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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 4 g axial load and 6 g 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.

On September 1, 2011, AIT completed a walk-down of the ISFSI Pads and has concluded that there are no indications of immediate safety issues associated with the movement of the vertical and horizontal ISFSI modules. Radiological conditions are normal and monitoring systems are functional. Damage as a result of the earthquake did not seem detrimental for the integrity of the casks.

On September 7, 2011, NMSS and Region II participated in technical discussions with the licensee to discuss near and long term ISFSI plans. NMSS will determine appropriate vehicle to ensure that the licensee takes appropriate action.