

OBE EXCEEDANCE ISSUES

NRC / INDUSTRY MEETING

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1

OBE EXCEEDANCE ISSUES

- Regulatory Guidance appears confusing and will be difficult to implement
- Free-field (ground surface) location will not allow a direct comparison to the NPP design input motion (seismic response)
- Free-field locations are difficult to achieve, extremely costly to connect to the NPP, and difficult to maintain and protect (long-term)

2

REGULATORY BACKGROUND

- **10CFR50, Appendix S** -- "Suitable instrumentation must be provided so that the seismic response of NPP features important to safety can be evaluated promptly after an earthquake."
- **RG 1.12** -- "Free-field instrumentation data will be used to compare measured response to the engineering evaluations used to determine design input motion to the structures and to determine whether the OBE has been exceeded."
- **RG 1.12** -- "The free-field sensors should be located and installed so that they record the motion of the ground surface and so that the effects associated with surface features, buildings, and components on the recorded motion will be insignificant."

3

REGULATORY BACKGROUND

- **SRP 3.7.1** -- "...the ground motion response spectra (GMRS) in the free-field is used in developing the OBE and SSE design ground motion needed for the design of NPP SSCs."
- **SRP 3.7.1** -- "The site-specific GMRS reviewed under SRP 2.5.2 are determined in the free-field on the ground surface. For sites with soil layers near the surface that will be completely excavated to expose competent material, the GMRS is specified on an outcrop or hypothetical outcrop that will exist after excavation."

4

EPRI NP-5930

A CRITERION FOR DETERMINING EXCEEDANCE OF THE OBE

- OVER 300 STRONG MOTION EARTHQUAKE RECORDS WERE EVALUATED
- RECORDING STATIONS INCLUDED TEST LABS, DAMS, REFINERIES, BUILDINGS, LIBRARIES, & FREE-FIELD
- RECOMMENDED THAT THE GROUND MOTION SENSORS BE LOCATED AT THE GROUND SURFACE IN THE FREE-FIELD OR FOUNDATION OF CONTAINMENT IF THE NPP IS FOUNDED ON ROCK
- OBJECTIVE OF THE SENSOR LOCATION IS TO ENSURE THAT EARTHQUAKE MOTIONS RECORDED ARE CONSISTENT WITH THE PLANT DESIGN

5

NRC STAFF POSITIONS

- NRC ENDORSED EPRI NP-5930 WITH A STIPULATION THAT THE CAV CRITERION CAN ONLY BE USED WITH A FREE-FIELD INSTRUMENT:
 - "A concern of the Staff is that data from free field instruments were used in developing the CAV criterion and we know that recordings obtained in large embedded structures, such as NPPs, may be significantly influenced by the structure. Therefore, a free field instrument must be used for determining the CAV..." [Brian Sheron - July 1, 1994]
 - "The NRC may consider data from seismic monitoring instrumentation at a plant foundation location instead of the free-field location, if this instrument has been placed in a Category I structure at a location where the relationship between the free-field ground motions and the foundation ground motions have been properly analyzed and documented." [Brian Sheron - November 27, 1995]

6

REGULATORY GUIDANCE CONFUSION

- Regulatory Guidance Requires:
 - Development of the SSE [OBE] from the GMRS, which can be specified on a competent material outcrop (after excavation)
 - Suitable instrumentation for evaluation of the seismic response of NPP features important to safety
 - Use of a free-field instrument (on the ground surface) for determination of OBE Exceedance, located away from the influence of NPP structures

7

FREE-FIELD LOCATION CONCERN

- Free-field definition may have many interpretations, such as 2-3 foundation dimensions, 3-4 foundation dimensions, or possibly 10x embedment depth
- Regardless of definition, free-field in general requires placement at a significant distance away from the NPP structures, typically resulting in a location on native materials, which most likely will be different from the materials supporting the NPP structures

8

INDUSTRY QUESTION ?

- How can the free-field, ground surface motion (recorded on native soils) effectively be used to compare its measured response to the engineering evaluations used to determine the design input motion to the NPP structures

9

INDUSTRY CONSIDERATIONS

- Reassess the appropriate seismic instrument location which can properly evaluate the seismic response of NPP features important to safety per 10CFR50, Appendix S
- Reassess the definition of "free-field" to allow a meaningful comparison of the measured response to the NPP design input motion
- Reassess use of appropriate parameters for decisions on OBE Exceedance which may require plant shutdown

10

INDUSTRY OPTIONS

- Sites may elect to install a “free-field” (ground surface) instrument -- while resolving location characteristics of native soils (or engineered fill), along with the basis for comparison of its recorded motions to the NPP design input motions
- Sites may elect to eliminate a “free-field” instrument and use the NI foundation instrumentation for direct comparison to the NPP design input motions -- while excluding use of the CAV OBE Exceedance Criterion
- These options or other alternatives will require exceptions at DCR or COL submittals