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MONTICELLO NUCLEAR GENERATING PLANT  
Docket No. 50-263 License No. DPR-22

PRAIRIE ISLAND NUCLEAR GENERATING PLANT  
Docket Nos. 50-282 License Nos. DPR-42  
50-306 DPR-60

Comments on Draft Regulatory Guide DG-1016

Reference: [1] Draft Regulatory Guide DG-1016, "Nuclear Power Plant Instrumentation for Earthquakes" dated November 1992.

Attached are our comments on the Draft Regulatory Guide DG-1016.

If you need additional clarification to any of the comments, please contact Eric Ballou at (612) 388-1121 ext. 4529.

Roger O Anderson  
Director  
Licensing and Management Issues

Attachment

c: J E Silberg

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DRAFT REGULATORY GUIDE DG-1016

Comment 1:

Concern: Listed in reference [1] are at least nine specific seismic instrumentation characteristics for the seismic trigger, recorder, and acceleration sensors. We understand that technical justification for the selection of these characteristics would not necessarily be provided in [1], however, we were curious about the selected ranges of some characteristics.

Discussion: As an exercise to satisfy our curiosity, we contacted four vendors selling seismic related monitoring equipment or parts to the nuclear industry. We asked each vendor to provide enough data about their equipment so that we could determine ranges of characteristics which may be deemed acceptable for seismic equipment.

Results: We found the following ranges between the various vendors;

- a. "Time beyond last seismic trigger" varies from 1 to 90 seconds.
- b. "Dynamic Range of Accelerometer Sensor" varies from 1000:1 to 100000:1.
- c. "Frequency Range of Accelerometer Sensor" varies from 0 to 150 Hz.
- d. "Recorder Sample Rate" varies from 200 to 500.
- e. "Recorder Bandwidth" varies from 0 to 350 Hz.
- f. "Dynamic Range of Recorder" varies from 1000:1 to 100000:1.
- g. "Actuating level of Seismic Trigger" is usually defined in terms of percent of full scale.
- h. "Seismic Trigger set for Threshold Ground Acceleration" includes 0.02g.
- i. "Recording Time" varies from 10 minutes to 50 minutes.

Recommendation: At this time we request consideration for making the following changes;

- a. Change Sections 4.5.1 and 4.6.3 to say Dynamic Range should be 1000:1 or greater.
- b. Change Section 4.4 to Shorten Recording Time to a more reasonable value (See comment 2).

Comment 2:

Concern: The draft recording time requirement of greater than 25 minutes comes into question when one considers the whole idea behind the Cumulative Absolute Velocity (CAV) Methodology which is based not only on the absolute acceleration but also on the duration of the event.

Discussion: We have found nothing in common between Monitor recording time and CAV Methodology. When one reviews the work which led to the creation of CAV Methodology, one senses that the significant majority of the ground motion amplitude with which we would need to be concerned actually occur in less than 40 seconds after the initiation of the event. If the event could last 25 minutes, the usefulness of CAV could be questionable.

From figure 4 of EPRI NP-5930 one will find that all six of the acceleration time history plots selected by EPRI to demonstrate CAV from review of over 300 earthquakes show ground acceleration levels tapering to less than 0.025g's before 40 seconds into the event. Actually two of the six events having acceptable CAV's (under CAV limit setpoint of 0.16g-sec) of 0.047g-sec and 0.083g-sec lasted only 5 seconds. The other four earthquakes had CAV's which vary from 0.318g-sec to 1.239g-sec (between 2 to 8 times the current acceptable CAV limit), yet each of these earthquakes tapered off before 40 seconds. This calls into question the 25 minute operating time requirement.

If we assume there is a family of earthquakes and potential aftershocks that would have reasonably significant peaks ( $>0.025g$ ) somewhere between 40 and 1500 seconds after event initiation, then our complete earthquake family set has grown to the point where it dwarfs the EPRI "40 sec." earthquake family set outlined in NP-5930 to demonstrate CAV Methodology. If indeed this is the case, we may need to rethink the usefulness of CAV Methodology on the basis that the CAV limit will most likely be exceeded for most earthquake events. If this is not the case then we should lower the draft operating time requirement with technical justification that significant earthquakes do not last 1500 seconds. Just lowering the requirement to 600 seconds will save plants money and minimize plant pre-shutdown data assessment time.

Recommendation: Review technical justification for the draft 25 min. recorder operating time and shorten the period which captures the total earthquake duration.

Comment 3.

Concern: Based on recorder maintenance history it may possible to minimize the required maintenance and repair procedures and maintenance durations mentioned in section 8.2.

Discussion: We have found it reasonable to verify the operability of the seismic monitor under the following schedule.

- a. We check the batteries quarterly.
- b. We calibrate and perform in depth functional tests annually.
- c. We check the peak-recording accelerometers every refueling outage.

To date we have not found results which would call for shorting the periodicity of the surveillances or the maintenance to weekly or monthly checks. We would expect that state-of-art digital instrumentation would not require weekly or even monthly checks as described in section 8.2 of the draft. Based on the history of checking the current instrumentation you may find that such frequent checks add little value to overall safety readiness and operability of the instrumentation but adds to the cost of plant operations.

Recommendations:

Collect a reasonable sample of the current maintenance periodicity for seismic monitors at various operating plants.

Revise the draft to reflect maintenance periodicity based on history of performance of monitors at operating nuclear plants.