PILGRIM WATCH

Pilgrim's Spent Fuel: Cask, Transfer Procedure, ISFSI

January 7, 2015

Entergy began spent fuel cask storage in January 2015 because the pool is at its maximum capacity. Entergy plans to fill 3 casks, each containing 68 assemblies every two years to maintain sufficient room in the spent fuel pool to conduct refueling operations, keeping the pool tightly packed and placing the public at risk from a pool fire. Each cask will contain one-half as much Cesium-137, over a million curies, as the total amount released at Chernobyl.[1]

Spent Nuclear Fuel policy in the USA is dominated by short-term thinking and cost minimization. This paper reviews Pilgrim's dry casks and the risks involved in transferring the assemblies from the pool to dry casks.

Problems with Pilgrim's dry casks discussed in this paper include: Canisters may need to be replaced within 30 years or sooner due to stress corrosion cracking especially in salt environments; No technology to adequately inspect canisters for stress corrosion cracking; No remediation plan to repair failed canisters; No current available method to replace failing canisters; No monitors installed on each cask to measure heat, helium (to provide early warning) and radiation; and. Casks are susceptible to attack. We rely primarily on papers authored by D. Gilmore (http://sanonofresafety.org/), Dr. Gordon Thompson, Executive Director IRSS, Cambridge, and technical expert on spent fuel for the Massachusetts Attorney General during Pilgrim's license renewal adjudication, (http://www.irss-usa.org/) and NRC and Holtec.

SPENT FUEL DRY STORAGE CASKS

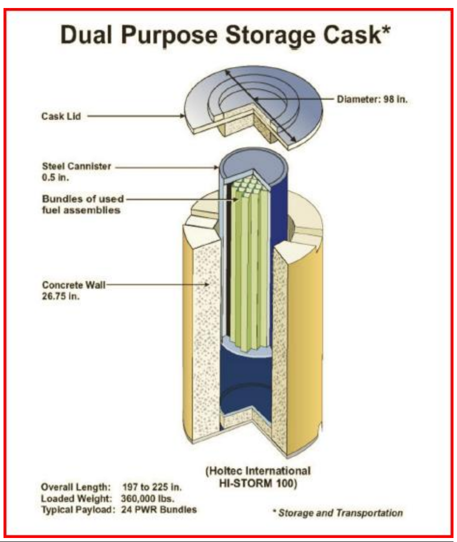
Dry casks removed from pool and reactor building en route to dry cask pad

[1] Environmental Impacts of Storing Spent Nuclear Fuel and High-Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Waste Confidence Decision and Environmental Impact Determination, Dr. Gordon Thompson, February 6, 2009, pg.,45

Pilgrim is using Holtec HI-Storm 100 S Version B MPC-68 dry cask storage system. The system is comprised of three components: MPC-68, HI-TRAC 100D, and HI-STORM 100 S Version B MPC-68[2].

- MPC-68 is a leak-tight metal canister that has a storage capacity of 68 BWR spent fuel assemblies.
- HI-TRAC 100D transfer cask is a metal transfer cask that provides a means to lift and handle the canister as well as provide radiological shielding of the spent fuel assemblies
- HI-STORM 100 S Version B storage overpack is steel-encased concrete storage cask that provides physical protection and radiological shielding for the metal canister when in storage. It is vented for natural convection cooling to dissipate the spent fuel decay heat.

Each loaded cask weighs 40 tons, the equivalent of about 7 adult male African elephants. The casks will be placed on a concrete storage pad 52" X 238.5" located about 100 yards from the shore at 25 MSL. The pad is not enclosed or covered in any way. The pad will eventually hold around 80 dry casks to run out Pilgrim's license, 2032. The casks will be onsite for a long-time according to the NRC, perhaps 300 years or more.



<u>Dry Cask Storage Issues[3]</u>

According to the Nuclear Regulatory Commission (NRC)

• The thin (0.5") stainless steel canisters may crack within 30 years.
• No current technology exists to inspect, repair or replace cracked canisters.
• With limited monitoring, we will only know after they leak radiation.
And, casks are susceptible to attack.

[2] Entergy Letter No. 2.13.042, Attachment 1, pg., 2-3, ADAMS ML 13346A026
[3] For the following analysis on cask issues see: San Onofre Dry Cask Storage Issues analyses at: https://sanonofresafety.files.wordpress.com/2011/11/drycaskstorageissues2014-09-23.pdf

The Nuclear Regulatory Commission's (NRC), Waste Confidence Final Rule 2014 said that spent fuel can be stored at nuclear plants for 60 years (short-term), 100 years (long-term) and indefinitely[4]. But the NRC currently only certifies dry cask storage systems for 20 years, so we cannot depend on the NRC for assurances that these cask systems will last long term. The NRC, the Electric Power Research Institute (EPRI), and numerous government and scientific sources report the following problems with the current steel/concrete U.S. spent nuclear fuel dry storage systems:

- **Canisters may need to be replaced within 30 years or sooner - Stress Corrosion Cracking**: The thin 1/2" welded stainless steel canisters may have premature stress corrosion cracking within 30 years, caused by our marine environment.[5] This could result in major radiation releases. Cracks in similar materials at nuclear power plants caused component failures in less than 30 years, including at San Onofre[6]. Other cask systems, such as the German CASTOR V/19 (~20" thick) ductile cast iron casks, do not have this problem[7]. The concrete overpacks also have aging issues that are accelerated in coastal environments.
- **No technology to adequately inspect canisters for stress corrosion cracking.** There is no technology to inspect even the outside of the stainless steel canisters for cracks once they are loaded with nuclear waste (spent nuclear fuel)[8]. The NRC is giving the nuclear industry five years to develop a method to inspect the outside of the canisters. And then they only plan to require inspection of one canister at each nuclear plant. Cask systems, such as the German CASTOR, can be inspected, since they do not need concrete overpacks for gamma ray and neutron protection.
- **No remediation plan to repair failed canisters**. Technology used for other stainless steel components cannot be used to repair canisters containing nuclear fuel waste[9]. The NRC stated that if one of the canisters becomes defective (e.g. 75% through-wall stress corrosion cracks), there is no way to repair or replace the canister; especially if the spent fuel storage and transfer pools are demolished, as licensees have done when decommissioned. And before a canister can be transported (inside a transport cask), the canister must not have cracks. The

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[4] U.S Nuclear Regulatory Commission's (NRC) Nuclear Waste Confidence renamed Continued Storage of Spent Nuclear Fuel Generic Environmental Impact Statement (GEIS) and Rule, 79 Fed. Reg. 56,238-56,263 (Sept. 19, 2014) (Effective October 20, 2014). The decision is under appeal by the NY, MA, Vermont AGO and independent groups.

[5] Chloride-Induced Stress Corrosion Cracking Tests & Example Aging Management Program, Darrell S. Dunn, NRC/NMSS/SFST, Public Meeting with NEI on Chloride Induced Stress Corrosion Cracking Regulatory Issue Resolution Protocol, August 5, 2014 https://sanonofresafety.files.wordpress.com/2013/06/8-5-14-scc-rirp-nrc-presentation.pdf

[6] Outside Diameter Initiated Stress Corrosion Cracking Revised Final White Paper, PA-MSC-0474, October 13, 2010, Ryan Hosler (AREVA), John Hall (Westinghouse) http://pbadupws.nrc.gov/docs/ML1104/ML110400241.pdf

[7] Top 10 Reasons to Buy Thick Casks, San Onofre Safety at: https://sanonofresafety.files.wordpress.com/2014/10/thincanistersvsthickcasks2014-10-14.pdf

[8] EPRI Extended Storage: Research Perspective, John Kessler, EPRI Used Fuel and High-Level Waste Management Program, NWTRB Meeting, September 14, 2011 http://www.nwtrb.gov/meetings/2011/sept/kessler.pdf

[9] EPRI Extended Storage: Research Perspective, John Kessler, EPRI Used Fuel and High-Level Waste Management Program, NWTRB Meeting, September 14, 2011 http://www.nwtrb.gov/meetings/2011/sept/kessler.pdf

NRC is optimistic there will be a solution before it is needed. However, they do not know what that might be. In addition, Dr. Kris Singh, CEO, Holtec International said that it is not practical to repair a damaged nuclear fuel canister.[10] He said:

> *"...It is not practical to repair a canister if it were damaged...* ***if that canister were to develop a leak, let's be realistic; you have to find it, that crack, where it might be, and then find the means to repair it.*** *You will have, in the face of millions of curies of radioactivity coming out of canister;* ***we think it's not a path forward…***
>
> ***…****A canister that develops a microscopic crack (all it takes is a microscopic crack to get the release),* ***to precisely locate it… And then if you try to repair it (remotely by welding)…****the problem with that is you create a rough surface which becomes a new creation site for corrosion down the road.* ***ASME Sec 3. Class 1 has some very significant requirements for making repairs of Class 1 structures like the canisters, so I,*** *as a pragmatic technical solution, I don't advocate repairing the canister.****"***

Instead Dr. Singh says:

> *…you can easily isolate that canister in a cask that keeps it cool and basically you have provided the next confinement boundary, you're not relying on the canister. So that is the practical way to deal with it and that's the way we advocate for our clients.*

However, there are many problems with Dr. Singh's solution of putting cracked and leaking canisters inside [transport] casks.

> There are no NRC approved Holtec specifications that address Dr. Singh's solution of using the "Russian doll" approach of putting a cracked canister inside a [transport] cask.
>
> NRC requirements for transport casks require the interior canister to be intact for transport. This NRC requirement provides some level of redundancy in case the outer cask fails. Does this mean this leaking canister can never safely be moved? Who will allow this to be transported through their communities? How stable is the fuel inside a cracked canister?
>
> What is the seismic rating of a cracked canister (even if it has not yet cracked all the way through)? The NRC has no seismic rating for a cracked canister, but plans to allow up to a 75% crack. There is no existing technology that can currently inspect for corrosion or cracks. The NRC is allowing the nuclear industry 5 years to develop it. It is likely to be inadequate due to the requirement the canisters must be inspected while in the concrete overpacks.

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[10] https://www.youtube.com/watch?v=euaFZt0YPi4&w=640&h=360]

What is the cost for the transport casks that will be needed for storage? Will they be on-site? Where is this addressed? Transport casks are intended to be reusable because of their higher cost. How and where will they be stored and secured on-site?

How will the leaking canisters be handled by the Department of Energy at the receiving end of the transport? The DOE currently requires fuel to be retrievable from the canister.

A better solution is to use casks that are not susceptible to cracks, that can be inspected and repaired and that have early warning monitoring systems that alert us **before** radiation leaks into the environment.

- **There is no current method to replace failing canisters**. Neither industry nor NRC has any idea what to do in the event of canister failure and/or fuel degradation. The only fuel-handling method currently discussed as available to the commercial nuclear generating industry is to bring a cask [or canister] back into a spent fuel pool for reopening. However we are not aware of a dry cask that has been stored for any period of time outside and then loaded back into a pool containing other fuel assemblies. Doing so would be problematic due to temperature differences between the fuels and contaminating the pool from the damaged fuel in the dry casks. Therefore it would be best to put the fuel back into an empty pool. Dry handling (hot cell transfer) of the cask and fuel is discussed as an option. To avoid disturbing the properties of the cask, cladding, fuel, and related hardware that would occur if the materials were rewetted and rapidly cooled. However, there is no dry handling facility available in the nation that is large enough to handle these canisters. …and removal of a welded storage cask lid is problematic[11]. There is also no dry handling (hot cell) mobile facility designed for this purpose and one may not even be feasible.[12]
- **There are no monitors installed on each cask to measure heat, helium (to provide early warning) and radiation. NRC explained that: "**The canisters to be used at Pilgrim's are welded closed and therefore do not require the use of instrumentation to assure the safe storage of spent fuel. Prior to being placed on the ISFSI pad, the welds are examined and tested to confirm their integrity, and radiation measurements are taken. In accordance with the CoC for the HOLTEC HI- STORM 100 system, a surveillance of the passive heat removal system (air inlet and outlet vents) is required daily to ensure system operability. This can be achieved by either monitoring the inlet and outlet vent temperatures or performing a visual inspection daily to ensure that the vents are not blocked. Pilgrim has

[11] Viability of Existing INL Facilities for Dry Storage Cask Handling, Rev. 1, April 30 2013, Randy Bohachek, et al.,
Idaho National Lab http://energy.gov/sites/prod/files/2013/12/f5/INLFacilitiesDry%20StorHBUFViabilRptR1b.pdf
[12] Technical Workshop on the Impacts of Dry-Storage Canister Designs on Future Handling, Storage, Transportation, and Geological Disposal of Spent Nuclear Fuel in the United States, NWTRB, November 18-19, 2013

elected to perform daily visual inspections to ensure the air inlet and outlet vents do not become blocked and the passive heat removal system remains operable."

In addition NRC expects Thermoluminescent dosimeters (TLDs) will be placed around the ISFSI (cask storage pad). Ray McKinley said that, "The NRC intends to inspect Entergy's plans for radiation monitoring of their independent spent fuel storage installation (ISFSI) at Pilgrim during upcoming inspection activities. Typically we have seen licensees at other sites install thermoluminescent type dosimeters at the ISFSI periphery. The frequency that licensees have performed radiological monitoring from dosimeters has varied from quarterly to yearly based on their specific program requirements. The results of radiological monitoring associated with the ISFSI are included in the licensee's REMP report."

Pilgrim Watch finds that the public would be better protected if each cask had heat, helium and radiation monitors, considering that the canisters and concrete outer packs are prone to cracking and corrosion, especially in our environment. Also, TLDs are limited because: they only provide an average figure; TLD's can only read to a maximum threshold, that is, like a film badge they can only read so high; and TLD's do not read high or low let alpha and beta.

- **Casks are susceptible to attack.**[13]

  Potential for Release from a Case: Dr. Thompson observes that**:** Casks are not robust in terms of its ability to withstand penetration by weapons available to sub-national groups. The cylindrical wall of the canister is about 1/2 inch (1.3 cm) thick, and could be readily penetrated by available weapons. The spent fuel assemblies inside the canister are composed of long, narrow tubes made of zirconium alloy, inside which uranium oxide fuel pellets are stacked. The walls of the tubes (the fuel cladding) are about 0.023 inch (0.6 mm) thick. Zirconium is a flammable metal.

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

  Another type of scenario for an atmospheric release would involve the creation of one or more holes in a canister, with a size and position that allows ingress and egress of air. In addition, the scenario would involve the ignition of incendiary material inside the canister,

[13] Environmental Impacts of Storing Spent Nuclear Fuel and High-Level Waste from Commercial Nuclear Reactors: A Critique of NRC's Waste Confidence Decision and Environmental Impact Determination, Dr. Gordon Thompson, February 6, 2009, pgs., 29, 47, 50, Tables 7-6, 7-7.

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

A typical ISFSI module would contain 1.3 MCi of cesium-137, about half the amount of cesium-137 released during the Chernobyl reactor accident of 1986. Most of the offsite radiation exposure from the Chernobyl accident was due to cesium-137. Thus, a fire inside an ISFSI module, as described in the preceding paragraph, could cause significant radiological harm.

Modes of Attack, Thompson, Table **7-6**

The Shaped Charge as a Potential Instrument of Attack

Category of Information	Selected Information in Category
General information	• Shaped charges have many civilian and military applications, and have been used for decades • Applications include human-carried demolition charges or warheads for anti-tank missiles • Construction and use does not require assistance from a government or access to classified information
Use in World War II	• The German MISTEL, designed to be carried in the nose of an un-manned bomber aircraft, is the largest known shaped charge • Japan used a smaller version of this device, the SAKURA bomb, for kamikaze attacks against US warships
A large, contemporary device	• Developed by a US government laboratory for mounting in the nose of a cruise missile • Described in an unclassified, published report (citation is voluntarily withheld here) • Purpose is to penetrate large thicknesses of rock or concrete as the first stage of a "tandem" warhead • Configuration is a cylinder with a diameter of 71 cm and a length of 72 cm • When tested in November 2002, created a hole of 25 cm diameter in tuff rock to a depth of 5.9 m • Device has a mass of 410 kg; would be within the payload capacity of many general-aviation aircraft
A potential delivery vehicle	• A Beechcraft King Air 90 general-aviation aircraft will carry a payload of up to 990 kg at a speed of up to 460 km/hr • A used King Air 90 can be purchased in the US for $0.4-1.0 million

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

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

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

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

Type of Event	Module Behavior	Relevant Instruments and Modes of Attack	Characteristics of Atmospheric Release
Type I: Vaporization	• Entire module is vaporized	• Module is within the fireball of a nuclear-weapon explosion	• Radioactive content of module is lofted into the atmosphere and amplifies fallout from nuc. explosion

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

Options to reduce risk of release: Use thick-walled metal casks, dispersal of the casks, and protection of the casks by berms or bunkers in a configuration such that pooling of aircraft fuel would not occur in the event of an aircraft impact. Holtec has developed a design for a new ISFSI storage module that is said to be more robust against attack than present modules. The new module is the HI-STORM 100U module, which would employ the same canister is used in the present Holtec modules. For most of its height, the 100U module would be underground. Holtec has described the robustness of the 100U module as follows[14]:

[14] Holtec International, "The HI-STORM 100 Storage System", accessed at <http://www.holtecinternational.com/hstorm100.html> on 17 June 2007.

> "Release of radioactivity from the HI-STORM 100U by any mechanical means (crashing aircraft, missile, etc.) is virtually impossible. The only access path into the cavity for a missile is vertically downward, which is guarded by an arched, concrete-fortified steel lid weighing in excess of 10 tons. The lid design, at present configured to easily thwart a crashing aircraft, can be further buttressed to withstand more severe battlefield weapons, if required in the future for homeland security considerations. The lid is engineered to be conveniently replaceable by a later model, if the potency of threat is deemed to escalate to levels that are considered non-credible today."

- **Casks will be stored outside on a pad, perhaps indefinitely.** Because the Holtec system is susceptible to stress corrosion cracking exacerbated by a salt environment, Pilgrim Watch believes the ISFSI should be inside a building. Germany, Japan and other countries house their casks in buildings that provide protection from the environment and external forces.

TRANSFER PROCESS SPENT FUEL ASSEMBLIES TO DRY CASKS

Transfer Process

The following links are to videos prepared by the nuclear industry. Although Pilgrim uses a different cask and stores the casks vertically on the pad, the process is essentially the same as shown on the videos.

- http://www.youtube.com/watch?v=9eFxP0VFdt0 AREVA TN - NUHOMS Used Nuclear Fuel Loading
- http://www.youtube.com/watch?v=mILvWNgggfU&feature=player_embedded
- http://www.muzikkitabi.com/Video/VIDEOIDrh6FeQWuhCs/Dry-Cask-Storage-For-Spent-Fuel-At-Nuclear-Energy-Plants

Pilgrim's Preparation for Transfer

Pilgrim applied to the NRC for a license amendment in order to begin the transfer process.[15] Prior to transfer, the pool was licensed only for transfer of assemblies weighing 2,000 lbs; but the loaded cask in the pool will weigh 40 tons- the equivalent of 7 adult male African elephants. The application justified Pilgrim's readiness for the transfer operation by installing the various changes: Upgrading the crane to single failure proof; removing the energy absorbing pad; and installing a leveling platform

[15] Docket ID NRC-2014-0202, 56608 Federal Register / Vol. 79, No. 183 / Monday, September 22, 2014 / Notices

Safety Issues Transfer[16]

Entergy will remain operating during the dry run exercise and the actual transfers to dry cask storage. Ray McKinley in response to a question from Pilgrim Watch said:

> *The Certificate of Compliance for the spent fuel storage cask requires a dry run training exercise of the activities associated with dry cask loading prior to the first use of the system to load spent fuel assemblies. Pilgrim's dry run is being conducted in four phases which are being observed by the NRC A specially designed simulated MPC will be utilized that approximates the 40 ton weight of an MPC loaded with fuel. The plant will not be shut down during the dry cask loading activities. It is not necessary. The safety features of the crane and the designated heavy loads path in the reactor building protect plant systems*

Canister Drop in the pool: If a cask is dropped in the pool and the pool floor is breached, there are many safety-related components located on the floors below the spent fuel pool which could be disabled that could simultaneously initiate an accident and disable accident mitigation equipment

Canister Drop on the reactor building floor once removed from the pool and lowered to prepare for transfer outside the building to the storage pad: If a cask is dropped on the reactor building floor once it is removed from the pool, a drop could induce relay chatter or the opening and/or closing of relay contacts. This may result in important equipment being rendered inoperable such as valves erroneously opened or closed, pumps shut off, and loss of indications of the status of safety systems.

NRC Guidance: Entergy, however, is not required to analyze the impact of a canister drop inside the pool or, we presume, analyze the impact of a canister drop on the reactor building floor, once removed from the pool. Ray McKinley explained that:

> *Entergy is in the process of upgrading the crane to a single-failure-proof design under the provisions of 10 CFR 50.59, using NRC approved guidance for design of the crane. NRC licensing guidelines accept the provision of a highly-reliable handling system in place of load drop analyses. Therefore, going forward, Entergy will credit the handling system rather than a load drop analysis as the basis for safe handling of the canisters, both in the spent fuel pool and when lowering the cask onto the transporter.*

Pilgrim Watch believes that there are no guarantees and that there are not failure-proof operators or designers and workers at factories manufacturing the crane and its accessory structure's parts.

[16] Email correspondence Raymond McKinley Chief, Division of Reactor Projects Branch 5 U.S. NRC Region and Mary Lampert, Pilgrim Watch/Duxbury Nuclear Advisory Committee-available on request.

There were near misses at Entergy's Palisades NPS[17] and Vermont Yankee NPS[18], both reactors had failure-proof cranes.

Entergy is not required to have an energy absorbing pad at the floor of the pool. Again the rationale is that they have a single-failure proof crane; and also they installed a leveling platform.

Preparations for a seismic event: Entergy analyzed the equipment for a seismic event. The analysis is "proprietary".[19] Pilgrim Watch was informed by Ray McKinley that the seismic analysis was based on previous expectations not on the more severe event that we can now expect here[20]. Pilgrim Watch asked NRC, and is awaiting an answer, if both the bridge and the trolley were fitted with seismic restraints to maintain the crane on the girder and runway rails.

Vertical Cask Transporter (VCT) to move the cask from the reactor building to the pad: PW asked NRC and was told that the VCT uses foam filled rubber tires. We understand that rubber tires have advantages in seismic situations (rubber tires have elasticity and a lower center of gravity) and foam fill prevents flat-spotting, loss of pressure, blow-outs and prevents damage to travel surface.

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[17] http://www.nirs.org/reactorwatch/licensing/caskdanglesummaryreport4406.pdf

[18] http://www.timesargus.com/article/20141104/NEWS03/711049924

[19] Holtec Proprietary Report Hl-2104715 Rev. 7 "Seismic Analysis of the Loaded H1-TRAG in the SFP and SFP Slab Qualification" (112 Pages) Entergy Response to NRC Request for Additional Information (RAI), Regarding the Heavy Loads License Amendment Request (TAC NO. MF3237) OCT 3, 2014, NRC Adams Library, ML14280A230

[20] The updated seismic data shows that Pilgrim could feel the effects of earthquakes as far away as 400 miles, double the previously estimated distance.

Senators Markey and Warren in a letter to NRC Chair Macfarlane,[20] March 31, 2014 noted that, "The new seismic hazard was found to exceed the safe shutdown earthquake at the ground shaking frequencies that are most likely to threaten the equipment needed to safely shut down the reactor." Further, the Senators expressed special concern about Entergy's March 10 request to the NRC asking for permission to alter some of the numbers used to model the geologic properties of the bedrock on which the Pilgrim nuclear plant sits to "prevent unjustified alarm by stakeholders when GMRS [ground motion response spectrum] results are made public."

On May 2014 Entergy completed a seismic walk-down at Pilgrim. The NRC staff assessment of the walk-down concluded that, "… the licensee, through the implementation of the walk-down guidance activities and, in accordance with plant processes and procedures, verified the plant configuration with the current seismic licensing basis; addressed degraded, nonconforming, or unanalyzed seismic conditions; and verified the adequacy of monitoring and maintenance programs for protective features. Furthermore, the NRC staff notes that no immediate safety concerns were identified."[20] But, significantly NRC failed to say that the seismic walk-downs were based on earlier and outdated understanding of seismic risk here.