed to Pilgrim is 100 millirads per year for a 70-year lifetime. According to the Academy’s report this translates to (1) in (100) members of the public getting cancer if so exposed. In addition, 1 in about 5 workers would get cancer if exposed to the legally allowable occupational doses over their 50 years in the workforce. Pilgrim claims to release a tiny fraction of the permissible dose. If true, why do they fight changing the standard to a far lower number to better protect public health?

29 The National Academy’s report is available on the Web at [http://books.nap.edu/](http://books.nap.edu/)
These risks are much higher than permitted for other carcinogens - the allowable release for one chemical from a factory is a lifetime cancer incidence risk of (1) in a million. Apparently it is permissible for Pilgrim to cause cancer in TEN THOUSAND times as many people as an ordinary chemical factory.

**EPA DRAFT PROTECTIVE ACTION GUIDELINES (PAGS)**  
See the comments of Dr. Daniel Hersch, Committee to Bridge the Gap, on [http://www.epa.gov/radiation/docs/er/pag-manual-interim-public-comment-4-2-2013.pdf](http://www.epa.gov/radiation/docs/er/pag-manual-interim-public-comment-4-2-2013.pdf)

Highlights of what is wrong with the PAGS and how EPA is abdicating its responsibility to protect public health include, for example:

1. EPA eliminates the existing requirements from the 1992 PAGs triggering evacuation when thyroid or skin doses exceed specified limits.
2. EPA eliminates the existing relocation limit of 5 rem cumulative dose over 50 years, saying it might conflict with their long-term cleanup approach, which in the new associated guidance from NCRP would allow cumulative 50-year doses of 100 rem, twenty-fold higher. *Even thirty years exposure at the 2 rem/year figure would, by EPA's own official risk estimates, result in an excess cancer in every eighth person exposed; orders of magnitude higher risk than EPA has ever considered acceptable.*
3. EPA incorrectly argues that relaxed long-term standard is somehow justified because the public’s exposure will not be for 70 years. But this is a disingenuous argument. The core of the long-term cleanup part of the PAGs is setting a very high permissible annual dose that one would be allowed to get for a whole lifetime (indeed, the standard 70 year lifetime assumption) without the government having to cleanup at all. The one-year exposure is for the intermediate phase; the long-term phase is forever, and that is what is so troubling about relaxing long-term cleanup standards.
4. EPA says that the Safe Drinking Water Act Maximum Contaminant Limits (MCLs) may not be appropriate and propose five alternatives far more lax, and does so in footnotes. Those proposed weaker limits would allow concentrations of radionuclides in drinking water orders of magnitude higher than considered safe by EPA under the Safe Drinking Water Act. I have attached two tables Dr. Hirsch put together comparing these levels for four key radionuclides. Their proposals are frequently as bad as the Bush water PAG proposal and in some cases worse. Generally, they are proposing allowing hundreds to tens of thousands of times higher concentrations of radioactivity in drinking water than EPA has historically allowed as safe under the Safe Drinking Water Act.

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EPA incorporates 1998 guidance allowing extremely high contamination of food, despite internal EPA criticism of doing so which said it would produce a cancer in every fiftieth person so exposed.

6. EPA incorporates the DHS PAGs for dealing with long-term cleanup from a nuclear weapons explosion and applies it to any kind of release. The DHS PAG is based on "optimization" and contemplated permitting long-term doses as high as several rem per year. The new PAG is tied to the NCRP new guidance which would allows doses up to 2 rem per year over a lifetime (the equivalent of about 1000 extra chest Xrays every year, or 3 Xrays every day of your life from birth to death). EPA's estimate of a 70-year lifetime exposure at that level would be one in every six people exposed would get a cancer (the risk coefficient they use is different for exposure over a lifetime than for earlier years because of the elevated risk at younger ages).

7. The associated NCRP guidance on implementing the PAGs for long term cleanup recommends radionuclide concentration levels so high that they would allow concentrations for strontium-90, for example, hundreds of thousands of times higher than the EPA's official Preliminary Remediation Goals for the same exposure scenarios. They would produce cancer risks using EPA's risk figures in the several cancers per ten people exposed, orders of magnitude outside the long-held acceptable risk range.

8. In essence, the PAGs and the documents associated with them are saying nuclear power accidents could be so widespread and produce such immense radiation levels that the government would
simply abandon most cleanup obligations and force people to live with exposures so high that extremely large fractions of the exposed population would get cancer from the exposure.

9. Troubling in a different fashion, EPA buries the “bad stuff” in footnote references to a whole series of other documents so it is hard for a lay reader to see the troubling things EPA has done. EPA thereby has made the PAG manual itself essentially useless in a real accident. It was supposed to be a stand-alone, clear document that a first-responder could take off the shelf, look up a table in it, see if a radiation level exceeded a PAG and if so undertake the protective action described therein. But all of that is now removed from the PAG document. Instead, there are footnotes to URLs for numerous referenced documents, most of which are contradictory, so that the PAG does not achieve its intention that is to be useful in providing some guidance.

Furthermore, EPA is statutorily mandated to produce PAGs and other radiation guidance for the rest of the federal family and historically has viewed DOE and NRC as not sufficiently protective in radiation matters. The PAG now abdicates EPA’s responsibility to come up with guidance and instead references almost exclusively documents from DOE that EPA has historically opposed. It now directs the use of DOE’s Operational Guidance document which uses cleanup concentrations hundreds of thousands of times higher than EPA’s official concentrations. Rather than use its own conversions from concentration to risk, EPA now defaults to DOE’s models, documents, and values with which it has long disagreed as technically not defensible and not sufficiently protective. But at the end of the day, no emergency responder will have a Protective Action Guide that is useable. If it were used, however, it would allow doses to the public so far outside the range ever considered acceptable as to be deeply disturbing.

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National Academy of Sciences  Analysis of Cancer Risks in Populations Near Nuclear Facilities-Phase 1

At the request of the U.S. Nuclear Regulatory Commission (USNRC), the National Academy of Sciences is carrying out an assessment of cancer risks in populations living near USNRC-licensed nuclear facilities. This assessment will be carried out in two consecutive phases. A Phase 1 scoping study will identify scientifically sound approaches for carrying out an epidemiological study of cancer risks. This scoping study will begin on September 1, 2010, and will last for 15 months. The result of this Phase 1 study will be used to inform the design of the cancer risk assessment, which will be carried out in a future Phase 2 study. For further information on the study, please visit the project website at www.nationalacademies.org/cancerriskstudy. To sign up for project updates or to submit a comment or question, please send a message to the project email: crs@nas.edu

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PILGRIM- RADIATION HEALTH IMPACTS - SOUTHEASTERN MASSACHUSETTS

Increases in radiation-linked disease in the communities around Pilgrim were in part attributed to operating with defective fuel; operating without the off-gas treatment system in the first years; poor management and practices culminating in the releases in June 1982 that coincided with weather conditions that held the releases over surrounding communities and parts of Cape Cod.

The cancers found in the communities around the power station were studied by Dr. Sidney Cobb and Dr. Richard Clapp and their results were published in a peer reviewed journal in 1987. They included elevated rates of Myelogenous Leukemia – a type of cancer most likely to be triggered by exposure to
radiation. This led to a case-control study carried out by the Massachusetts Department of Public Health that showed a fourfold increase in adult leukemia between 1978 and 1983. The report stated "a dose-response relationship was observed in that the relative risk of leukemia increased as the potential for exposure to plant emissions also increased."  

**Massachusetts Department of Health Southeastern Massachusetts Health Study 1990**

The Massachusetts Department of Health’s own case-controlled study, *The Southeastern Massachusetts Health Study* [published in the *Archives of Environmental Health*, Vol. 51, p.266, July-August 1996] found a four-fold increase in adult leukemia the closer one lived or worked to the Pilgrim NPS.

**Recommendations Made by MDPH's Southeastern Massachusetts Study- Status**

1. Implement a system of real-time monitoring of radionuclide emissions so that reliable and timely data are available by which exposure can be assessed more precisely. The Sage System was put in place for public relations purposes not for its effectiveness. It consisted of 14 monitors on the edge of Pilgrim’s property, too close, and MDPH did not analyze or make the data public. MDPH within the past few years took over the Sage System (now Evinet) started in earnest to work on the 1990 SMHS monitoring recommendation – see following monitoring section.
2. Develop and implement a state air quality standard more stringent than that currently in use by federal regulatory agencies and other states. The air quality standard was too high and not enforced.
3. DPH survey cancer occurrence in the Plymouth area through data collected by the Massachusetts Cancer Registry. Massachusetts Cancer Registry data is available however the Registry does not have data refined to see patterns of disease at the neighborhood level and there is no registry for birth defects and reproductive disorders.
4. Based upon the availability of resources, interviews of the families of childhood leukemia cases be conducted. Not done

**Denial: Response to MDPH’s Southeastern Massachusetts Health Study :**

The Southeastern Massachusetts Health Study was conducted, peer reviewed, and made public during the Dukakis Administration. The department (MDPH) began the process to address the first two recommendations – monitoring and establishing a more conservative radioactive air emission standard. However, there was a complete about face in November 1990 when Governor Weld took office. December 1990, Governor Weld sent his Executive Secretary to accompany Pilgrim’s Vice President and Pilgrim’s Health Physicist to visit Massachusetts’ Interim Commissioner of Public Health, David Mulligan.

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31 An epidemiological analysis of five towns around Pilgrim shows a 60 percent increase in leukemia rate, excluding leukemias not caused by radiation exposure. - Dr. Sidney Cobb, et.al. Lancet, 1987. The rate of myelogenous leukemia (the type most likely to be triggered by exposure to radiation) among males in the 5 towns around the Pilgrim reactor was found to be 2 1/2 times greater than the statewide average. *Leukemia in Five Massachusetts Coastal Towns*, Dr. Sydney Cobb, et al., Abstract for the American Epidemiologic Society, March 18, 1987; and *Leukemia near Massachusetts Nuclear Power Plant*, letter, Clapp, R.W., Cobb, S, Chan, C.K., Walker, B., Lancet 1987;2:1324-5.

32 Adults living and working within ten miles of the Pilgrim reactor had a fourfold increased risk of contracting leukemia between the years of 1978 and 1983 when compared with people living more than 20 miles away, according to a 1990 study by the Massachusetts Department of Public Health. *Southeastern Massachusetts Health Study 1978-1986*, Morris, M.S., Knorr, R.S., Massachusetts Department of Health, Southeastern Massachusetts Health Study, Oct., 1990. *Archives of Environmental Health*, Vol. 51, p266, 1996, July-Aug. #4
At that meeting Pilgrim gave their wish list. Pilgrim, the implicated industry, would be allowed to appoint a second peer review panel to re-review the Southeastern Massachusetts Health Study; and, until their own peer review panel decided whether the study was credible all the study’s recommendations would be put on hold.

The second peer review panel could find nothing wrong with the study’s methodology. The re-review panel stated clearly in their Executive Summary that, “The [original SMHS] study team adhered to generally accepted epidemiologic principles…” and “the findings of the SMHS cannot be readily dismissed on the basis of methodology errors or proven biases…” But somehow they just couldn’t believe it - given Pilgrim’s emissions. However for emissions data, they relied on data collected and provided by Pilgrim - not surprisingly it indicated that Pilgrim hardly emitted any radiation.

The story gets worse. Massachusetts Department of Public Health allowed Pilgrim, the implicated industry, to provide all the sound bites, press releases and public announcements about the re-reviews findings and refused to let their employees, who conducted the original study, speak to the press.

Once again, we see political science used to re-write real science on behalf of industry.

Southeastern Massachusetts Childhood Leukemia Study, Massachusetts Department of Public Health

The study was funded and in the planning phase, 2002. However, the project was cancelled because funds appropriated were insufficient to perform a study that would be statistically significant.

Subsequent reviews of the MA Cancer Resistry shows the “foot prints” of radiation linked disease in communities impacted by Pilgrim.

Evidence of radiation-linked disease continued. In a statement before the Southeastern Massachusetts Health Study Review Committee [June 26, 1992] Dr. Richard W. Clapp, the founder and former director of the Massachusetts Cancer Registry, presented a graphical assessment of the pattern of leukemia and thyroid cancer in the towns closest to Pilgrim during the period 1982-1989 and an Analysis of 1974-1989 Massachusetts Cancer Registry for Leukemia & Thyroid Cancer, Dr. Richard Clapp, DSc, MPH (2006), personal communication.
The graphs of the incidence leukemia and thyroid cancer in the Plymouth area show that the incidence of leukemia peaked in 1982 and subsequently declined until 1986. Then there was a second, smaller peak in 1987 and 1988 while declined in 1989. The number of cases exceeded the number expected in 1982-85 and 1987-88. The second graph depicts the pattern of thyroid cancer in the same set of towns. It shows a peak in the years 1987-1988. These patterns of cancer incidence are consistent with the predicted health effects of the radiation released in the early 1980s. A graph showing the predicted health effects is also shown in Exhibit F. A statistically significant increase in childhood leukemia was noted in communities near Pilgrim, too. Although Massachusetts Department of Public Health recommended a state sponsored case controlled childhood leukemia study, it was not done.

The Massachusetts Cancer Registry also shows, for the years 1998-2002, a continuing increase of leukemia and thyroid cancer in the towns around PNPS. Specifically, there were 83 cases of leukemia reported to the Massachusetts Cancer Registry (MCR), where 72.9 would have been expected based on statewide rates. This results in a Standardized Incidence Ratio (SIR) of 114 (95% conf. int. = 91-143). In addition, there was excess thyroid cancer in these same towns for the same time period. The thyroid cancer SIR was 122 (95% conf. int. = 96-155). In other words, leukemia was 14% elevated over the statewide rate and thyroid cancer was 22% elevated. Neither of these calculations were statistically significantly elevated by the usual convention (P<.05), but there were more cases than expected nevertheless. This means there is a continuing excess of these two radiation-related cancers in the population, as there was in the 1980s. Analysis of 1998-2002 Massachusetts Cancer Registry for Leukemia & Thyroid Cancer, Dr. Richard Clapp, 2006, personal communication.

Prostate cancer and multiple myeloma, both radiation-linked diseases, are also elevated and statistically significant for the years 1998-2002 in the seven towns most likely to be impacted near Pilgrim (Carver, Duxbury, Kingston, Marshfield, Pembroke, Plymouth, and Plympton). Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2 (2006). Occupational Radiation Studies, Chapter 8, National Academies Press, 2006. Specifically, data from the Massachusetts Cancer Registry indicates 613 cases of prostate cancer vs. 513.5 expected, SIR=119 (95% C.I.=110-129); multiple myeloma: 47 cases vs. 31.7 expected, SIR=148 (95% C.I.=108-198). Analysis of 1998-2002 Massachusetts Cancer Registry for Leukemia & Thyroid Cancer, Dr. Richard Clapp, 2006, personal communication.

Radiation-linked Cancers in Towns Surrounding Pilgrim showing Statistical Significance of SIR a 95% level probability-Massachusetts Cancer Registry 2002 -2009 – examples:

<table>
<thead>
<tr>
<th>Town</th>
<th>Leukemia</th>
<th>Multiple Myeloma</th>
<th>Prostate Cancer</th>
</tr>
</thead>
</table>
For further updates, visit the Massachusetts Department of Public Health’s Cancer Registry - data is listed by year for each town. [http://www.mass.gov/eohhs/gov/departments/dph/programs/mass-cancer-registry.html](http://www.mass.gov/eohhs/gov/departments/dph/programs/mass-cancer-registry.html) The next MA Cancer Registry report is due summer 2014.

<table>
<thead>
<tr>
<th>Town</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marshfield</td>
<td>2003-2007 (female)</td>
</tr>
</tbody>
</table>

9. MONITORING: RADIATION RELEASES INTO AIR & WATER

RADIOACTIVE AIR EMISSIONS OFFSITE

Importance, Emergency Planning & Epidemiology Studies: It is important that additional/enhanced offsite real-time or minute-by-minute meteorological and radiological monitoring is done by the State and that the data is reported to the public. Because:

Fore-casting: It would provide a tool to use ahead of time for emergency pre-planning to understand where a plume would likely go under various typical weather regimes, and what and where the resultant concentrations/potential doses could be.
**Now-casting:** It would be important during a radiological emergency to know where the plume actually is going and resultant concentrations/potential doses required for making appropriate recommendations (i.e., evacuate or shelter in place).

**Hind-casting:** It would important for the post-radiological emergency timeframe. Combining meteorological modeling with expanded meteorological/radiological data to provide for more accurate/realistic dose estimates can help with disaster recovery, cleanup, litigation resolution, and short-term acute and long-term epidemiological health studies.

**Neighborhood Watch:** If the licensee knows that it is being watched, it is motivated to take extra care.

**Status Mass. Department Of Public Health Air Monitoring System, October 2012**

<table>
<thead>
<tr>
<th>Monitors</th>
<th>Effective Real-time Air Monitoring System Includes</th>
<th>MDPH’s System 2012</th>
</tr>
</thead>
</table>
| **Location** | • Monitors placement must be based on prior meteorological analysis.  
• Monitors ring the reactor, including placement in all (5) Emergency Planning Zone (EPZ) towns and Cape Cod, **at minimum**.  
• Monitors in near-field placed at sufficient distance from potential release points on site to maximize detection.  
• Monitors placed in a double ring in order to gauge penetration of the plume inland. | (12) Located ½ to 1 ½ miles from site in small quadrant behind plant  
2013 additions:  
(1) placed at the Gunet; (I) placed in downtown Plymouth, (1) placed at shopping mall (Colonie Place) Rt. 44, Plymouth |
| **Number** | 22 at minimum as originally promised in the early 1990’s | 15 |
| **Detection Capability** | Gamma, alpha, beta radionuclides & weather data - precipitation, wind direction, speed | Gamma radiation; precipitation, one monitor |
| **Data Linked** | Data linked to Massachusetts Department of Public Health (MDPH), Massachusetts Emergency Management Agency (MEMA), Local Emergency Operation Centers | Linked to MDPH and MEMA |
| **Public Availability** | Data live-streamed on MDPH’s website; monthly summary reports provided on MDPH’s website & concurrently forwarded to the designated State/Local officials; annually reported in the licensee’s Radiological Environmental Monitoring Program report to NRC. If a reading is above a predetermined base level for a pre-determined sustained period of time, notification to designated state/local officials made before the end of the next business day according to a pre-announced protocol, determined with public input. | Public notification envisioned to begin Fall 2012 |
Cost | Monies come out of section 5K of chapter 111 of the General Laws that provides the department may expend not more than $180,000 from assessments collected under section 5K for services provided to monitor, survey and inspect nuclear power reactors | $18,000 each monitor (purchase price and installation)

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**Location Monitors:**

The monitors are located ½ mile to 1 ½ miles from the reactor. They are too close together; equipment is wasted and should be relocated further afield. For example, the Southeastern Massachusetts Health Study and subsequent studies by Dr. Clapp showed radiation-linked effects in populations well beyond 1 ½ miles. There are no monitors in the direction of where 60% of the prevailing winds, according to Entergy, shown immediately below.

Testimony of Dr. Kevin R. O’Kula and Dr. Steven R. Hanna on Meteorological Matters Pertaining to Pilgrim Watch Contention 3, Entergy Exhibit 00001, Pilgrim LRA Proceeding, 50-293-LR, 06-848-02-LR, January 3, 2001]
Plans to install additional Monitors:  Downtown Plymouth; Colony Plaza, West Plymouth(route 44); Gurnet, located south end Duxbury Beach; Mattakesett Court Duxbury, monitor provided by Town of Duxbury.

Funding Program: The money comes out of section 5K of chapter 111 of the General Laws that provides the department may expend not more than $180,000 from assessments collected under section 5K for services provided to monitor, survey and inspect nuclear power reactors. The assessment should be increased.

RADIOACTIVE LIQUIDS LEAKING OFFSITE

Leaks of radioactive contaminated liquid into the ground from buried components at U.S. nuclear reactors have occurred with increased frequency. Many of these leaks were initially undetected and remained undetected for many years. In at least one case, the leak was not detected until after an underground plume of several million gallons of contaminated water traveled beyond the nuclear facility's site into drinking wells. In most cases, the leak was finally detected more by happenstance than by rigorous monitoring. In all cases, a small leak undetected for an extended period of time permitted large amounts of contaminated water to enter the ground around the facilities.

Better prevention and monitoring systems are needed. Unmonitored leaks of radioactive materials offsite are against NRC regulation; a public health hazard; a threat to local fishing and aquaculture; and may significantly increase the monies needed to decommission the reactor beyond what the owner set aside, sticking added costs to citizens.

Tritium, What Is It? Tritium, a radioactive form of hydrogen, is a gas in its elemental form. Like ordinary hydrogen, tritium combines with oxygen to make water, called tritiated water. Tritiated water is radioactive. Tritiated water is chemically identical to normal water and the tritium cannot be filtered out of the water.

Where Does It Come From? Natural: There is some natural background tritium in surface and groundwater that comes from the interaction of cosmic radiation with the atmosphere. These levels are very low – typically 5 to 25 picocuries per liter in surface water and less than 6.4 to 12.8 picocuries per liter in groundwater. Weapons: Large amounts were added in the atmosphere and global waters from atmospheric testing of nuclear weapons. However the last atmospheric test was by China in 1980; and since the half-life of tritium is 12.3 years, most of the additions due to testing have decayed away. Nuclear Reactors: Nuclear reactors generate tritium in the course of their operation and release it both to the atmosphere and to water bodies.

How Do People Become Exposed To Tritium? Tritium is almost always found as a liquid and primarily enters the body when people eat or drink food or water containing tritium or absorb it through their skin. People can also inhale tritium as a gas in the air.

What Are The Health Risks? As radioactive water, tritium can cross the placenta, posing some risk of birth defects and early pregnancy failures. Ingestion of tritiated water also increases cancer risk.
How Much Is Considered Safe? Standards for tritium in drinking water range from 20,000 picocuries per liter in drinking water to 400 picocuries.

- EPA: EPA’s standard for tritium in drinking water is 20,000 picocuries per liter.
- Ontario Canada’s Drinking water quality standard for tritium is 540 picocuries per liter.
- California’s recommended public health goal for tritium in drinking water is 400 picocuries per liter.
- The Department of Energy agreed to an action level of 500 picocuries per liter for tritium in surface water in the clean up at Rocky Flats - a level corresponding to Colorado’s standard for tritium in surface water.

Therefore when reactor owners and the NRC dismiss public concerns about leaks, saying that tritium levels measured offsite by the plant operators were well below the EPA drinking water standard of 20,000 picocuries per liter and are “safe. This is not correct because: All radiation protection regulations and the most recent report of the National Academies BEIR VII report concluded that the hypothesis that best fits the facts is that every exposure to radiation produces a corresponding cancer risk – low exposures produce low risk, and that risk increases with exposure. There is no threshold below which there is zero risk. The EPA’s method of expressing this reality is to set a Maximum Contaminant Level Goal (MCLG) which corresponds to zero health risk. The EPA value for MCLG for all radionuclides, including tritium, is zero.

What Are NRC’s Reporting Requirements? Reporting Requirements for Liquid Releases: NRC’s reporting requirement for a minimum detection limit, also called the Lower Limit of Detection (LLD), is 2,000 picocuries per liter that can be increased to 3,000 picocuries per liter if no drinking water pathway exists. NRC believes that this is satisfactory because the EPA drinking water standard (20,000 picocuries per liter) is used as a reference. But it is quite unsatisfactory if the California public health goal (400 picocuries per liter) is the reference value. Evidently, for a reliable conclusion that the level is below 400 picocuries per liter, the LLD required should be consistently lower than that. We believe that NRC must tighten its tritium LLD to 200 picocuries per liter or less and require the specification of the LLD.

Tritium measurements are done quarterly, with composite samples that are collected at various intervals, commonly monthly. This means that samples from the times tritium is discharged (many times each quarter) and the times that it is not, are put together and averaged to give a quarterly result.

There are problems with this approach. There is generally no independent verification by the NRC of when the samples are actually taken. The NRC (and hence the public) depend on the reactor operators’ word that they are taken at the time of contaminated water discharge and not just before or well after. As a result, there is no verification of how representative the samples are and hence of the accuracy of the data in providing estimates of total tritium releases. If the samples are not coordinated with plant discharges occurring over a period of time and are not fully representative of the discharges, the estimates of total tritium discharges made using the results could be inaccurate. There is at present no independent way for communities and the public to verify what is occurring in terms of discharges measurements and reporting of the same.

Reporting Requirements for Gaseous discharges: As discussed in the foregoing, rainfall episodes that occur during gaseous discharge events result in the rainfall becoming contaminated with tritium. Despite the fact that such contamination could reach high levels under certain weather and tritium
release conditions, data for rainfall near reactors are not part of the Environmental Reports filed by nuclear power plant operators. The NRC does not require rainwater monitoring nor monitoring of groundwater and surface water that may be affected by contaminated rainfall events.

**How Releases Are Monitored?** NRC requires monitoring wells only if the groundwater onsite is used for drinking by the licensee; otherwise it is voluntary. In response to the proliferation of leaks from reactors around the country, especially at Braidwood NPS in Illinois where tritium leaks ended up in offsite drinking water, the NRC formed a Task Force in 2006. The task force’s findings and the NRC’s response are available on the NRC Web site at: [http://www.nrc.gov/reactors/operating/ops-experience/grndwtr-contam-tritium.html](http://www.nrc.gov/reactors/operating/ops-experience/grndwtr-contam-tritium.html). NRC allowed industry to develop a voluntary NEI initiative instead of establishing a regulation.

**Tritium in Groundwater Monitoring Wells at Pilgrim**

Nuclear Energy Institute’s Groundwater Protection Initiative was implemented at nuclear power plants across the United States. Entergy established the groundwater monitoring program at Pilgrim Nuclear Power Plant (PNPP) in November 2007 to monitor for tritium in groundwater beneath and around the facility. The put in place four wells, heretofore they did not monitor groundwater as NRC required monitoring only if the licensee used water onsite for drinking. So what may have leaked offsite into Cape Cod Bay or into the ground onsite since operations began in 1972 is unknown. The purpose of monitoring groundwater is to provide a system of watchfulness with regard to plant operations and infrastructure.

Results of groundwater monitoring well samples collected at PNPP to date can be accessed by clicking on MDPH’s website at: [http://www.mass.gov/eohhs/consumer/community-health/environmental-health/exposure-topics/radiation/environmental-monitoring.html](http://www.mass.gov/eohhs/consumer/community-health/environmental-health/exposure-topics/radiation/environmental-monitoring.html)

Groundwater samples collected at PNPP were analyzed by an Entergy contract laboratory and split samples were analyzed by MDPH/RCP Massachusetts Environmental Radiation Laboratory (MERL). All groundwater samples were collected from groundwater monitoring wells located on the PNPP property. Approximate locations of monitoring wells are on the map below.

The environmental monitoring data are summarized by year for 2007 to 2014; data are reported quarterly for the more frequent sampling which began in 2010. **Samples show elevated levels of tritium in some wells; the source of the leaks is still not known.**

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33 Entergy’s Buried Piping and Tanks Inspection and Monitoring Program, NRC Electronic Library Accession No., ADAMS ML081090289
Aging Management Program: The basic problem is that Pilgrim's program to prevent and detect leaks in buried components has improved but remains inadequate. It still lacks a sufficient number of monitoring wells placed in accordance with accepted design standards; lacks cathodic protection to prevent corrosion; lacks a requirement to perform a more robust inspection program, currently only (1) inspection is required over the 20-year license renewal period.

RESOURCES


 ENVIRONMENTAL MONITORING

Entergy's Environmental Monitoring: The NRC requires licensees to issue an Annual Environmental Monitoring Program Report. The reports are available each year on NRC’s Electronic Library, ADAMS. The reports are available each year on NRC’s Electronic Library, ADAMS. Pilgrim’s docket number for future reference is 05000293.

Problem: The Licensees are required to do environmental monitoring offsite and report the results annually. However the monitoring is inadequate because: the number of samples taken for testing has markedly been reduced over the years; the location of some of the sampling stations is inadequate because the indicator sampling locations are too close to the reactor, and Entergy sends the samples to their own lab (Fitzpatrick Lab) for testing and analysis. In response to the proliferation of leaks around the country at reactors, NRC established a task force. Its report is worth reading. Groundwater Contamination (Tritium) at Nuclear Plants-Task Force – Final Report, NRC, Sept 1, 2006. The report is available here: http://pbadupws.nrc.gov/docs/ML0626/ML062650312.pdf

Solution: Increase the number of samples; place the indicator sampling locations in areas that are expected to show influence from the reactor; provide split samples to the Mass Department of Public Health for analysis and assure licensee provides funding for the program and that the results are regularly reported to the public.

Mass Department of Public Health’s Environmental Monitoring: The Radiation Control Program has the statutory authority to conduct environmental monitoring in areas around operating nuclear power stations in or near the Commonwealth. Environmental radiation monitoring devices are deployed at a variety of sites around these power stations, and staff conduct periodic sampling of crops, finfish, shellfish and dairy products originating in these areas. These environmental samples and monitoring devices are evaluated at the Massachusetts Environmental Radiation Laboratory to determine the extent of radioactive releases, if any, from these power stations.

The program is underfunded so that the sampling currently is inadequate; legislation needs to be filed to increase assessment in the MA General Laws, section 5K chapter 111.

For example, to search for the 2011 report in Advanced search click in property, highlight accession number; click in operator, highlight “is equal to”; click in value, add accession number “ML11143A032”
10. MARINE IMPACT

Once Through Cooling: Pilgrim, like all nuclear reactors, generates too much heat. To remove excess heat, they draw in over 500 million gallons of water a day from Cape Cod Bay. Along with the water, they suck in fish eggs and other microscopic organisms; larger fish get pulled in by the current too and become trapped on intake screens. The marine life that is drawn in gets pulverized by the reactor condenser system and emerges as sediment that clouds the water around the discharge area, often blocking light from the ocean floor. The sediment cloud results in killing plant and animal life by curtailing the light and oxygen needed to survive. The water that is drawn in cycles through and is then released at temperatures 30 degrees above Bay temperature (62F to 100F) – disrupting the ecosystem. The water discharge temperature is averaged over an hour time period. The U.S. Environmental Protection Agency wanted Entergy to measure the water temperature discharged instantaneously recognizing that some discharges are 130 degrees or more - although the hourly average remains within limits. Entergy prefers the hourly average. Agreement has not been reached. Some organisms are attracted to the warmer environment. But when the reactor is abruptly shut down, water temperatures will drop causing cold-stunning, fatal to fish acclimated to warmer waters.

The following report is from http://www.pilgrimcoalition.org/facts/environment/.

Pilgrim has used the equivalent of the entire volume of Cape Cod Bay over the last four decades for cooling, drawing in and killing about a million fish and billions of plankton, fish eggs, larvae, and other marine life. This is a far greater impact than was projected in pre-permitting studies in 1970 that led to the licensing of Pilgrim in the first place.

In 2006, Entergy sued MassDEP to avoid new water pollution regulations. In 2011, the Supreme Judicial Court upheld the new regulations, saying, “The environmental impact of [CWIS] is staggering...destabilizing wildlife populations in the surrounding ecosystem. In areas with a designated use as aquatic habitat (such as Cape Cod Bay where Pilgrim’s CWIS operates), therefore, CWISs hinder the attainment of water quality standards.”

A report by Stratus Consulting 2002 evaluating habitat replacement costs for EPA’s Region I placed the “kill rate” for fish higher. It said that an average of 14.5 million fin fish and 160 billion blue mussels are estimated to be killed on average each year (based on data from 1973-1999) via entertainment and impingement combined. This would mean that more than a million fish have been killed over the past 4 decades.

Violations by Entergy35:

- No state CWIS permit as required by 2006 regulations.
- Discharge violations: Since at least 1995, discharging toxic corrosion inhibitors without a state or federal permit; chlorine discharge limit violations in 5 of last 12 quarters.

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35 See NRC Electronic Library, Electronic Hearing Docket http://adams.nrc.gov/ehd/ Petitioner’s Pleadings in: Pilgrim_CWA; Pilgrim_ESA-MSA; Pilgrim_ESA-Rosette Tern
- The joint EPA-DEP Clean Water Act “NPDES” permit expired 16 years ago; and although it has been “administratively extended” for 16 years, Entergy has violated its terms since 2000.
- The Massachusetts “Section 401 certification” of the NPDES permit is outdated and invalid given unpermitted discharges of various pollutants and other violations.
- Since about 2000, no approved “marine monitoring plan” as required by NPDES permit.
- Since 2000, Entergy has refused to cooperate with the required technical advisory committee, which was set up as an “integral part” of the NPDES permit. Entergy is not meeting its obligations: without compliance with this critical provision, the permit is meaningless.
- Radioactive tritium is leaking into the groundwater which flows into Cape Cod Bay.
- State 2006 coastal zone management “federal consistency certification” is invalid.

**RESOURCES MARINE IMPACT, CONTACT**

Margaret Sheehan, environmental attorney at meg@ecolaw.biz
Pine Dubois, Jones River Watershed Association at pine@jonesriver.org
Anne Bingham at annebinghamlaw@comcast.net
Licensed to Kill: Classic report explaining once-through cooling http://www.nirs.org/reactorwatch/licensedtokill/licensed2kill.htm
Riverkeeper in New York challenges to Indian Point’s once-through –cooling and protect marine life at http://www.riverkeeper.org/?s=once+through+cooling&area=

**11. NRC OVERSIGHT**

**NRC’s Track Record:** The crisis at the Fukushima Daiichi nuclear plant in Japan following the March 11 earthquake and tsunami is a stark reminder of the risks inherent in nuclear power. One of its consequences has been heightened concern about the safety of nuclear power facilities in the United States. The Nuclear Regulatory Commission, the federal agency responsible for ensuring that U.S. nuclear plants are operated as safely as possible, gets mixed reviews in a March 2011, 2012, 2013 Union of Concerned Scientists reports, http://www.ucsusa.org/nuclear_power/

The 2012 report [http://www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/nrc-and-nuclear-power-safety-annual.html] is the most recent report in an annual series. The report describes 14 nuclear near-misses in 2012. In 2011 there were two near-misses at Pilgrim. They included: Security problems prompted the NRC to conduct a special inspection. Details of the problems, their causes, and their fixes are not publicly available. Second, when restarting the reactor after a refueling outage, workers overreacted to indications that the water inside the reactor was heating up too rapidly, and lost control of the reactor. The plant’s safety systems automatically kicked in to shut down the reactor.
The UCS 2013 Report, *NRC and Nuclear Power Plant Safety in 2013: More Jekyll, Less Hyde* explains that the NRC *can* effectively enforce nuclear safety regulations—but it’s doing so inconsistently.\(^{36}\)

**NRC Approved Cost Benefit Analyses- underestimate offsite consequences so retrofits not justified**

For license renewal or backfitting retrofits, licensees are required to perform a cost-benefit analysis to weigh the costs of off-site consequences in a severe accident against the costs of mitigation to reduce the risk of an accident. This means that none of the lessons learned from Fukushima (NRC Staff’s initial recommendations) will be implemented unless the consequence code used shows that the offsite costs in an accident justify the cost of the retrofit to the licensee. The same situation is the case in licensing and re-licensing. The question is how valid are the assumptions in the NRC approved consequence code (tool) to perform the analysis? The code (Melcor Accident Consequence Code, MACCS/MACCS2) is outdated and severely underestimates offsite consequences so that retrofits/ mitigation to reduce risk will not be justified. For example: the code underestimates: the probability of core damage; the amount of radioactive release, size of accident, size of area contaminated; clean up costs and decontamination is severely underestimated, waste disposal ignored; economic costs; health costs; overestimates how rapid evacuations occur impacting estimate health impacts; and allows the licensee to choose a mean average for the consequence data, not the 95 percentile.\(^{37}\)

**12. PUBLIC PARTICIPATION**

**How to Participate in NRC Regulatory Processes**

The NRC provides for public participation via rulemaking, licensing, enforcement, and hearings. The following NRC links provide basic information: [http://www.nrc.gov/public-involve.html](http://www.nrc.gov/public-involve.html)

**How effective are these options?**

**Rulemaking:** Filing rule change petitions may help move the ball down the road but as Entergy’s own lawyers said at the initial oral hearing in Pilgrim Watch’s challenge to the NRC’s post-Fukushima Orders, June 2012 “We all know how long the NRC ... can take with rule-making.” (Stenger, Tr. 56)

**Licensing:** Pilgrim Watch knows of no re-licensing application denied; and recalls only two new commercial reactors stopped in challenges- one in Oklahoma (Black Fox NPS) and the other in Long Island (Shoreham NPS). Adjudication has many benefits, however. Challenges bring issues forward to


See also at same link: *Safety regulations are enforced inconsistently and Near-misses are fewer and less severe, but still happening*


educate the wider general public, press and politicians; and provide the opportunity for safety gains through settlements with the licensee and by commitments added to the license.

10 C.F.R. § 2.206 Enforcement Proceedings: The evidence before the Atomic Safety Board showed that, with one possible exception, the NRC has not granted a section 2.206 petitioner the substantive relief it sought for at least 27 years; and the NRC Staff’s near 100% rejection rate is exacerbated by the fact that any review of Director’s decisions is essentially impossible.

On May 17, 2012, Judge Rosenthal issued an order in which he “directed the Staff to provide the Board with a list of those section 2.206 petitions filed with it since January 1975 (the birth of the agency) in which substantive relief had been sought and granted.” (Decision, Additional Opinion of Judge Rosenthal, 2, underlining Judge Rosenthal's) The Staff’s first response to the Board’s Order of May 17 said that the requested substantive relief was granted in only 2 of the 387 Director decisions that the Staff reviewed, but that 140 had been granted in part. (Id.) Judge Rosenthal’s “examination of one of the two items that the Staff represented to be the grant of full substantive relief” showed that was not the case in at least one of the two.

In a later filing, Entergy pointed to four petitions as to which Entergy said substantive relief had been granted. PW showed that this was not true in any of the four. Judge Rosenthal did not understand how either, he said that:

But at least where truly substantive relief is being sought (i.e., some affirmative administrative action taken with respect the license or licensee) there should be no room for a belief on the requestee’s part that the pursuit of such a [§2.206] course is either being encouraged by Commission officialdom or has a fair chance of success. (Id. 7)

Hearings: The NRC provides opportunity to participate in person, via the web or phone link. Meetings are held during normal business hours that is unavoidable in most circumstances that decreases opportunity for the general public to participate. Industry is well represented so that it behoves the public to make every effort to participate.

13. DO WE NEED PILGRIM’S POWER

At the April 6, 2011 Massachusetts State House Hearing called in response to the Fukushima accident and its implications for the Commonwealth, ISO New England testified. The video is accessible at http://www.malegislature.gov/Events/EventDetail?eventId=733&eventDataSource=VideoService&videoSource=jnt and ISO’s presentation is from minutes 121.50-145. Beginning at 138.56 on the video,

39 References regarding 2.206 below available on http://adams.nrc.gov/ehd/ “All Power Reactors”
40 Pilgrim Watch Comments On Significance Of Staff Disclosures, July 3, 2012; Pilgrim Watch Motion For Leave To Reply To Entergy’s Comments On NRC Staff Response To The Board Order Regarding Petitions Under 10 C.F.R § 2.206 (July 3, 2012), July 10, 2012; Pilgrim Watch Reply To Entergy’s Comments On NRC Staff Response To The Board Order Regarding Petitions Under 10 C.F.R § 2.206 (July 3, 2012), July 10, 2012; Memorandum And Order (Denying Petitions For Hearing), LBP-12-14, July 10, 2012, Additional Comments of Judge Rosenthal
41 Entergy’s Comments on NRC Staff Response to the Board Order Regarding Petitions Under 10 C.F.R § 2.206, July 3, 2012
42 Pilgrim Watch Motion For Leave To Reply To Entergy’s Comments On NRC Staff Response To The Board Order Regarding Petitions Under 10 C.F.R § 2.206 (July 3, 2012), July 10, 2012
Senator Downing, on behalf of Senator Wolf, asked ISO what the effect on the grid would be if Pilgrim were not relicensed – in other words, would the lights stay on? Mr. Roark, ISO, replied that we would have other sources to make up power that would be lost if Pilgrim shut down. I note that Pilgrim is currently shutdown for refueling and the lights remain on in the region.

Mr. Roark opined that there may be a need for transmission upgrades in the area; however he noted that ISO was working on transmission upgrades to Cape Cod that would be ready in a few years and would likely have spill-over effect to Pilgrim’s geographic area. Transmission upgrades go through three stages: study, citing and construction. (Video at 143)

RESOURCES

SOUTHEASTERN MASSACHUSETTS GROUPS FOCUSED PILGRIM

- Pilgrim Watch  http://www.pilgrimwatch.org/
- Pilgrim Coalition  http://www.pilgrimcoalition.org/
- Cape Downwinders  http://www.capedownwinders.org/
- Cape Cod Bay Watch  http://www.capecodbaywatch.org/

NATIONAL NUCLEAR SAFETY ORGANIZATIONS

- Union Concerned Scientists  http://www.ucsusa.org/nuclear_power/
- Beyond Nuclear  http://www.beyondunder.org/
- Nuclear Information Service  http://www.nirs.org/

GOVERNMENT

- Nuclear Regulatory Commission  http://www.nrc.gov/
- NRC Meeting Schedule  http://www.nrc.gov/public-involve.html