

Rivera-Ortiz, Joel

From: Munday, Joel - R2
Sent: Monday, August 29, 2011 7:28 AM
To: Rivera-Ortiz, Joel
Subject: FW: Documents Related to North Anna NPP Earthquake Issue
Attachments: North Anna Site Visit Notes.word.docx; Talking Points for North Anna NPP Seismic Event final.word.docx; FW: North Anna timeline

FYI

From: McCree, Victor
Sent: Sunday, August 28, 2011 11:22 PM
To: Wert, Leonard; Croteau, Rick; Munday, Joel
Cc: Christensen, Harold; Jones, William
Subject: Fw: Documents Related to North Anna NPP Earthquake Issue

FYI

This email is being sent from an NRC Blackberry device.

From: Khanna, Meena
To: McCree, Victor
Cc: Franke, Mark
Sent: Sun Aug 28 22:57:54 2011
Subject: Documents Related to North Anna NPP Earthquake Issue

Hi Victor, attached are the documents that we will be discussing at the 7:30 am meeting, tomorrow. The third attachment is a timeline that the region provided...we just added that as an fyi...thanks!

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B/15

North Anna Site Visit Notes (Week of August 22, 2011)

Yong Li and George Thomas from NRR/DE conducted a site visit at North Anna during the week of August 22, 2011, to evaluate the issues related to the recent earthquake. They met with the licensee and presented questions from NRR/NRO/RES to the licensee and looked at Earthquake instrument panel in the control room. A summary of the status of the visit, to date, is provided below:

- The licensee conducted the 1st walkdown of the plant with focus on safety related SSC (except the containment) within 8 hours in accordance with the North Anna Power Station abnormal procedure for seismic event. From the walkdown, the licensee identified many discrepancies for which condition reports have been written. The damages noted were generally minor.
- Among the items identified through the initial walkdown, the bushing of all four transformers were found to be damaged and the oil leaked from the transformer which caused the turbine generator to trip, resulting in shutdown of the reactor. The other items were identified to be "superficial," such as, minor cracks on walls, loose insulation, conduits coming lose, 25 of 27 ISFSI vertical casks moved horizontally 0.5 inches to 3 inches, etc.
- The licensee conducted the 2nd walkdown after the aftershock triggered at 2 am on 8/25/11; however, no additional discrepancies were identified. In the mean time, the licensee is in the process of developing specific guidance in preparation for detailed walkdowns.
- The licensee indicated that all seismic monitors are contained in the Unit 1 containment at different levels of the structures as well as in the auxiliary building. No seismic monitors are located in the Unit 2 building.
- Scratch plate readings from the auxiliary building basemat were sent to California to be interpreted by a vendor. We were informed that the time histories initially sent to Calvert Cliffs are being sent to California to be interpreted. Those interpretations were received by the licensee for the auxiliary building. Scratch plates from Unit 1 containment basemat have been sent to California.
- Since the licensee doesn't have a seismic monitor located in the free field on the free surface, therefore, a strictly comparison of ground motion for SSE and OBE is difficult. However, the staff confirmed with the licensee that design response spectra at the mat and different levels are available and a comparison can be carried out between the original design and the recorded data when all the seismic readings from the seismometers are confirmed.
- On August 26, the licensee declared all safety-related SSCs of Units 1 and 2 inoperable, based on growing pieces of evidence that the DBE may have been exceeded at the site.

Talking Points for North Anna NPP Seismic Event

Design Basis

- North Anna Nuclear Power Plant (NANPP) has two Design Basis Earthquake (DBE) ground motion, one for structures, systems, and components (SSCs) founded on top of rock, which is anchored at 0.12 g, and the other is for SSCs founded on top of soil, which is anchored at 0.18 g.
- NANPP has two corresponding Operating Basis Earthquake (OBE) ground motion, anchored at 0.06 g for rock and 0.09 g for soil.

Seismic Event

- Earthquake of August 23 occurred at a close distance (approx. 18 km) to the plant with a magnitude of 5.8 at a relatively shallow depth. Approximately 11 aftershocks have followed since then, the worst one of which was of magnitude 4.5.

Seismic Impact at NANPP

- Initial interpretation of data obtained from the licensee's seismic Response Spectrum Recorder (scratch plates) located in the auxiliary building (at top of basemat (EL 241 ft) and at EL 273 ft) indicate that the acceleration experienced at the NANPP Auxiliary Building has exceeded the corresponding DBE spectrum in at frequencies above 8 Hz, by a factor of approximately 1.5 to 2, in the vertical and horizontal directions.
- The USGS estimates, as of August 26, indicate the peak ground acceleration (PGA) at the North Anna site between 0.20g and 0.27g. The response spectrum corresponding to these estimated PGA values exceed the NANPP DBE spectrum over some frequency range. Data from the seismic response spectrum recorders in the Unit 1 containment are currently being interpreted.
- 25 of 27 vertical casks at the ISFSI have displaced horizontally 0.5 to 3 inches.
- After the initial walkdown, the licensee generated a Condition Report to describe all the discrepancies identified.
- On August 26, the licensee declared all safety-related SSCs of Units 1 and 2 inoperable, based on growing pieces of evidence that the DBE may have been exceeded at the site.

NRC Evaluations

- NRC staff performed an independent analysis using the best estimate of the earthquake location and magnitude together with the EPRI ground motion prediction equations. The staff's calculation is lower than USGS' estimate on the ground motion at the site (see attached Figure).
- The staff will confirm that the licensee is performing plant walk downs in accordance with RG 1.166, "Pre-earthquake Planning and Immediate Nuclear Power Plant Operator Post-earthquake Actions," which endorses sections of EPRI NP-6695, "Guidelines for Nuclear Plant Response to an Earthquake," with certain exceptions. RG 1.166 also refers to RG 1.167.
- Information from NANPP's seismic recordings will provide the basis for the staff's assessment of the licensee's operability determination of the affected structures and components.
 - The staff will confirm that the licensee is following the guidance in RG 1.167, "Restart of a Nuclear Power Plant Shutdown by a Seismic Event," regarding the exceptions to the EPRI NP-6695 document prior to recommending plant restart.

Significant Information Outstanding for Assessing Seismic Motions and Effects

- Results from seismic response spectrum recorders (scratch plates) and other seismic instrumentation in Unit 1 containment.
- Validation of onsite instrumentation and outputs
- ISFSI response
- Results of initial walkdowns inside containment

Actions for Seismic Spectrum Beyond Design Basis

- Appendix S to Part 100—Paragraph V(a)(2), “Determination of Operating Basis Earthquake” (this regulation does not address beyond design basis events.)
- RG 1.166, “Pre-earthquake Planning and Immediate Nuclear Power Plant Operator Post-earthquake Actions”
- RG 1.167, “Restart Of A Nuclear Power Plant Shut Down By A Seismic Event”

Licensee Actions

- As of August 26, the licensee was in the process of coming down to a safe shutdown condition.
- The licensee will begin making the 50.72 reports (at least one 1 hr call) that are required now that this determination has been made and ensuring compliance with the applicable TS action statements.
- Licensee is currently in the process of developing plans and procedures for detailed walkdowns and other evaluations and actions to be taken prior to restart.

NRC Actions

- Region II with NRR/NRO support will be conducting an AIT at the North Anna site, in accordance with MD 8.3, “NRC Incident Investigation Program.” The AIT will be led by Mark Franke. The entrance meeting is scheduled for August 30. The AIT is being chartered to collect data and determine the facts and circumstances related to the North Anna Nuclear Power Plant seismic event associated with the August 23 earthquake. Upon completion of the inspection, the NRC will issue an inspection report.

Plant Restart

- Appendix S to Part 100—Paragraph V(a)(2) states, “*If vibratory ground motion exceeding that of the Operating Basis Earthquake occurs, shutdown of the nuclear power plant will be required. Prior to resuming operations, the licensee will be required to demonstrate to the Commission that no functional damage occurred to those features necessary for continued operation without undue risk to the health and safety of the public.*”
- NRR agrees with OGC that the NRR Director would be the authorized official to approve plant restart.

Potentially Affected Plants

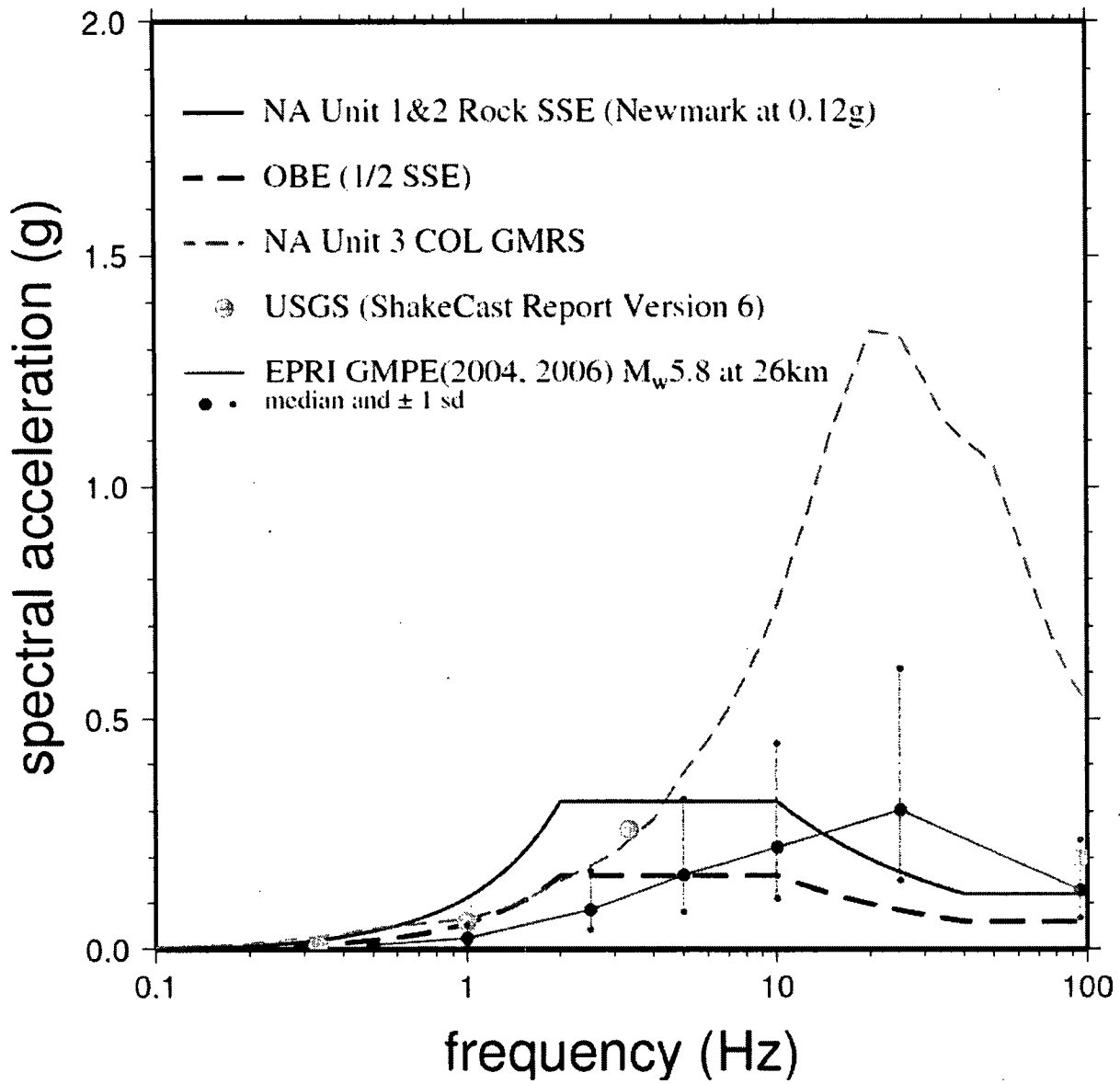
The list below provides the plants and the associated distance from the Epicenter:

North Anna is 18 km from the Epicenter
Surry is 139 km from the Epicenter
Calvert Cliffs is 141 km from the Epicenter

DE will work with DORL Project Managers to confirm that the OBE was not exceeded at Surry and Calvert Cliffs.

Relation to GI-199

The potential for the occurrence of an earthquake larger than the recent event is within the scope of GI-199 Generic Letter (GL), where licensees are requested to perform seismic risk evaluation based on latest seismic hazard estimates. The GL provides a systematic process to perform the requested evaluations and determine the delta increase in seismic core damage frequency.



Rivera-Ortiz, Joel

From: Li, Yong
Sent: Sunday, August 28, 2011 3:23 PM
To: Khanna, Meena; kamal.manoloy@nrc.gov
Subject: FW: North Anna timeline
Attachments: North Anna Timeline revision 1.docx

From: Kolcum, Gregory
Sent: Friday, August 26, 2011 10:48 AM
To: Li, Yong; Thomas, George
Subject: North Anna timeline

*Gregory Kolcum
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Region II, Division of Reactor Projects
U.S. Nuclear Regulatory Commission*

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North Anna Timeline:

8/23/2011, Tuesday

1348 Earthquake felt (5.8 USGS.gov)
1349 Loop, all EDGs started and loaded
1351 Unit 1 negative rate trip, turbine trip on Main transformer relay due to earthquake
1351 Unit 2 negative rate trip, manual trip of turbine, had to manually close some main steam trip valves
1403 Alert HA6.1
1432 TSC activated
1440 Secured 2H EDG due to coolant leak. SA1.1 declared after 2H EDG secured.
1520 AP-36 entered due to seismic trigger activated
1533 SBO DG started and 2H emergency bus energized
1740 Transferred 2J E bus to C RSST
1745 Secured 2J EDG
1748 Energized 1H from F transfer bus, securing 1H EDG
2003 B RSST energized
2004 Aftershock felt in MCR (4.2 USGS.gov)
2017 A RSST Energized
2051 1J E bus energized from A RSST, secured 1J EDG
2117 2H EDG available

8/24/2011, Wednesday

0851 U1 started cooldown
1116 Exit Alert to NOUE HU1.1 (seismic)
1315 NOUE exited
1328 U1 entered Mode 4
2126 U1 entered Mode 5

8/25/2011, Thursday

0108 earthquake aftershock felt in MCR (4.5 USGS.gov)
0118 NOUE HU1.1
1137 U2 started cooldown
1622 U2 entered Mode 4
1704 2H EDG Available