Bozin, Sunny

From: Nieh, Ho - COMM
Sent: Thursday, September 01, 2011 1:28 PM
To: Ostendorff, William
Subject: FW: Updated One Pager on North Anna Earthquake
Attachments: One Pager on North Anna Earthquake Issue updated 9-1-11.docx

Sir – fyi.

Key info from AIT so far are below...

- Preliminary raw data provided by the licensee indicate that the DBE has been exceeded in both the horizontal and vertical plane. The licensee is performing a review of the complete data package in order to make a final determination of the ground motion experienced at the site, and expect to have an answer before the end of the week.
- The team has found no indication that any safety related equipment failed during the event, except the 2H EDG. Because of the probability that the DBE has been exceeded the licensee has declared all safety related equipment inoperable and taken action to place the units in a safe condition (CSD).
- Preliminary data on the 2H EDG failure indicates that the cooling water system gasket may have been installed incorrectly.
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9.43

From: Bowman, Gregory
Sent: Thursday, September 01, 2011 1:17 PM
To: Hipschman, Thomas; Marshall, Michael; Castleman, Patrick; Gilles, Nanette; Orders, William; Nieh, Ho; Franovich, Mike
Subject: Updated One Pager on North Anna Earthquake

The attached provides a summary of the latest information on North Anna, and includes information related to both the reactors and the ISFSI. We're passing this along for information only. If you have any questions, please let me know.

Greg

F/70

Summary of Earthquake Information for the North Anna NPP as of August 24, 2011

North Anna Design

The North Anna Nuclear Power Plant (NANPP) has two Safe Shutdown Earthquake (SSE) ground motions, one for structures, systems, and components (SSCs) located on top of rock, which is anchored at 0.12 g, and the other is for SSCs located on top of soil, which is anchored at 0.18 g. The NANPP has two corresponding Operating Basis Earthquake (OBE) ground motion spectra, anchored at 0.09 g for soil and 0.06 g for rock. The figure below shows a comparison between the SSE and OBE for Units 1 and 2, the Unit 3 Combined License (COL) application Ground Motion Response Spectrum (GMRS), the current best estimate of the August 24, 2011 earthquake ground motions from the USGS (ShakeCast version 7), and predicted median and standard deviation earthquake motions using the EPRI ground motion prediction equations.

The current best estimate of the Peak Ground Acceleration (PGA) for the NANPP site is 0.26g, which contains uncertainty and may be updated later. This estimate indicates that the ground motion likely exceeded the SSE response spectra for NANPP Units 1 and 2 (0.12g) over a considerable frequency range, as shown by the green and red points in the figure. The estimated ground motion from the earthquake was not a surprise based on the combined operating license application (COLA) ground motion response spectrum for NANPP Unit 3. This preliminary estimate appears to validate the NRC's current seismic hazard assessment approaches and models for new reactors, as well as the basis for GI-199 reviews.

- The licensee has retrieved its seismic instrumentation recordings from within the plant and has processed the initial information. Preliminary results from the seismic instrumentation indicate some exceedance above the SSE at certain frequencies, depending on the building, measurement direction, and elevation. The information from the NANPP will be used to evaluate the USGS estimates of ground motion and will be compared against the FSAR design basis. The data will be used to inform the staff whether additional analysis is needed.

The licensee has indicated that it will perform plant walk downs in accordance with RG 1.167, "Restart of a Nuclear Power Plant Shutdown by a Seismic Event," which endorses EPRI's "Guidelines for Nuclear Plant Response to an Earthquake" with conditions. If the SSE is exceeded at certain frequencies, the staff will assess the licensee's evaluation of SSCs that are most sensitive to ground motion in that frequency band.

Timeline

- On August 23, 2011, North Anna Power Station declared an Alert due to significant seismic activity onsite from an earthquake which had a measured magnitude of 5.8.

- The licensee conducted the 1st general walkdown of the plant as required by the North Anna Power Station abnormal procedure for seismic event.
- The licensee conducted the 2nd walkdown after the magnitude 4.5 aftershock.
- Preliminary readings of the Seismic Response Spectrum Recorder (scratch plate) and the magnetic tapes identified that the Design Basis Earthquake had been exceeded at certain frequencies. On August 26, the licensee declared all safety-related SSCs of Units 1 and 2 inoperable and issued a 10 CFR 72 Notification

Augmented Inspection Team (AIT)

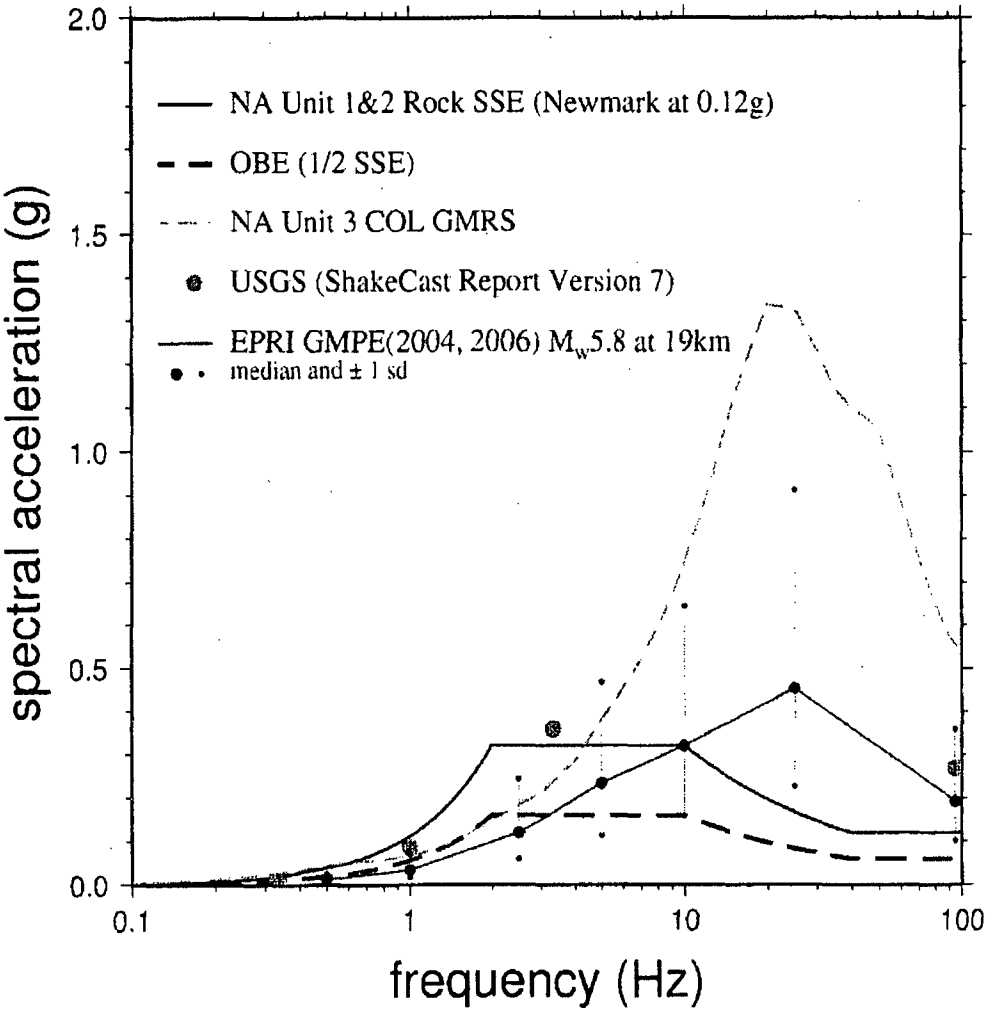
North Anna Earthquake AIT has arrived on site on 8/31/11, held an entrance with the licensee, and commenced the inspection. The data available from the plant instrumentation indicates that the reactor tripped on negative flux rate prior to the loss of offsite power.

- Preliminary raw data provided by the licensee indicate that the DBE has been exceeded in both the horizontal and vertical plane. The licensee is performing a review of the complete data package in order to make a final determination of the ground motion experienced at the site, and expect to have an answer before the end of the week.

- The team has found no indication that any safety related equipment failed during the event, except the 2H EDG. Because of the probability that the DBE has been exceeded the licensee has declared all safety related equipment inoperable and taken action to place the units in a safe condition (CSD).

- Preliminary data on the 2H EDG failure indicates that the cooling water system gasket may have been installed incorrectly.

North Anna Spectrum Curves



North Anna Independent Spent Fuel Storage Installation
Response to Earthquake

Background:

The North Anna Independent Spent Fuel Storage Installation (ISFSI) uses two spent fuel storage systems manufactured by Transnuclear (TN)

1) Twenty seven vertical TN-32 metal casks under a 10 CFR Part 72 site specific license. This system has a bolted closure lid with a pressure monitoring/alarm system, and stands freely on the ISFSI concrete pad. The design/licensing basis for the vertical TN-32 is controlled primarily by the North Anna ISFSI FSAR and NRC license (SNM-2507) and NRC certificate (1021). The FSAR defines the design acceleration values of 0.18g horizontal and 0.12g vertical, and sliding was not predicted to occur at these values.

2) Twenty six TN NUHOMS HD-32PTH horizontal storage modules (13 loaded) under a 10 CFR Part 72 general license. This system uses a welded-sealed canister and rests on horizontal rails inside the horizontal storage module. The design/licensing basis for the TN NUHOMS HD is controlled primarily by the separate TN-NUHOMS FSAR and NRC certificate (1030), as supplemented by additional site-specific evaluations that were performed by North Anna under 10 CFR 72.212. NUHOMS-HD components are designed to acceleration values of 0.3g horizontal and 0.2g vertical.

Event:

The North Anna ISFSI suffered minor damage from the earthquake:

1) Twenty five of the twenty seven TN-32 casks slid up to 4.5 inches on the concrete pad during the quake. Six cask sets (12 casks) were closer than the 16 foot separation distance specified in the FSAR. There was no damage to the pressure monitors in each cask and no pressure monitoring system alarms during or after the earthquake. There were no crack indications observed in the concrete pad or casks.

2) For the TN-NUHOMS modules, some slight damage was identified around the outlet vents and some surface cracking indications were noted. Additionally, some modules showed gaps between them of approximately 1.5" versus the required 1.0" maximum gap.

Preliminary Determination of Safety Significance:

The staff believes there is no immediate safety issue. The cask designs are robust and consider severe natural phenomena. As expected, the casks withstood the earthquake at North Anna. The spent fuel continues to be surrounded by several tons of steel and

concrete, and sealed in an inert helium environment. Damage to concrete components appear to be cosmetic, and does not impact structural integrity or radiation shielding capability. Additionally, the fuel assemblies are designed to withstand a maximum of 4g axial load and 6g lateral load. Inlet and outlet vents were inspected and no exterior blockage was found. Radiation surveys indicate no changes to cask surface dose rates. Thermal performance measurements for all loaded casks found no abnormal temperature differences.

Additionally for the TN-32 casks, the requirement specifying a minimum distance of 16 feet between casks with a heat load greater than 27.1 kW was conservatively established so that the casks do not influence each other thermally and to allow for emplacement on the pad by the cask transporter. Currently, the two casks with the least separation (15 feet, 3.5 inches) are casks that had decay heats of 15.4 kW and 18.0 kW when loaded in 2000 and 2001, both well below the 27.1 kW requirement.

Licensee Response:

The licensee is following RG 1.166, "Pre-Earthquake Planning And Immediate Nuclear Power Plant Operator Post-Earthquake Actions" as a guide to perform their post-event assessment and has completed walkdowns of the ISFSIs

The licensee reviewed this event for reportability under 10 CFR 72.75 (significant reduction in effectiveness of any spent fuel storage cask confinement system) and determined that the TN-32 displacement and NUHOMS-HD damage described above was not reportable.

The licensee contacted TN and provided them with all available pictures, data, and inspection results. TN requested that the licensee perform a more detailed inspection and evaluation of the current condition and sent a team to support this inspection.

NRC Response:

Item 10 of the AIT charter requires the AIT to "Assess the extent of any impact or damage to the Independent Spent Fuel Storage Installation from the seismic event." NMSS and Region II will continue to support the AIT and evaluate information related to the ISFSI to determine whether longer-term licensing or inspection actions are warranted for North Anna or generically.