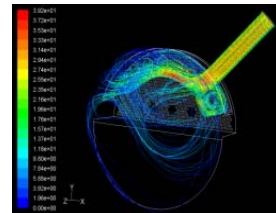
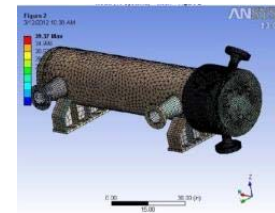
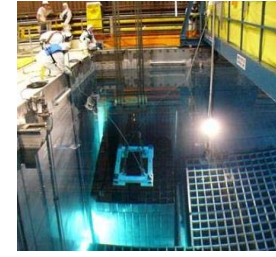




**Pre-Decisional Enforcement Conference  
Inspection Report 07201014/2024-201**



## Agenda

- Background
- Additional Information on Apparent Violations
- Safety Significance of Apparent Violations

## Apparent Violations

- NRC performed inspection in October 2024
- NRC Inspection Report No. 72-1014/2024-201, Reference number EAF-NMSS-2025-0102, received on July 17, 2025
  - ✔ 5 Apparent Violations
  - ✔ Apparent Violation A and B are being considered for escalated enforcement
  - ✔ Apparent Violations C, D, and E are currently considered SL-IV, however Holtec will provide additional information, as applicable.

# Additional Information on Apparent Violations



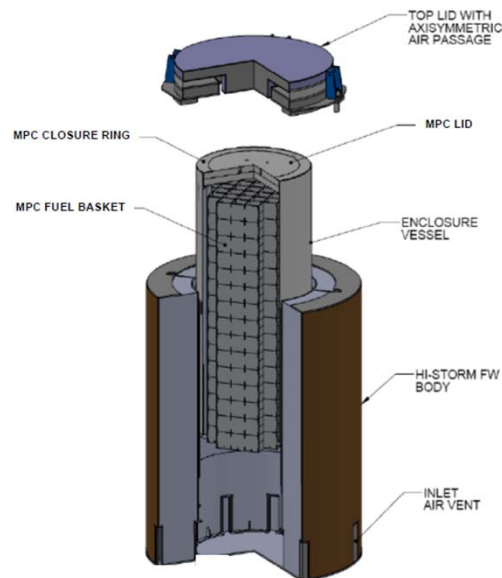
## Apparent Violation A:

- NRC claims, “**Holtec failed to obtain a CoC amendment pursuant to 10 CFR 72.244, prior to implementing a design change that raised the air inlet vents from the bottom of the HI-STORM FW overpack to above ground positions, which created a low point for water to collect in the overpack after normal rainfall.** When Holtec made this change and evaluated the design change with their design control change process, Holtec failed to recognize that this created a possibility for all air inlet vents to become blocked for a period greater than what was analyzed in the FSAR when rainwater entered the overpack.”

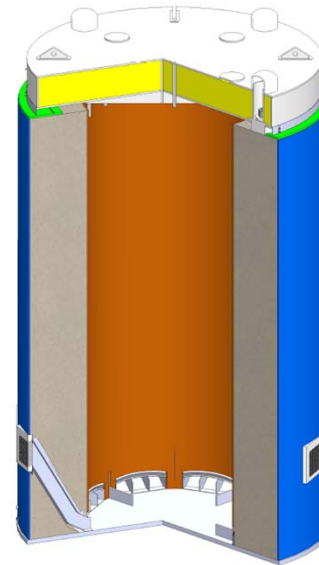
# Additional Information on Apparent Violation A

- Apparent violation claims that Holtec had created a new possibility that air inlet vents to be blocked from rainwater in the Version E and E1 design of the HI-STORM FW

## ✓ Previous Design:



## Version E Design



## Additional Information on Apparent Violation A



- Holtec FSAR clearly indicates that: “A blockage of all of the circumferentially arrayed vents cannot be realistically postulated to occur at most sites. However, a flood, blizzard snow accumulation, tornado debris, or volcanic activity, where applicable, can cause a significant blockage.” (Section 12.2.13)
  - ✓ There is no credit in the existing licensing basis taken for the fact that water would exit the previous design ground level vents – neither FSAR nor SER have any documentation that this was relied on
  - ✓ There is no pathway for rainwater to enter the upper vents and collect at the bottom of the system - vents are on the side of the lid, and covered with perforated screens, rain would have to go fully sideways to enter
  - ✓ FSAR says this is because of the circumferential vents - upper vents are essentially the same circumferential design in both variants
  - ✓ Although vent blockage is considered non-credible, an accident analysis is still performed and documented in the FSAR

# Additional Information on Apparent Violation A



- Holtec disagrees that this is a new malfunction
  - ✔ Blockage of vents from rainwater remains non-credible as stated in the FSAR
  - ✔ NEI 12-04 defines malfunction as the failure of the SSC to perform intended design function
    - Overpack maintains its structural integrity
    - Cooling passages are not credibly blocked and maintain airflow to keep heat transfer function as designed
  - ✔ Notwithstanding, a vent blockage analysis is performed in the FSAR, so the scenario is an analyzed accident condition

## Additional Information on Apparent Violation A



- During the design process for the new versions, Holtec did consider the possibility of an accident condition, like a flood, where water would credibly enter the vents (not from normal rainwater)
  - ✔ A drain line was included to recover from such an accident
  - ✔ Not needed for normal operation, where rainwater entrance is not credible, but for post-accident recovery
  - ✔ Some loaded casks had plugs closing those drain lines
    - When those plugs were removed from loaded casks, no water was found
      - This operating experience supports the existing licensing basis that during normal conditions rainwater does not block the vents
    - Unloaded casks do not apply to this scenario
      - May not be stored in same manner
      - Not subject to license

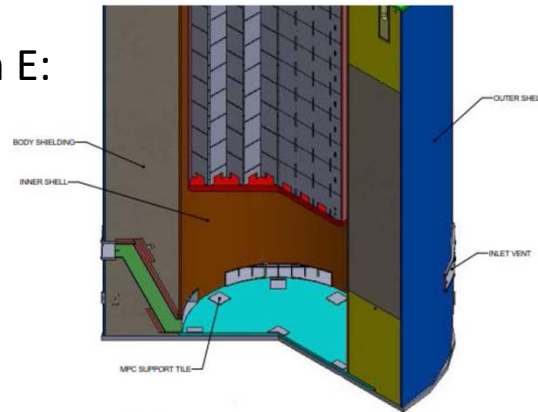


## Additional Information on Apparent Violation A

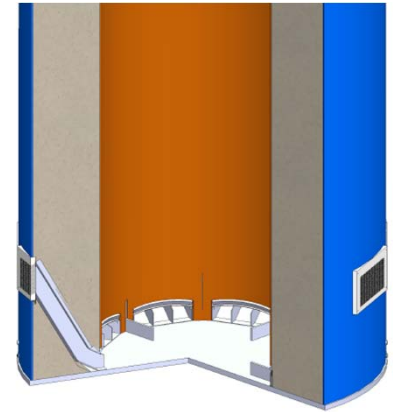
### ■ Precedent exists on similar designs

- ✓ HI-STORM 100 Version E was submitted to the NRC under amendment, due to new canister types and new heat loads
- ✓ System has very similar vent styles to HI-STORM FW Version E
- ✓ System has a similar licensing basis where no credit is taken for rainwater exiting from the bottom vents, because no significant amount of water can credibly enter the system
- ✓ NRC review and approval of that design does not identify rainwater intrusion as a malfunction, nor was there any need to change the analysis of the vent blockage event, and no change to LCOs

HI-STORM 100 Version E:



HI-STORM FW Version E:



## Apparent Violation B

- NRC claims, “**Holtec made a change to the original HI-STORM FW overpack design using their design change control process to raise the air inlet vents from the bottom of the overpack to above ground positions. However, Holtec failed to identify that rainwater that enters the overpack can remain trapped inside of the overpack blocking the air inlets for an extended period due to the elevated position of the air inlet vents.** This trapped rainwater could result in a condition where air inlet vents are blocked longer than previously analyzed in the FSAR, thereby causing a potential for the fuel to exceed peak cladding temperatures and to exceed the internal pressure limits in the MPC.”

## Additional Information on Apparent Violation B



- This violation is essentially the same as Apparent Violation A
- Holtec disagrees with the violation, it remains non-credible for rainwater to enter the vents since the design maintains essentially the same top vents
- The new design was evaluated under design control measures commensurate with those applied to the original design
  - ✓ All impacted disciplines were evaluated
  - ✓ New analyses performed where needed
  - ✓ Changes were documented and evaluated using Holtec's design control procedures, engineering change documentation, and 72.48 process
  - ✓ Unclear which design control measure was violated

## Safety Significance of Apparent Violations A and B

- NRC Enforcement Policy 6.1 (c)(6) - Severity Level III includes (for 50.59s) “the licensee fails to obtain prior Commission approval for an activity or change that has a consequence evaluated by the SDP as having low-to-moderate or greater safety significance”
- **No safety significance associated with this design change**
  - ✓ Rainwater intrusion is non-credible in the FSAR in normal operations
  - ✓ For accident scenarios, 100% vent blockage is evaluated in the FSAR (PCT limit 570 °C)
- At full design basis heat load (46.36 kW), 32 hours of blockage still remains within accident pressure and temperature limits (PCT less than 570°C)
  - ✓ At this heat load, any water in the system would evaporate (water boils at 100°C)
  - ✓ At lower heat loads, time of blockage is longer, but water still evaporates
  - ✓ At low enough heat loads where water does not evaporate, vent cooling is no longer required for system to remain below pressure and temperature limits

## Apparent Violation C



NRC claims, “the certificate holder (**Holtec**) **failed to maintain records of changes in the facility or spent fuel storage cask design, of changes in procedures, and of tests and experiments made pursuant to paragraph (c) of this section.** The records did not include a written evaluation which provided the bases for the determination that the moving of the HI-STORM 100 overpack version E and E1 without a lid outside the fuel building does not require a license or CoC amendment pursuant to paragraph (c)(2) of this section.”

“Specifically, **Holtec stopped at their procedural 10 CFR 72.48 screening process step and did not perform a full evaluation.** The inspectors determined that Holtec should have screened this design change for a full evaluation under Holtec’s screening questions a. and c. since (1) the proposed activity could adversely affect the design function of the MPC and (2) there was no method of evaluation used in supporting an updated FSAR analysis that demonstrates the intended design function will be accomplished under design basis conditions such as natural phenomena. “

# Additional Information on Apparent Violation C



- Holtec disagrees with this violation - the violation indicates that screening questions (a) and (c) should have been answered 'YES'
- Question (a) relates to adversely impacting a design function of the MPC
  - ✔ The screening in 72.48 #1591 states that no design function of the MPC is adversely affected
  - ✔ The site-specific tornado missiles at the impacted site are bounded by those in the FSAR, therefore there is no adverse impact from the existing FSAR analysis
  - ✔ All impacts to the MPC are bounded by the existing analyses
- Question (c) relates to a change in MOE
  - ✔ There was no new evaluation performed in support of this proposed activity, because the missiles remain bounded by the FSAR, therefore no MOE is impacted
    - The violation statement seems to acknowledge this – “there was no method of evaluation used in supporting the updated FSAR analysis”
  - ✔ The FSAR has an analysis of a direct impact on the MPC lid from tornado missiles that bound those at the site, therefore no new evaluation is performed

## Safety Significance of Apparent Violation C

- **No safety significance associated with this apparent violation**
- The MPC is already evaluated in the FSAR for a direct missile impact to the lid
- The site-specific missiles are bounded by those in the FSAR
- While the scenario is fully evaluated and shown to have no safety consequences, the probability of a tornado missile occurring during the short period of time where the HI-STORMs are being moved is extremely low
- All fuel at the impacted site (IPEC) has already been moved to dry storage and no further lidless HI-STORM movement is expected, so the scenario is now non-credible

## Apparent Violation D



- NRC claims, “the certificate holder (**Holtec**) **failed to maintain records of changes in the facility or spent fuel storage cask design, of changes in procedures, and of tests and experiments made pursuant to paragraph (c) of this section.** The records failed to include a written evaluation which provided the bases for the determination that the introduction of an alternative storage overpack for the HI-STORM FW Version F and common lid using an updated method of evaluation does not require a license or CoC amendment pursuant to paragraph (c)(2) of this section. Specifically, **Holtec used a different version of the ANSYS finite element analysis (ANSYS 2020 R2) for the new overpack and lid than what was previously approved for the standard HI-STORM FW (ANSYS 11).** Holtec performed a verification and validation of the ANSYS 2020 R2 with favorable results. However, Holtec did not reanalyze one or more representative cases using the revised software (ANSYS 2020 R2) to compare those cases with those in the FSAR to determine if the current results produced results that are conservative, non-conservative, or essentially the same, as the previous values in the FSAR for the overpack and common lid.”



## Additional Information on Apparent Violation D



- While the use of ANSYS Version 2020 R2 is considered a change to an element of an MOE, Holtec disagrees that it requires prior NRC approval based on the following:
  - ✔ Holtec has verified and validated ANSYS 2020 R2 in accordance with the company's approved QA program. Specifically, ANSYS 2020 R2 was validated per the requirements in Holtec procedure HSP-101101, and the results are documented in Holtec report HI-2012627 rev. 16. [Note: Section 3.6 of the HI-STORM FW FSAR includes a compliance matrix that summarizes the steps taken by Holtec to validate ANSYS and ensure the numerical accuracy of all solutions.]
  - ✔ A total of 39 representative cases were analyzed using both the previous version of ANSYS (Version 11) and the revised version (Version 2020 R2).
  - ✔ The results from the representative cases using both the previous version and the revised version of ANSYS were found to be “essentially the same”, as the results agreed within roughly 1% of each other.

## Additional Information on Apparent Violation D



- The 39 representative cases analyzed by Holtec considered a wide range of ANSYS element types, material behaviors, boundary conditions, etc., which are commonly used by Holtec in dry storage applications.
  - ✔ For example, one of the cases analyzed (VM7) uses 3D structural solid elements (SOLID185) and a bi-linear stress-strain curve to simulate the plastic behavior of a steel pipe under compression. This same element type and a similar nonlinear material model are used to simulate the behavior of the HI-STORM FW Common Lid during the tipover event.
  - ✔ Another case (VM66) uses 3D solid shell elements (SOLSH190), which are also employed in the analysis of the HI-STORM FW Common Lid, to analyze the vibration modes of a cantilevered steel plate.
- Holtec deliberately selected these 39 cases analyzed using both ANSYS Version 11 and ANSYS Version 2020 R2 because they collectively represent the finite element (FE) attributes and features that are used in the FSAR

## Additional Information on Apparent Violation D



- This approach is fully supported by the guidance in Section 6.8.1 of NEI 12-04, which calls for the revised software (i.e., ANSYS 2020 R2) to be used to re-analyze “one or more representative cases”.
  - ✔ While the exact case from the HI-STORM FW FSAR would qualify as a “representative” case, NEI 12-04 does not mandate that a specific FSAR case be re-analyzed using the revised software.
- While the guidance implies V&V and representative cases as being a 2 step process, Holtec chose V&V cases that were also representative cases for the licensing basis usage of the software – this is not prohibited
- Holtec maintains that the change from ANSYS Version 11 to ANSYS Version 2020 R2 is not a departure from the approved MOE established in the HI-STORM FW FSAR, and the change in software version is acceptable under 10 CFR 72.48 per the guidelines established in NEI 12-04.

## Safety Significance of Apparent Violation D

- **No safety significance associated with this apparent violation**
- The change in code year for a well validated code that has been run with cases representative of those in the FSAR has no impact on the safety of the system
- Version 11 was released in February 2007, Version 2020 was released in 2020
  - ✓ Version 11 is not current industry standard for operating systems
  - ✓ Version 11 is no longer supported by ANSYS
- The results demonstrate that the system is within all existing limits
- No safety concerns were raised during the inspection or in the inspection report

## Apparent Violation E

- NRC claims,”(Holtec) failed to establish measures to ensure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. Specifically, Holtec failed to promptly identify and correct a quality issue (QI) for the Holtec position paper (DS-331) credited in the storage and transportation system design basis of the FSARs for the development of stress and strain curves. Holtec used the wrong value, which would place the systems in an unanalyzed state or outside their storage and transportation systems licensing basis. However, when identified during the EA-23-044 cited violation issue and HI-STORM FW amendment review in December 2023, Holtec failed to initiate a QI and correct the deficiencies and nonconformances. “

## Additional Information and Safety Significance of Apparent Violation E



- Holtec revised the position paper identified in Apparent Violation E several times to address staff questions during HI-STORM FW Amd 7 review
  - ✔ Position paper is a reference in Amd 7
  - ✔ Methodology is fully documented in the FSAR independent of the position paper
- In response to EA-23-044, full root cause was performed and reviewed by NRC
  - ✔ The position paper is not identified in the EA-23-044 documentation
  - ✔ However, the issue has been added to Holtec's QI process in response to NRC inspection report
- There is no safety significance to this issue
  - ✔ The FSAR is the licensing basis regardless of any supporting references or position papers
  - ✔ All related analyses use the updated methodology as approved by the staff

# Summary

- No Safety Significance associated with ANY apparent violations
- The designs under question in Apparent Violations A and B are consistent with the existing licensing basis and were documented under 72.48 evaluations
- The proposed activity in Apparent Violation C is not adverse to the MPC and does not use a new MOE
- The proposed activity in Apparent Violation D uses representative cases to demonstrate the acceptability of a new code year in accordance with NEI 12-04 guidance
- Apparent Violation E has no regulatory or safety significance, position papers are not licensing basis documents

# Thank You



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