From: Donna Gilmore
To: RulemakingComments Resource
Subject: [External_Sender] Docket ID NRC-2015-0067
Date: Friday, July 24, 2015 4:15:42 PM
Attachments: UMAX Amendment 1 CommentsDonnaGilmore2015-07-23revised.pdf

Please replace the document I submitted 7/23/2015 with the attached document. It corrects one critical word in the last paragraph on the first page, as shown below in bold.

A Diablo Canyon canister has all the conditions for cracking in a 2-year old canister. Temperatures were low enough for magnesium chloride salts found on the canister to deliquesce. However, since technology does **not** exist today that can be used to find cracks in loaded canisters, we do not know if any of the thin steel canisters loaded in the U.S. have cracks or how deep those cracks may be.
https://sanonofresafety.files.wordpress.com/2011/11/diablocanyonscc-2014-10-23.pdf

Thank you,
Donna Gilmore

July 23, 2015

To: NRC Docket ID NRC-2015-0067
Fr: Donna Gilmore
SanOnofreSafety.org

Re: **Holtec International HI-STORM UMAX Canister Storage System, Certificate of Compliance No. 1040, Amendment No. 1**

Wind Effect on Underground Casks
According to NUREG-2174, "for the underground cask design, the peak temperature in the fuel package region, represented by a homogenous composite of the gas region, the fuel, and the cladding (hereafter referred to as the peak cladding temperature (PCT)) increases for low-speed wind, as compared to quiescent conditions."

Was this taken into consideration in developing the heat load limits of the UMAX system?

The heat load maximum of the underground system evaluated in NUREG-2174 (Holtec HI-STORM 100U) is 36.9 kW (page 10). The heat load maximum for the UMAX system even is higher at 37.06 kW (FSAR page 2-42).

See Impact of Variation in Environmental Conditions on the Thermal Performance of Dry Storage Casks, NRC NUREG-2174, February 2015 (ML15054A207)
http://pbadupws.nrc.gov/docs/ML1505/ML15054A207.pdf

MPC Seismic Evaluation
The thin stainless steel MPC canisters are subject to pitting and corrosion (particularly from marine environments -- chloride-induced stress corrosion cracking). Since cracks may initiates during the initial licensing period in these canisters, were cracking canisters included in the seismic analysis for MPC's stored while in the UMAX system? This would be of more concern in high risk seismic areas as proposed for this UMAX Amendment.

The Koeberg nuclear plant had a similar component fail in 17 years. The component crack depth was 0.61". It was located in a similar environment to San Onofre with prevalent on-shore winds, surf and frequent fog. See Chloride-Induced Stress Corrosion Cracking Tests and Example Aging Management Program, Darrell S., August 5, 2014
http://pbadupws.nrc.gov/docs/ML1425/ML14258A082.pdf

A Diablo Canyon canister has all the conditions for cracking in a 2-year old canister. Temperatures were low enough for magnesium chloride salts found on the canister to deliquesce. However, since technology does not exist today that can be used to find cracks in loaded canisters, we do not know if any of the thin steel canisters loaded in the U.S. have cracks or how deep those cracks may be.
https://sanonofresafety.files.wordpress.com/2011/11/diablocanyonscc-2014-10-23.pdf

Transfer cask
Are the transfer casks approved for storage of an MPC in case of a failed MPC? If so, for how long may they stay in the transfer cask?

Failed Canister remediation
What is the plan to remediate a failed canister? The Holtec documents claim it can't happen. They have not provided substantiation of that claim, but should be required to do that. Also, did the NRC use NUREG-1864 when considering the claims of Holtec? NUREG-1864 does not address environmental factors, such as stress corrosion cracking that can damage the thin canisters.
http://pbadupws.nrc.gov/docs/ML0713/ML071340012.pdf

MPC thickness
Is the maximum MPC thickness allowed in this Amendment 0.5" as stated in the FSAR on P 3-31? Holtec has proposed using a thickness of 0.625 at San Onofre. Shouldn't that require a license Amendment to use it in this UMAX system in order to evaluate how the change in limiting parameters will affect seismic, thermal, weight, dimensions and other critical analysis?
http://pbadupws.nrc.gov/docs/ML1420/ML14202A031.pdf

Long-term
Please require a definition of "long-term" in the FSAR.

Underground
Please require a definition of "underground". Would a structure that is only partially underground, but covered on the side with an "earthen berm" be considered "underground" for compliance with this CoC? For example, Southern California Edison has submitted documents to the California Coastal Commission proposing a UMAX system that is only partially buried, due to the high water table. They plan to add an earthen berm on the sides.

> FEBRUARY 2015 SONGS ISFSI EXPANSION PROJECT
> SOUTHERN CALIFORNIA EDISON
> **COASTAL DEVELOPMENT PERMIT APPLICATION PACKAGE**
> ATTACHMENT A: PROJECT DESCRIPTION
> https://sanonofresafety.files.wordpress.com/2013/06/attachment-a-02182015.pdf
> Page A-1
> Under the Proposed Project, SCE would construct a new ISFSI incorporating approximately 80 additional steel-reinforced FSMs. The FSMs would remain until transfer of the transportation canisters to an off-site repository. Unlike the existing aboveground ISFSI, the additional FSMs would house spent fuel storage canisters in a vertical configuration. The completed structure, encompassed by an earthen berm, would provide the benefits of an underground system
>
> **ATTACHMENT B:** ENVIRONMENTAL AND LAND USE ISSUES

https://sanonofresafety.files.wordpress.com/2013/06/attachment-b-02182015.pdf

ATTACHMENT C: FIGURES
https://sanonofresafety.files.wordpress.com/2013/06/attachment-c-2-17-15.pdf
Figure 6 partially underground diagram

Heat Load Charts
The FSAR shows changes to storage cell kW heat loads. Was this evaluated by the NRC in this Amendment and shouldn't it be if it is shown as a change in this FSAR revision?
Example of one of the heat load Charts that show a revision (denoted by vertical line): FSAR page 2-62 Figure 2.1.18: HI-STORM UMAX MPC-37 Heat Load Chart 3 for "Long" Fuel

Also, please explain the rationale for the heat load configuration. Normally the cooler assemblies are in the interior and the hotter ones are on the outer storage cells for fuel cladding integrity. However, that doesn't seem to be the case in Figure 2.1.18 and on some of the other heat load charts.

MPC Inspection
Page 2-78 should be clarified to state that these inspections to verify the integrity of the confinement boundary are only used and can only be used before the MPC is loaded with fuel.

"Most confinement boundary welds are inspected by radiography or ultrasonic examination. Field welds are examined by the liquid penetrant method on the root (if more than one weld pass is required) and final weld passes. In addition to multi-pass liquid penetrant examination, the MPC lid-to-shell weld is pressure tested. The vent and drain port cover plates are also subject to proven non-destructive evaluations for leak detection such as liquid penetrant examination. These inspection and testing techniques are performed to verify the integrity of the confinement boundary."

Assumption of no fuel cladding degradation after dry storage is not substantiated
FSAR Page 2-79 states "there is no credible mechanism for gross fuel cladding degradation of fuel classified as undamaged during storage in the HI-STORM UMAX."

However, there is no basis to substantiate this. Holtec should be required to substantiate these claims. This study supports the opposite:

Ductile-to-Brittle Transition Temperature for High-Burnup Zircaloy-4 and ZIRLO™ Cladding Alloys Exposed to Simulated Drying-Storage Conditions M.C. Billone, T.A. Burtseva, and Y. Yan Argonne National Laboratory September 28, 2012.
http://pbadupws.nrc.gov/docs/ML1218/ML12181A238.pdf

> "…the trend of the data generated in the current work clearly indicates that failure criteria for high-burnup cladding need to include the embrittling effects of radial-hydrides

> for drying-storage conditions that are likely to result in significant radial-hydride precipitation...A strong correlation was found between the extent of radial hydride formation across the cladding wall and the extent of wall cracking during RCT [ring-compression test] loading."

Given high burnup fuel is more likely to cause cladding embrittlement, consideration should be given to require damaged fuel containers for high burnup fuel, treating it the same way Holtec treats damaged fuel:

> "Fuel classified as damaged fuel or fuel debris are placed in damaged fuel containers. The damaged fuel container is equipped with mesh screens which ensure that the damaged fuel and fuel debris will not escape to block the MPC basket flow holes."

And this statement that "the MPC is loaded once for long-term storage and, therefore, buildup of crud in the MPC due to numerous loadings is precluded" is an assumption without basis. So are the following statements:

> 2.3.4.2 Confinement Boundary Leakage
> None of the postulated environmental phenomenon or accident conditions identified will cause failure of the confinement boundary. Section 7.1 of the HI-STORM FW FSAR provides the rationale to treat leakage of the radiological contents from the MPC as a non-credible event.

VVM Needs Substantiation for expected lifespan
On FSAR Page 2-81 (Table 2.3.1) Holtec claims a Design life of 60 years, a Service Life of 100 years and a Licensed life of 40 years**.** Substantiation is not provided for these claim, so should be removed from the FSAR. There is information to the contrary as provided in these comments that indicate a must lower lifespan, possibly within the 20-year license certification.

"No monitoring required" is not substantiated
The FSAR states no monitoring of the MPC is required. It does not substantiate this claim. There is evidence to the contrary in my comments that show failure could occur within the initial license period. The FSAR erroneously states:

> "The MPC confinement boundary has been designed to withstand any postulated off normal operations, accident conditions, or external natural phenomena. Redundant closure of the MPC is provided by the MPC closure ring welds which provide a second barrier to the release of radioactive material from the MPC internal cavity. Therefore, no monitoring system for the confinement boundary is required."

Here are other FSAR sections that claim no monitoring required, but that are not substantiated:

> Page 2-130
> b. Instrumentation
> As a consequence of the passive nature of the HI-STORM UMAX System, Important-to-Safety instrumentation is not necessary. No instrumentation is required or provided for HI-STORM UMAX storage operations, other than normal security service instruments

and dosimeters. However, in lieu of performing the periodic inspection of the HI-STORM UMAX VVM vent screens, temperature elements may be installed inside the VVM outlet duct and below the bottom of outlet screen to continuously monitor the air temperature. If the temperature elements and associated temperature monitoring instrumentation are used as the sole means of surveillance then they shall be designated as Important-to-Safety.

Page 2-133
c. Radiological Alarm System
The HI-STORM UMAX does not require a radiological alarm system. There are no credible events that could result in release of radioactive materials from the system. Furthermore, direct radiation exposure from the ISFSI is subject to monitoring by the plant's existing dose monitoring system.

Concrete Inspection
Given that high seismic risk areas are more likely to cause cracking or other structural changes within the license period, does the UMAX design provide a safe and accessible method to perform inspections? Was this part of the NRC's review? Shouldn't it be? In the NRC concrete workshop held February 24-25, 2015, the additional challenges of inspecting an underground system were identified and appear to be "challenging" to say the least. Until a method is provided by the licensee to show inspections and repairs can be safely and effectively performed in this UMAX system, this license amendment should not be granted. Numerous concrete failure modes were identified in this workshop. A particular problem with the underground system is how do you inspect the exterior sides of the concrete, since it's covered with earth and may not be stable if the earth is removed for inspection.

NRC's Expert Panel Workshop on Degradation of Concrete in Spent Nuclear Fuel Dry Cask Storage Systems, February 24-25, 2015, identified numerous concrete degradation problems, particularly with below ground systems (such as the Holtec UMAX dry storage system) due to limited inspection capability, ground moisture and chemical reactions with concrete.

NRC Concrete Expert Panel Workshop, February 24-25, 2015
Slide presentation, February 24-25, 2015 (ML15051A369)
http://pbadupws.nrc.gov/docs/ML1505/ML15051A369.pdf

Transcript February 24, 2015 (ML15093A003)
http://pbadupws.nrc.gov/docs/ML1509/ML15093A003.pdf

Transcript February 25, 2015 (ML15093A004)
http://pbadupws.nrc.gov/docs/ML1509/ML15093A004.pdf

Inspection Limitations
This November 2014 report, Available Methods for Functional Monitoring of Dry Cask Storage Systems, Xihua He, et.al., November 2014, outlines the many challenges to develop inspection and monitoring technology or to adapt existing technology to the thin canisters and their concrete

overpacks/casks. The underground system has added challenges not even addressed in this document, however, other information in this document is relevant to this system.
http://pbadupws.nrc.gov/docs/ML1432/ML14323A067.pdf

> "…Substantial advancement in technology may be necessary for methods that are not presently designed or packaged for field use…
>
> …No suitable method was identified for detecting and monitoring of atmospheric deposition of solid chloride-containing salts that may lead to degradation of safety significant SSCs, such as welded stainless steel canisters used in the majority of DCSSs…
>
> …Stress corrosion cracking sensors are limited. Surrogate sensors, which are an instrumented SCC coupon, have been developed for condition monitoring in field applications. Significant advancement and qualification testing would likely be necessary to use the sensor for DCSS monitoring. Other methods, such as fiber optic sensors or crack propagation sensors, have significant limitations (e.g., unknown temperature and radiation tolerances). Fiber optic sensors appear to be the only direct method of monitoring the actual component of interest. Implementation of this type of system would be challenging, given the temperatures and radiation near the canister surface. Such an application also would need to consider the possible detrimental effects of attaching a sensor to the canister surface…
>
> …Concrete degradation monitoring methods are well developed and have sufficient sensitivity to detect degradation before physical deterioration begins. However, these methods also have limitations, such as being labor intensive and limited to interrogation depths of 10 cm [4 in] or requiring access to the interior surfaces. Embeddable sensors have been developed and are commercially available; however, significant effort would be required to install these sensors in existing DCSSs. In addition, determining an optimized location for sensor placement may require analysis or knowledge of susceptible areas for degradation…
>
> …Monitoring the canister internal environment poses several challenges because of high temperatures, radiation, and accessibility difficulty…"

Given this Holtec UMAX Amendment is for high-seismic areas, factors that might not normally occur in the first license period may occur in high seismic areas, so should be considered in this license period.

Thank you,

Donna Gilmore
SanOnofreSafety.org