North Anna 3

North Anna 3 COLA

Discussion Slides for Proposed COLA Changes – RAI 03.07.04-2

NA3 Operating Basis Earthquake

NRC Open Items Teleconference

July 10, 2014

Dominion

RAI 115: Question 03.07.04-2 Plant-Shutdown OBE

- The following slides are for discussion purposes during NRC NA3 Open Items teleconference 07/10/2014.
- The following information explains NA3 approach and shows proposed FSAR markups.
- In addition to proposed FSAR markups, COLA Part 7 describing NAPS DEP 3.7-1 will be revised to be consistent with FSAR changes.

Dominion

RAI 115: Question 03.07.04-2 Plant-Shutdown OBE

Section 3.7.4.4 defines two plant-shutdown OBE spectra: (1) the first one as 1/3 of the CSDRS, and (2) the second one as the site-dependent OBE derived from the SSE spectra at grade. This section states that plant shutdown is required only if there is an exceedance of both OBE response spectra.

ISG-1 states that the OBE should be the lower of (1) and (2) to avoid explicit response or design analysis required for the OBE. Please clarify how Section 3.7.4.4 meets the guidance of ISG-1, or provide justification for an alternate approach.

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Proposed Changes to FSAR Section 3.7.1:

The Unit 3 plant-shutdown OBE response spectrum limit is established to ensure (1) that, if not exceeded, plant equipment designed to withstand seismic loads will have margin to the design ground motion response spectra; and (2) that the seismic instrumentation system timely alerts plant operators within four hours and supports decision-making within eight hours as to whether or not to shut down the plant following a seismic event.

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Proposed Changes to FSAR Section 3.7.1 (cont):

The plant shutdown OBE is defined as one-third of the SSE. The following two sets of horizontal and vertical response spectra serve as the reference against which OBE exceedance checks are performed at grade for the purpose of plant shutdown:

- One-third of the CSDRS presented in Figures 2.0-201 and 2.0-202 that define the free field ground motion at bottom of the RB/FB and CB foundations; and
- One-third of the performance-based surface response spectra (PBSRS) presented in Figure 2.5.2-311 that define the Unit 3 site specific free field ground motion at grade.

Because all safety related SSCs will be designed, analyzed, and qualified to meet both the CSDRS and site specific FIRS, plant shutdown is required if both response spectra in (a) and (b) are exceeded, as described in FSAR Section 3.7.4.4.

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Proposed Changes to FSAR Section 3.7.1 (cont):

Exceedance of the response spectra (a) and (b) is evaluated independently (i.e., an envelope of the two response spectra is not used). For example, a response spectrum that exceeds (b) at a low frequency and exceeds (a) at higher frequencies, but falls below the envelope of the two response spectra is considered as exceeding the OBE; thus requiring shutdown of the plant as discussed in FSAR Section 3.7.4.4.

The use of CSDRS in (a) above as the basis for defining the OBE at grade for the purpose of plant shutdown is conservative because it neglects the amplifications of the standard design ground motion as it propagates from the bottom of the RB/FB and CB foundations to the plant grade. The OBE ground motion defined with the criteria above constitutes a single OBE ground motion for the entire site. See Section 3.7.4.4 for discussion on seismic monitoring instrumentation.

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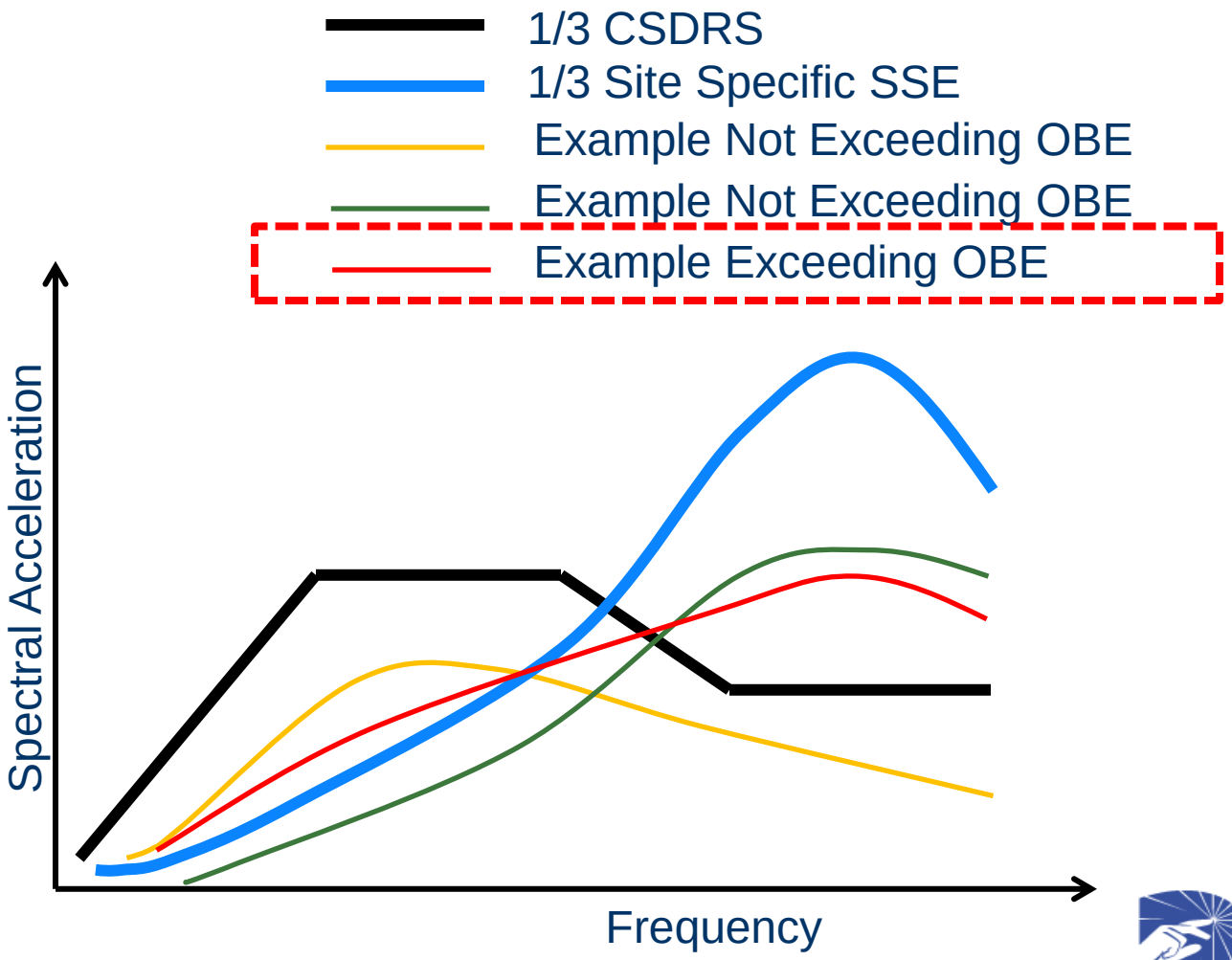
Schematic Example (Not included in the FSAR)



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Proposed Changes to FSAR Section 3.7.4.4:

The plant is shut down if the walkdown inspections discover damage to equipment that would affect the safe operation of the plant, or the recorded motion in the free field in any of the three directions (two horizontal and one vertical) exceeds both the certified design and site-specific response spectrum limits and the cumulative absolute velocity limit as follows:

- Certified design response spectrum limit is exceeded if:
  - at frequencies between 2 and 10 Hz, the recorded response spectral accelerations of 5% damping exceed 1/3 of the corresponding CSDRS values or 0.2g, whichever is greater; or
  - at frequencies between 1 and 2 Hz, the recorded response spectral velocities of 5% damping exceed 1/3 of the corresponding CSDRS values or 6 in/sec (152.4 mm/sec), whichever is greater.
- Site specific response spectrum limit is exceeded if:
  - at frequencies between 2 and 10 Hz the recorded response spectral acceleration of 5% damping exceed the corresponding site dependent OBE at grade presented in Table 3.7.1-216 or 0.2 g, whichever is greater; or
  - at frequencies between 1 and 2 Hz, the recorded response spectral velocities of 5% damping exceed the corresponding OBE values presented in Table 3.7.1-217 or 6 in/sec (152.4 mm/sec), whichever is greater
- Cumulative absolute velocity limit is exceeded if the cumulative absolute velocity value calculated according to the procedures in EPRI TR-100082, December 1991 (DCD Reference 3.7-12), is greater than 0.16 g-sec.