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Ms. Cindy Bladey
Office of Administration
Mail Stop: OWFN-12-H08
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Comments on Draft Regulatory Guide DG-1332, "Nuclear Power Plant Instrumentation for Earthquakes" (*Federal Register* 81FR64954, dated September 21, 2016, Docket ID NRC-2016-0201)

This letter is being submitted in response to the U.S. Nuclear Regulatory Commission's (NRC's) request for comments concerning the subject draft Regulatory Guide DG-1332, "Nuclear Power Plant Instrumentation for Earthquakes," published in the *Federal Register* (i.e., 81FR64954, dated September 21, 2016).

DG-1332 is a proposed Revision 3 to Regulatory Guide 1.12, "Nuclear Power Plant Instrumentation for Earthquakes" dated March 1997. Exelon Generation Company, LLC (EGC) appreciates the opportunity to comment on the subject draft Regulatory Guide.

There are no regulatory commitments contained within this letter. Should you have any questions regarding this letter, please contact Ryan Sprengel at (630) 657-2814.

Respectfully,

David M. Gullott
Manager – Licensing
Exelon Generation Company, LLC

Attachment 1 – EGC Comments on DG-1332

SUNSI Review Complete
Template = ADM – 013
E-RIDS= ADM -03
Add=S. Tabatabai (SHA1)
E. O'Donnell (EXO)

EGC Comments on DG-1332

General Comments:

1. One of the benefits, for an existing licensee, of Regulatory Guides (RGs) 1.12, 1.166, and 1.167 is to utilize the cumulative absolute velocity (CAV) in the operating basis earthquake ground motion (OBE) exceedance determination to avoid an unnecessary shutdown. In revision 2 of RG 1.12, it is clear that RG 1.166 and 1.167 also need to be followed. This is no longer mentioned in the "Implementation" section of the proposed Draft Regulatory Guide (DG). The proposed changes from RG 1.12 revision 2 (in particular, free-field locations) may make it difficult for any existing licensee to justify. If the guidance is more achievable, more licensees would voluntarily comply, which would ultimately improve many of the systems across the industry. For example: requiring that a free-field sensor be placed at the surface, but also up to 40 feet below the surface, will be more costly to implement. The below surface location creates problems in terms of addressing accessibility, flooding, ventilation, lighting, confined space, etc.

2. The criteria for instrumentation, particularly the number of sensors and maintenance, seem excessive. It is likely that there will be some future exception taken to the guidance, and leave licensees with questions on whether the exception will require licensing action(s) over minor maintenance requirements that could have been guided by the manufacturer. Please provide any basis for the expansion of criteria over RG 1.12 revision 2.

Specific Comments:

3. Page 2, Related Guidance. Suggest addition of: American National Standards Institute / American Nuclear Society (ANSI/ANS)-2.23-2016. "Nuclear Power Plant Response to an Earthquake" which describes actions that the owner of a nuclear power plant shall take to prepare for and respond to a felt earthquake at the plant.

4. Page 6, Section 1.2(2). Additional information on how to meet the guidance in (b) is needed. For example: is the intent that the sensor be placed in the bottom of a manhole? As a result and tradeoff for the additional data point, this location will require a means to provide ventilation, lighting, prevent floods, address confined space concerns, etc.

5. Page 6, Section 1.2(2). Suggest including definition for "three component," or utilizing standard language if meaning is "triaxial" as in other parts of the DG.

6. Page 6, Section 1.2(2). Portion (c) missing "three component" prior to "instrument" as in (a) and (b).

7. Page 6, Section 1.2(2). ANS-2.23-2016 section 6.4.3 (3rd bullet) allows that when response spectra input motions are defined at the foundation, it can be used in lieu of free-field. It is not clearly stated if the same spectra would apply to all three sensors (if needed) and also not clear how to determine exceedance if only one of three sensors exceed.

8. Page 7, Section 1.2(4). The intent of this portion of guidance is not clear. For example: if a licensee does not have a Seismic Category I structure where the expected response is different from that of containment, would the licensee select a random Seismic I structure?

9. Page 6, Section 1.2(6, 7, and 8). The basis for additional sensor locations beyond RG 1.12 revision 2 is not presented. Further, applicability may be clarified (i.e.,1.2(6) is only applicable when 1.2(2)(b) or 1.2(2)(c) selected, and 1.2(7) and 1.2(8) applicable for a design certified under 10 CFR 52).

10. Page 7, Sections 1.2(7) and 1.2(8). The implementation of this portion of guidance is not clear. The instrument location for (7) and (8) seem to be a duplication of instrument locations for (4) and (5), if there exists at least one Seismic Category I structure where the expected response is different from that of containment.

11. Page 7, Section 1.2(9). This portion of the guidance adds ambiguity. The intent is not clear (e.g., to require NRC concurrence for any implementation or alteration under this guidance, or to provide for additional location changes that licensee specify and may not apply).

12. Page 7, Section 1.3. This paragraph and 1.3.3 contradicts locating a sensor in primary containment, see DG Section 1.2(3), since primary containment is inaccessible during operation and will result in high exposures.

13. Page 7, Section 1.3.1, second sentence. Clarifying words proposed below:

    A distance of at least one major structure dimension <u>(height or length, whichever is greater)</u> away from all large structures in the vicinity <u>(those that are likely to cause soil-structure interaction effects that could contaminate data), but close enough so that the motion recorded is representative of the structure's input motion,</u> should be maintained where possible as recommended by the "Guidelines for Installation of Advanced National Seismic System Strong-Motion Reference Stations," published by Consortium of Organizations for Strong-Motion Observation Systems (COSMOS) (Ref. 12).

14. Page 8, Section 1.3.5. This paragraph is inconsistent with the free-field location of requiring a sensor up to 40 feet below the surface, see DG Section 1.2(1).

15. Page 8, Section 2. The scope of a "reduced set" of instrumentation is not clear, nor a method to determine. No additional seismic instrumentation is needed for identical units.

16. Page 8, Section 4.1. For existing licensees, adding more sensors to a location where there is no existing wiring going back to the central panel will likely make the project infeasible. Having a sensor not connected back to the central panel should be acceptable as long as it is not one used for OBE exceedance determination. The data can still be uploaded for post-earthquake analysis using a laptop.

17. Page 9, Section 4.6. Bartec Syscom's standard product has up to 60 hours autonomy with an internal battery. Although an external battery can be added to reach the 96 hours guidance, no discussion is provided for the basis of additional autonomous time from RG 1.12 revision 2.

18. Page 10, Section 4.11. Bartec Syscom's standard certified and tested product is a very stable MEMS sensor at 100dB, providing basically no maintenance and very low cost of ownership. No discussion is provided for the basis of the change from 1000:1 to 300,000:1.

19. Page 10, Section 4.11. Damping is not applicable to a MEMS sensor.

20. Page 11, Section 4.12.1. The guidance does not state a basis for going from 200 to 250 samples per second. RG 1.12 revision 2 provides a rate of 200 samples per second.

21. Page 11, Section 4.13.1. A 0.01g seismic trigger (from the previous 0.02g) creates more likelihood of spurious alarms, which contradicts later statements about avoiding spurious actuations. The basis for making this change from RG 1.12 revision 2 is not provided.

22. Page 12, Section 5.1. Clarifying words proposed below:

    If a special, light instrument hut is used, the pad should be monolithically cast concrete, reinforced with steel rebar or wire mesh, approximately 4 ft. square, with four 6 in. dia. x ~~18~~ 8 in. long (min.), reinforced concrete piers down into soil to ensure effective pad anchoring and coupling with ground (see Ref. 16, Figure 2).

23. Page 12, Section 5.1. This is the first mention of "downhole." If the meaning is a buried sensor at the free field, it should be described earlier in the DG.

24. Page 13, Section 5.7. Some sensors may not be able to be connected back to the central panel because of extensive cable costs. Consideration should be made for relaxing the guidance for sensors that are stand-alone in the field. The relative time accuracy can likely be achieved when the sensor is connected back to the central panel, but not when it is stand-alone. RG 1.12 revision 2 does not include provisions for all sensors being connected back to the central panel.

25. Page 13, Section 5.7. The requirement of Universal Time Coordinated time will require a GPS antenna or some other means (e.g., network connection) to achieve. This will create cyber security concerns. No discussion is provided for why the time precision is important.

26. Page 13, Section 5.7. Bartec Syscom, a leading seismic instrument vendor, can only achieve 5 milliseconds of relative timing.

27. Page 13, Section 6.1. It is understood that the free-field and perhaps the containment sensors should activate all of the recorders. But, if one of the elevation sensors is triggered, it seems that it would only need to trigger itself. Any sensor that gets triggered without the triggering of the free-field or containment foundation is expected to be a spurious trigger.

28. Page 13, Section 6.2. This statement contradicts the low trigger threshold, see DG Section 4.13.1 and 6.3.

29. Page 14, Section 7. Ambiguous guidance without additional clarity for intent of "or" and "any." The section can be interpreted to mean that triggering all or just one time-history recorder being triggered needs to annunciate in the control room.

30. Page 14, Section 9.1. Additional clarity for intent of guidance needed. The MEMS sensors are usually only functionally checked by putting on a tilt table. Testing should be based on the manufacturer's recommendations since they will differ from one system to the next.

31. Page 15, Section 9.2. Guidance does not address a station whose refuel cycle is every 2 years when it says "whichever comes first." It should state "24 months or during each refueling outage, whichever comes first" to include a 2 year refuel cycle.

32. Page 16. In the RG 1.12 revision 2, there was discussion of the need to comply with the other two associated RGs 1.166 and 1.167. In this revision, there is no mention of this requirement.

33. Page 19, Glossary. Clarifying words proposed below:

    Free field
    The free-field is defined as those locations on the ground surface or in the site soil column that are sufficiently distant from (not influenced by) the nuclear power plant structures to be essentially unaffected by the vibration of these structures. Therefore, a time-history recorder located at the free-field records essentially the free-field ground motion.

34. Page 20, Glossary. Additional term proposed below:

    Soil-Structure Interaction
    The phenomena in which a large structure rocks and translates in the surrounding soil thereby modifying the earthquake motion in its immediate vicinity and also changes the response of the structure. Such phenomena, which are more typical in relatively rigid structures such as nuclear power plant containments, can both decrease and increase the response of the structure at different frequency ranges.

35. Page 22, References. Tied to comment 21 above. Additional reference:

    16. EPRI TR-104239 "Seismic Instrumentation in Nuclear Power Plants for Response to OBE Exceedance: Guideline for Implementation," Electric Power Research Institute, Palo Alto, California, June 1994.