

North Anna 8/23/11 Seismic Event

NUHOMS® HD and ISFSI Pad 2 Overview

Cary LaRoe, P. E.

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Agenda

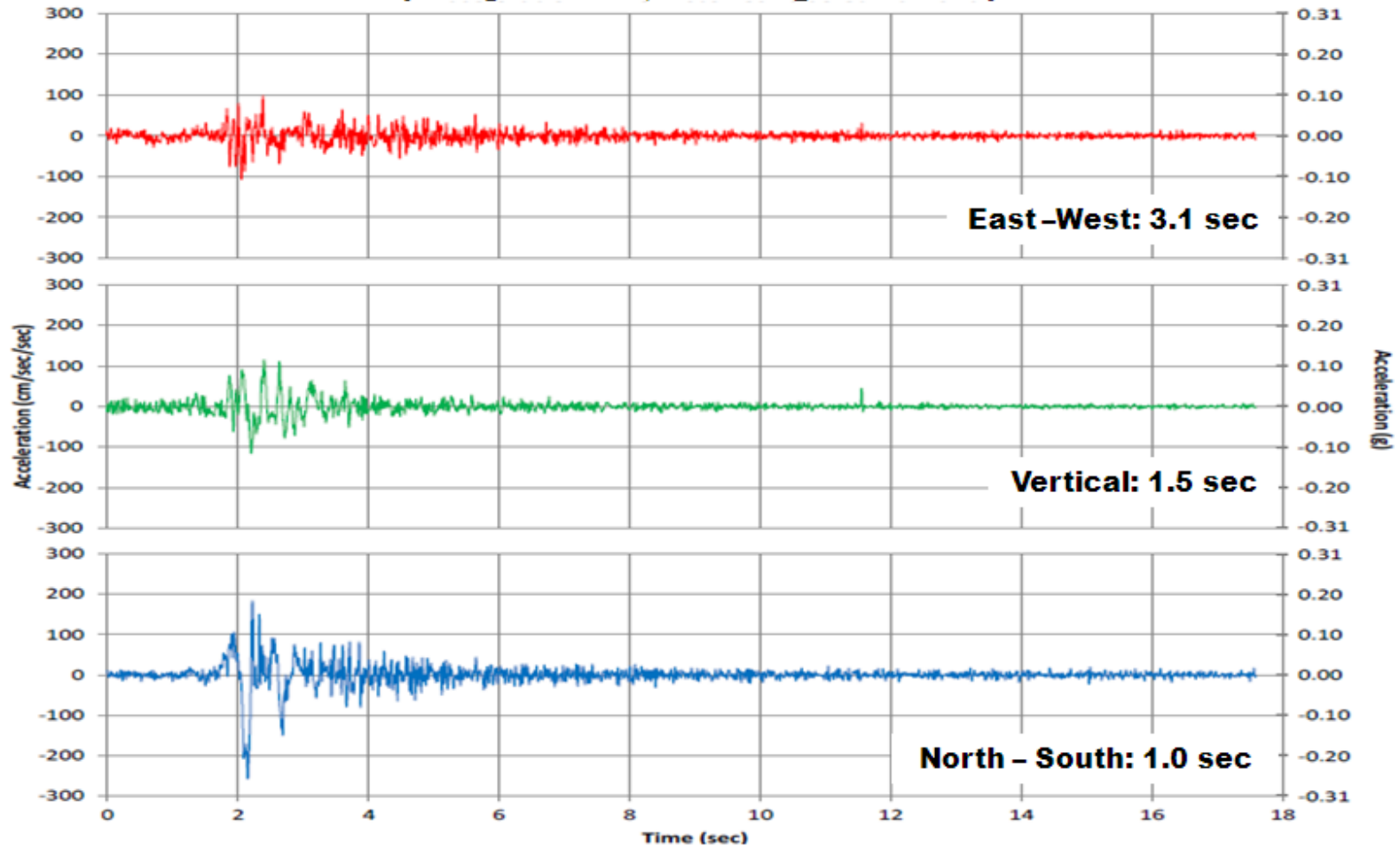
- **Overview** (Dominion)
- **Licensing Evaluation** (Transnuclear-proprietary)
- **Structural Evaluation** (Transnuclear-proprietary)
- **Shielding Evaluation** (Transnuclear-proprietary)
- **Concluding Remarks** (Dominion)

August 23, 2011 Event

- **5.8 magnitude earthquake**
- **Peak Ground Acceleration**
 - measured at Unit 1 basemat
 - 0.26 g north-south
 - 0.11 g east-west
 - 0.12 g vertical
- **Strong motion duration 3.1 seconds**

Acceleration Time Histories

(very short, strong motion)



Containment Basemat (elevation 216')

Initial Inspections

- **Initial inspections of NUHOMS®/Pad 2**
 - performed by site personnel on 8/24/11
- **Subsequent inspections**
 - performed by site and Transnuclear personnel on 8/29/11

Initial Observations

- **Gaps between some base or roof components**
- **Cosmetic concrete damage**
 - on inlet vent between loaded HSM-H 1 and 3
 - on several empty HSM-H outlet vents, including associated displacement of screen
- **Some HSM-H fasteners no longer “snug-tight”**
 - could be turned by hand (ex: roof vent cover bolts)
- **Minor surface cracks in Pad 2 (pre-existing)**

Initial Inspection Observations



Detailed Gap Measurements

(Obtained November 2011)

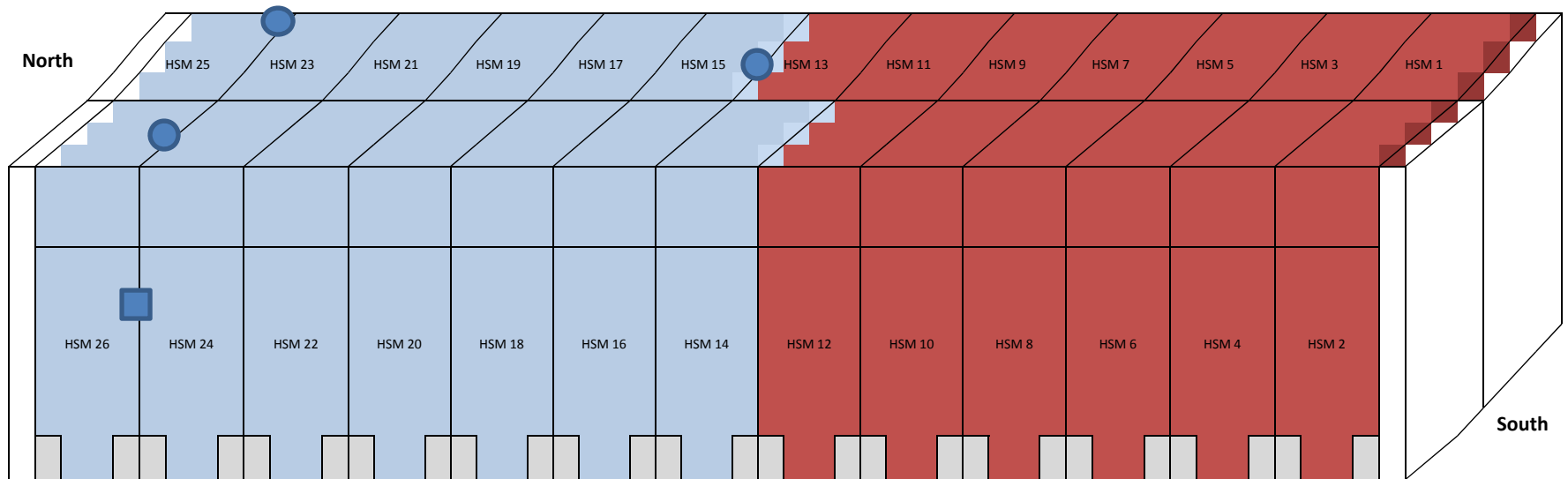
■ Installation Criteria

- Base: no max gap spec; placed for maximum contact
- Roof-to-roof: maximum 0.75 inch gap tolerance

■ As-Found Condition

- One base-to-base gap of 1.0 inch with no contact (between empty HSM-H 24 & 26)
- Other base-to-base gaps 0.75 inch or less (typically < 0.5 inch and appear to contact)
- Three roof-to-roof gaps > 0.75 inch (maximum 1.25 inch gap between empty HSM-H 24 & 26)

NUHOMS® HSM-H Gap Inspections Measured Gap Results



Empty HSM-H

Loaded HSM-H



HSM-H base-to-base gap > 0.75 inches
(maximum gap = 1.0 inch)



HSM-H roof-to-roof gap > 0.75 inches
(maximum gap = 1.25 inches)

Detailed NUHOMS® Inspections

(performed in January 2012)

- **All but one HSM-H out of alignment**
 - Maximum of 7/8 inch out of tolerance
- **Inspection of Empty HSM-H modules**
 - All empty modules inspected
 - Visual inspection of accessible interior and exterior, including interior concrete, DSC support structure , and heat shields
 - No observable structural or functional damage

Detailed NUHOMS® Inspections

(performed in January 2012)

- **Inspection of Loaded HSM-H modules**
 - Visual inspection of accessible exterior of all loaded modules
 - Visual inspection of accessible interior of 3 of 13 loaded modules
 - Removed HSM-H door and inspected visible interior and end of DSC
 - Boroscopic examination inside outlet vents
 - Robotic video inside HSM-H base (DSC, HSM walls, and DSC support structure)
 - No observable structural or functional damage

Current HSM-H Status

- **All Concrete Repairs Completed**
- **All Fasteners Checked & Retightened**
- **All Module Alignments Re-established**
- **Delta Temperature Surveillances Normal (No Blockage)**
- **Dose Surveys Consistent with Pre-Event Measurement**
- **Recertification of HSM-H array in progress with TN**

SSI and Pad Analysis

- **Soil Structure Interaction (SSI) Analysis**
 - Sargent & Lundy performed analysis
 - Same methodology as for original Pad 2 analysis using input from 8/23/11 event
 - Two scenarios (actual & fully loaded configuration)
- **SSI Calculation Output**
 - Max acceleration at top of pad
 - Max acceleration at center of gravity of HSM-H
 - Detailed acceleration time history

SSI and Pad Analysis

■ Analysis Conclusions

- Bounding peak accelerations:
 - 0.56 g N-S (transverse direction of HSM array)
 - 0.29 g E-W (longitudinal direction of HSM array)
 - 0.39 g Vertical
- Bounds top of pad & COG loaded/empty modules
- Peak acceleration insensitive to array configuration
- S&L structural analysis of Pad 2 confirms no damage

Transnuclear Evaluation

■ Preliminary Structural Analysis

- DSC / HSM-H acceptance criteria are met for 8/23/11 event
- DSC / HSM-H analyses envelope future 8/23 event
- Transfer cask (TC) UFSAR analysis bounds future 8/23 event
- No structural or functional damage

■ Preliminary Dose Analysis

- 10CFR72.104 limit met with post-8/23 gap configuration
- 10CFR72.106 limit met with postulated gap configuration following a future 8/23 event

Dominion Conclusion

Normal Operation (Loading & Storage) of NUHOMS[®] HDs at North Anna ISFSI Should Be Permitted to Resume

- Multiple detailed inspections conducted
- No observed structural or functional damage
- Minor repairs complete
- S&L analysis – no pad 2 structural damage
- TN structural analysis - no structural or functional damage
- TN dose analysis - 10CFR72 limits met
- Analyses address both 8/23 and an additional 8/23 event

Regulatory Summary

- **Determine regulatory mechanism to resume Normal Operation**
- **North Anna 72.212 Report Needs Update to:**
 - Address Occurrence of 8/23/11 Event
 - Incorporate Structural/Dose Analyses
- **Revise NAPS Operability Determination**
 - Document final evaluation and return to full qualification