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June 7, 2017

CITIZENS' OVERSIGHT PROJECTS
CitizensOversight.org

SAFETY CONCERNS REGARDING HOLTEC HI-STAR 190 TRANSPORT CASK, UMAX STORAGE SYSTEM, AND MPC-37 SPENT FUEL CANISTERS

Introduction

Citizens' Oversight has been an active participant as a ratepayer and public representative in the shut down of the San Onofre Nuclear Generating Station (SONGS), decommissioning and plans for moving fuel to another site. In November, Citizens Oversight became the leading plaintiff in the case to stop the storage of nuclear spent fuel in a Holtec UMAX ISFSI (Independent Spent Fuel Storage Installation) only about 100 feet from the ocean and literally only inches over the high-tide level. The environment hear the Pacific Ocean will result in canisters being subjected to salty ocean air. Experience by the nuclear industry in the continued integrity of canisters in this environment is very short, but it is well known that Chloride-Induced Stress Corrosion Cracking (CISCC) cracks will likely result in this environment once the surface temperature drops below about 85C. Also the area is in a tsunami inundation area, earthquake zone, near 8.4 million people and a heavily used freeway and railroad runs through the exclusion zone of the plant.

Because of these concerns, we are pushing to have the fuel moved promptly to another location using the "Load and Go" procedures outlined in the HI-STAR 190 transport cask documentation. We are, however, concerned with the safety of these procedures as it appears they have not be thoroughly thought through, as the primary need of the Holtec canisters and ISFSI has been for co-located storage rather than optimized for immediate transport. Therefore we comment on these concerns with this in mind.

Source Information

The use case has been proposed by the HI-STAR 190 documentation as found on the NRC ADAMS system as https://www.nrc.gov/docs/ML1623/ML16238A215.pdf , and also with reference to "Final Safety Analysis Report on the HI-STORM FW MPC Storage System (Non-Proprietary Rev. 2). Holtec Report No. HI-2114830, February 18, 2014."

We primarily refer to "CHAPTER 7: PACKAGE OPERATIONS" starting on page 531 of the first document.

WEIGHTS:
We find the following weights provided in these documents which we will use in our submission but these are subject to check by NRC and Holtec.

Table 3.2.6 HI-TRAC VW OPERATING WEIGHT DATA FOR REFERENCE FUEL				
Scenario			**HI-TRAC VW[4] Weight in Kilo-Pounds**	
Water in the MPC	**Water in the Water Jacket**	**Cask in (pool) Water/Air**	**Ref. PWR Fuel**	**Ref. BWR Fuel**
Yes	Yes	Water	167.7	173.3
Yes	Yes	Air	215.5	222.9
Yes	No	Water	159.4	164.6
No	No	Water	143.7	147.9
No	Yes	Air	199.9	206.2
No	No	Air	191.5	197.5

	Case	**Purpose**	**Assumed Weight (Kilo-pounds)**
1.	Loaded HI-STORM FW on the pad containing maximum length/weight fuel and 200 lb/cubic feet concrete – maximum possible weight scenario	Sizing and analysis of lifting and handling locations and cask stability analysis under overturning loads such as flood and earthquake	425.7
2.	Loaded HI-STORM FW on the pad with 150 lb concrete, shortest length MPC	Stability analysis under missile strike	302.1
3.	Loaded HI-TRAC VW with maximum length fuel and maximum lead and water shielding	Analysis for NUREG-0612 compliance of lifting and handling locations (TALs)	270.0
4.	Loaded HI-TRAC VW with shortest length MPC and minimum lead and water shielding	Stability analysis under missile strike	186.0
5.	Loaded MPC containing maximum length/weight fuel – maximum possible weight scenario	Analysis for NUREG-0612 compliance of lifting and handling locations (TALs)	116.4

Issue #1 -- Vertical Extraction after Storage

To load or unload the UMAX storage system, Holtec describes the use of the HI-TRAC transfer cask containing the MPC-37 Canister. Initially, the MPC-37 canister is loaded in the spent fuel pool, inside the HI-TRAC transfer cask, then the lid is welded to the top, and the combined assembly transported to the ISFSI where it is mated with a mating device and the UMAX cavity.

The bottom lid of the HI-TRAC transfer cask is removed and pulled to the side as shown in the adjacent diagram.

HI-STORM UMAX MPC-37 being Installed in the Underground Cavity

Then, the MPC-37 canister is lowered into the cavity in the UMAX ISFSI structure. To remove the canister, the process would be reversed.

The entire weight of the MPC canister, about 120,000 lbs, is supported by the welded lid as the canister is lowered into the ISFSI cavity. Our concern is retrieval once the canisters have been stored in the ISFSI. There is no drain in the bottom of the ISFSI cavity. Over a number of years, particularly in the corrosive salt air at San Onofre only 100 feet from the ocean, it is likely that the bottom of the canister may become corroded to the bottom of the ISFSI cavity. They say they use a thick, 9.5" lid. But it is welded to the 5/8" canister shell. Welds are a common location for CISCC cracking and corrosion due to the stresses induced in the metal and changes to the metal at welds.

Holtec mentions in the extraction below that the HUHOMS design has a design defect in that the end cover of the NUHOMS canister is used to both slide in and out the canister in the horizontal design. They say that the NUHOMS lid can only accept a pull force of about 30 tons applied to the lid, that it was unknown if the canister could be pulled out of the overpack, and that to date, no NUHOMS canisters has been removed. We believe this is also true of the Holtec UMAX system.

during insertion has been reported in recent years. Withdrawal of the canister from the module occurs by the reverse of the insertion process: The hydraulic ram engages a cam attached to the top lid and installs the canister into the transfer cask by pulling it. Because the permitted pull force applied at the center of the relatively thin large lid (≈ 3 inches thick, over 66 inches in diameter) connected to the shell by a partial penetration weld must be limited (to about 30 tons) to prevent the lid from tearing off, and the state of friction on the surface (inaccessible) between the canister and the rails is uncertain at the time of withdrawal, the success of the canister removal operations cannot be guaranteed. To date no high capacity NUHOMS canister has been removed after a period of storage on the pad. This is a looming problem for the NUHOMS sites that its users must confront at the time of decommissioning.

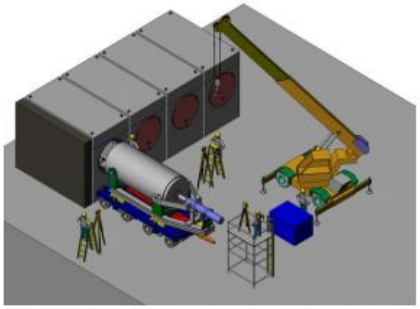


Figure 3.3 Hydraulic Ram Being Aligned to Push a Canister in a NUHOMS Module

There is no analysis to justify that a degraded Holtec MPC-37 canister with possible CISCC cracks in the canister, due to the corrosive environment only 100 feet from the ocean (as is the case at San Onofre) that the canister will maintain integrity as it is lifted from the ISFSI UMAX cavity. The top or bottom may separate from the sides of the canister or the side may rip open due to cracking.

There is no alternative means to extract a degraded canister from the UMAX storage system. There is no side access or means to get under a degraded canister so as to extract it if lifting using the cover is not feasible. This is a distinctive difference between the UMAX system and the above-ground systems, where the canister need not be lifted out to move the cask system.

Issue #2: HI-STAR 190 use scenarios dangerous and ill-defined

The HI-STAR documentation does not provide step-by-step drawings that illustrate how the MPC-37 is to be loaded into the HI-STAR 190 transportation cask, loaded on a railcar, moved to a remote location, and unloaded. This is in contrast to the scenarios provided for the HI-TRAC and UMAX systems in terms of loading the MPC and placing in the UMAX ISFSI.

For purposes of this discussion, we have sketched some drawings to use for explanation, see "Illustration #2". In this series, we assume we are in mid-stream of movement of spent fuel from the site to a remote location, both serviced by rail. In this first illustration, we attempt to provide the drawings to reflect the proposed loading scenario as proposed by Holtec.

The steps are as follows:

1. LIFT empty HI-STAR 190 from railcar. The empty HI-STAR 190 overpack weight is not provided in the public documents (that we can find) so we are estimating that it will be about 120,000 lbs. Also in this step, remove the impact limiters
2. TURN empty HI-STAR 190 to vertical orientation and place in loading area.
3. Remove top lid.
4. LIFT HI-TRAC + MPC (250,000 lbs) and place on top of the HI-STAR-190 using mating device.
5. LOWER MPC-37 into HI-STAR 190 (120,000 lbs).
6. LIFT and LOWER empty HI-TRAC (90,000 lbs). Install Lid on HI-STAR-190.
7. TURN loaded HI-STAR 190 + MPC to horizontal orientation (about 250,000 lbs).
8. LIFT Loaded HI-STAR 190 + MPC (about 250,000 lbs) onto railcar. Install impact limiters.

OUR SUGGESTION

LIFTING and ROTATING actions should be minimized to reduce accident risk. We suggest that an alternative approach may be better, as shown in Illustration #3. The steps are as follows:

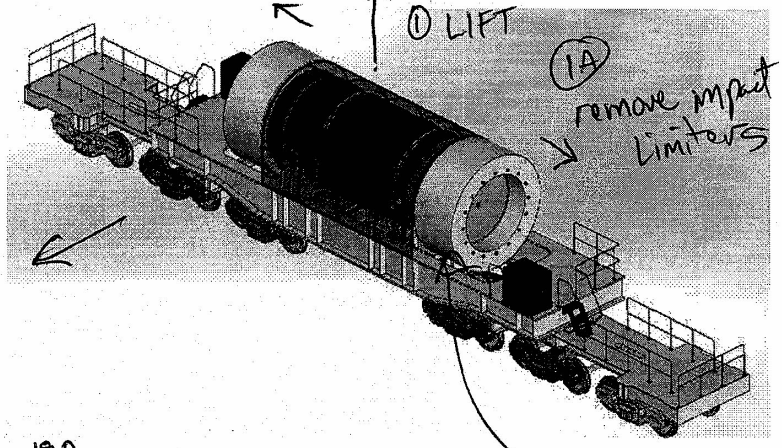
1. LIFT HI-TRAC + MPC (250K lbs) onto cradle by engaging bottom trunnions.
2. Lower to horizontal position. (Note that canister should probably be lowered in the other direction than as shown in illustration so that the top of the canister is to the rear, away from railcar).
3. Roll traincar (with empty HI-STAR 190 already mounted on supports) into position, partially under cradle so HI-TRAC and HI-STAR are aligned.
4. MATE two casks using mating device.
5. PUSH MPC-37 into HI-STAR 190 by sliding using hydraulic press as used in NUHOMS approach.
6. BOLT lid onto HI-STAR 190 and add Impact Limiter.
7. Railcar rolled away from the cradle, Empty HI-TRAC removed from cradle.

This approach includes only ONE lifting + rotation operation of about 250 K lbs of HI-TRAC + MPC, and slides MPC into HI-STAR 190 already mounted on rail car. There should be no need to remove the HI-STAR 190 from the rail car for each loading and unloading operation.

We are hoping that we can use the "Load and Go" approach so there is no degradation of the canister as it not stored in the UMAX storage system.

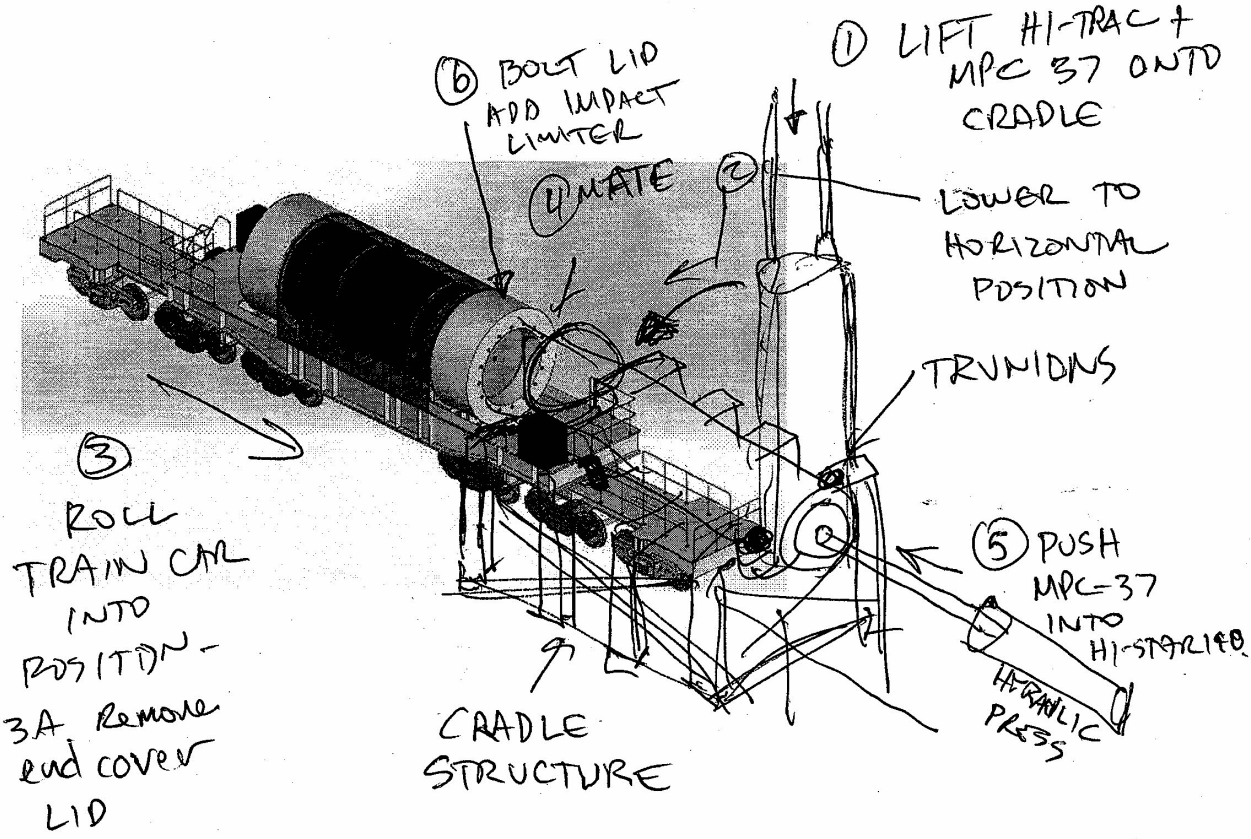
ILLUSTRATION #2

HOLTEC PROPOSED

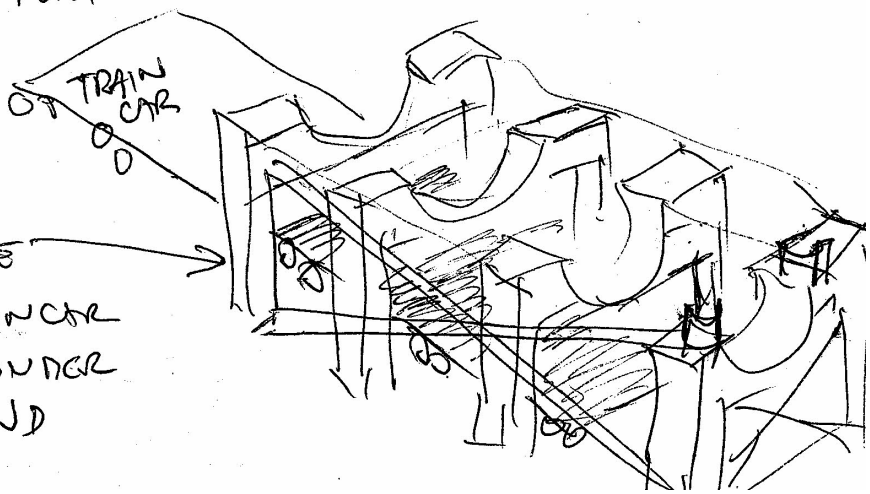


2 TURNS
4 LIFTS + (2 HIGH LIFTS)
1 LOWER

SUGGESTED ILLUSTRATION #3

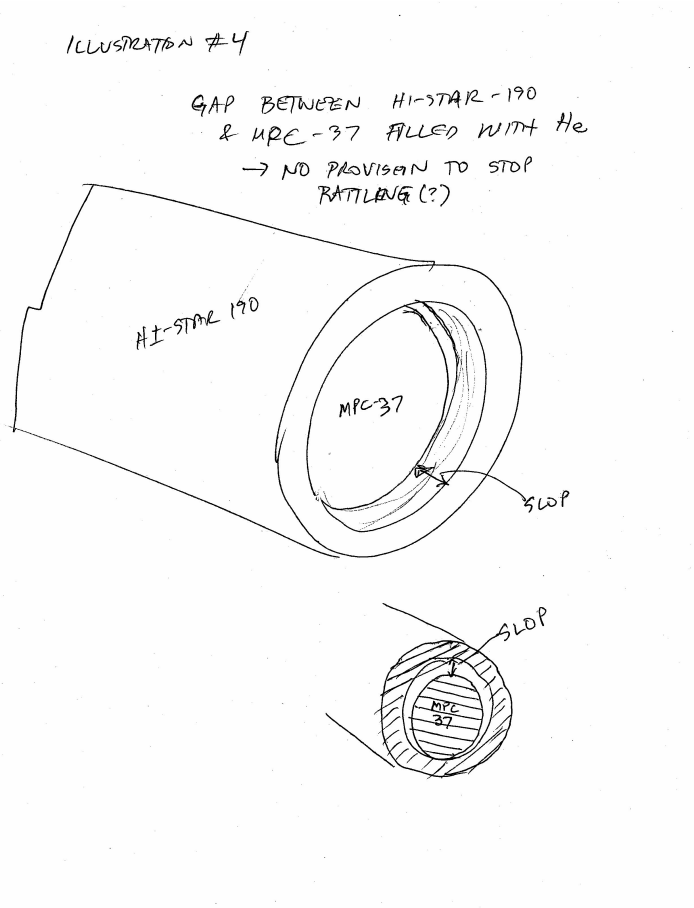


- no lifting A. Star-190 Required
- 1 TURN OF ONLY HI-TRAN + MPC-37
- 1 LIFT OF HI-~~STAR~~ TRAC + MPC
- 1 HYDRAULIC PUSH



Issue #3. Potential rattling of MPC in Transportation Cask

Please see the adjacent illustration #4. Our concern is the areas identified as "SLOP" in the drawing. We understand that once the MPC canister is inserted into the HI-STAR 190 transportation cask, the cover is put on and the space between the canister and the cask is evacuated and filled with He. This will provide no damping of vibrations and we are worried that the canister will rattle around inside the transportation cask and damage the canister and perhaps the cask.



Issue #4. Reduced Surveillance from 24 hours to 30 days not appropriate

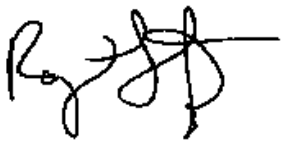
In the NRC teleconference of June 7, 2017, the NRC responded to Holtec request to reduce surveillance frequencies of HI-STORM systems from once every 24 hours to once every 30 days. They argue that the cladding temperature may exceed the normal operating limit of 400°C (750°F) but that the situation should be considered an accident condition, and thus the temperature can exceed that limit, up to 570°C (1058°F).

See attached document "Public Meeting with Holtec on June 7, 2017 -- Meeting Handout for Amendment 11 to Certificate of Compliance No. 1014 for the HI-STORM 100 Canister Storage System, Docket No. 72-1014" (HI-STORM A11.pdf).

> Holtec proposes to reduce the surveillance frequency for loaded casks that have a threshold decay heat of 19kW for the MPC-68 and 16kW for the MPC-32. Currently, the ventilated cask design has a surveillance frequency requirement of 24 hours to verify that the inlet and outlet vents are not blocked, with an additional 8 hours for recovery. This ensures that the required passive convective cooling mechanism is operating as designed. As currently approved, this system can remain in an accident condition (100% blocked vents) for a period not to exceed 24 hours with the requisite accident temperature limit of 570°C (1058°F) for the fuel cladding.
>
> The proposed surveillance frequency requested in this amendment is 30 days for the threshold decay heat identified above, with 24 hours for recovery. The technical approach employed by Holtec is to define this 30 day period as an accident condition with the associated accident limits (570°C, 1058°F) for peak cladding temperatures remaining as defined in ISG 11 rev.3.

There is no basis to reduce this surveillance frequency from once every 24 hours to once every 30 days, particularly if there is no alternative means to determine if an over-temperature condition exists, and get around the requirements by calling it an accident scenario. This request is absurd and raises the concern about whether Holtec can be trusted to operate in a prudent fashion. Holtec should be ashamed of themselves for asking for such a thing, and the NRC should not approve it.

Sincerely,



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