State Of California

ALFRED E. ALQUIST SEISMIC SAFETY COMMISSION

Arnold Schwarzenegger, Governor

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October 17, 2008

Commissioner James D. Boyd
Commissioner Jeffrey Byron
Project Manager Barbara Byron
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Dear Commissioners Boyd and Byron and Ms. Byron:

The Alfred E. Alquist Seismic Safety Commission's AB 1632 Subcommittee (CSSC) appreciates the opportunity to comment on the CEC's October 10, 2008 draft report titled "Assessment of California's Nuclear Power Plants: AB1632 Committee Report" (Report). Although the CSSC Subcommittee does not necessarily concur with many aspects of the Report and the consultant's report (as described in prior comments sent to Ms. Byron), we have focused our comments in the interest of time on the following changes to the Report's recommendations:

Abstract: On line 5 and in various other locations throughout the Report, references are made to a single earthquake that may affect both plants. Since the plants are approximately 215 miles apart, it is rather unlikely that both plants will be lose functions from one earthquake on any single fault. The Report should be revised to reflect prior CSSC staff comments, and similarly on page 2, paragraph 2, line 8.

Executive Summary: On page 1, paragraph 2, and elsewhere in the Report, reference is made to the plants providing 12 percent of the state's overall electricity supply, implying that a single earthquake can shut down both plants and create a need to replace 12 percent of the state's supply. It is unlikely that supply from both plants would be unavailable as a result of one earthquake. On the other hand, interruptions to electricity supplies resulting from earthquake damage to non-nuclear plants, substations and transmission systems are likely to be far greater than 12 percent and are unknown at this time since system-wide post-earthquake reliability studies based on the vulnerability of existing facilities are not available. The Report should be revised to provide the necessary context describing how the nuclear plants' vulnerability to earthquakes relates to vulnerability of the electrical system statewide. The Report's recommendations should also be revised to address the fact that reliability gaps are likely to exist elsewhere in the state's system.

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The CSSC recommends that the CEC consider a new recommendation to quantify system-wide vulnerability to earthquakes:

A. The CEC should immediately fund an earthquake reliability study of the statewide energy system that identifies the vulnerability of nuclear and non-nuclear power plants and transmission lines so as to quantify anticipated amounts of downtime, the losses to life and economy from the energy disruption, stockpiles for repair, replacement power needs and other preparations that will speed recovery. The CEC, in turn, should establish reliability goals in future Integrated Energy Policy Reports (IEPRs) to guide improvements in the system. The CEC's Public Interest Energy Research Program is a logical source to fund such an effort.

The CSSC recommends that the CEC revise its existing draft hazards recommendations as follows (restated here with revisions underlined or struck through):

1. The Energy Commission acknowledges PG&E's ongoing efforts to understand the seismic hazards affecting the Diablo Canyon site through its Long Term Seismic Program (LTSP), and recommends that this work continue. As part of future IEPR assessments, PG&E should report to the Energy Commission on the results of its research efforts. As ground motion models are refined to account for a greater understanding of the motion near an earthquake rupture, it will be important for PG&E to consider whether the models indicate larger than expected seismic hazards at Diablo Canyon and, if so, whether the plant was built with sufficient design margins to continue operating reliably after experiencing these larger ~~amplified~~ ~~amplified~~ ground motions.

   Rationale: Please revise the recommendation to mention the Long Term Seismic Program.

2. The California Energy Commission, in cooperation with other appropriate state agencies and in coordination with PG&E, should evaluate techniques such as ~~the degree to which using~~ three-dimensional geophysical seismic reflection mapping ~~should be pursued~~, if warranted by a cost-benefit analysis. This action will ~~to~~ supplement PG&E's Long Term Seismic Program and help ~~ongoing seismic research programs~~ ~~to~~ resolve uncertainties surrounding the seismic hazards at Diablo Canyon. Given the potential for an extended plant shutdown following a major seismic event, the Energy Commission, in consultation with appropriate state agencies, should evaluate whether these studies should be conducted in the near term. ~~part of the Diablo Canyon license renewal feasibility study for the CPUC~~.

   Rationale: Please mention the Long Term Seismic Program and expand options beyond seismic reflection mapping. The timeframe for accomplishing these can be shortened and it would be in the state's best interests to do so prior to the license renewal feasibility study due in 2011.

3. ~~PG&E should assess the implications of a San Simeon-type earthquake beneath Diablo Canyon. This assessment should include expected ground motions and vulnerability assessments for safety-related and non safety-related plant components that might be sensitive to long-period motions in the near field of an earthquake rupture.~~

   Rationale: Since this is already part of the Long Term Seismic Program and has been addressed by the NRC, we recommend that the CEC delete this recommendation.

4. The California Energy Commission, in cooperation with other appropriate state agencies, should consider the relevance of the USGS National Seismic Hazard Mapping Project models and the UCERF-2 database. ~~in the context of studies required as part of the license renewal feasibility assessment at Diablo Canyon for the CPUC.~~ Updated seismic hazards analyses incorporating these inputs would provide additional information for regulators and the public regarding the seismic hazards at the plant site.

   Rationale: The timeframe for accomplishing these can be shortened and it would be in the state's best interests to do so prior to the license renewal feasibility study due in 2011.

~~5. As ground motion models are refined to account for a greater understanding of the motion near an earthquake rupture, it will be important for PG&E to consider whether the models indicate larger than expected seismic hazards at Diablo Canyon and, if so, whether the plant was built with sufficient design margins to continue operating reliably after experiencing these amplified ground motions.~~

   Rationale: Since this has been merged with Recommendation #1, the CEC can delete #5.

6. SCE should develop an active seismic hazards research program for SONGS similar to PG&E's LTSP to assess whether there are sufficient design margins at the nuclear plant to avoid major power disruptions. The research program should prioritize and include further investigations into the seismic setting at SONGS and should assess whether recent or current seismic, geologic, or ground motion research in the vicinity of SONGS has implications for the long-term seismic vulnerability of the plant. As part of the Energy Commission's future IEPR assessments, SCE should report to the Energy Commission on the results of its seismic research efforts.

   No changes recommended by CSSC.

7. The California Energy Commission, in cooperation with other appropriate state agencies and in coordination with SCE, should evaluate the degree to which new research programs should be pursued using techniques such as three-dimensional seismic reflection mapping and a permanent GPS array for resolving seismic uncertainties at ~~offshore near~~ SONGS, if warranted by a cost-benefit analysis. Given the potential for an

extended plant shutdown following a major seismic event, the Energy Commission, in consultation with appropriate state agencies, should evaluate whether these studies should be conducted in the near term. ~~required as part of the SONGS license renewal feasibility assessments for the CPUC.~~

Rationale: Please expand options beyond seismic reflection mapping. The timeframe for accomplishing these can be shortened and it would be in the state's best interests to do so prior to the license renewal feasibility study due in 2011.

8. The California Energy Commission, in cooperation with other appropriate state agencies, should consider the relevance of the USGS National Seismic Hazard Mapping Project models and the UCERF-2 database. ~~in the context of studies required as part of the license renewal assessments at SONGS for the CPUC.~~ Updated seismic hazards analyses for SONGS incorporating these inputs would provide additional information for regulators and the public regarding the seismic hazards at the plant site.

   Rationale: The timeframe for accomplishing these can be shortened and it would be in the state's best interests to do so prior to the license renewal feasibility study due in 2011.

9. PG&E and SCE should review the tsunami hazards at their nuclear plants in light of recent research and improved scientific understanding of tsunamis. SCE should assess SONGS' tsunami vulnerability after new data from the National Oceanic and Atmospheric Administration for the SONGS site and adjacent coastal areas become available. SCE should also assess the relevance of the University of Southern California second-generation tsunami run-up maps for the tsunami hazards at their nuclear plant site ~~sites~~. PG&E should provide to the Energy Commission the results of the updated Diablo Canyon tsunami hazards study as part of a future IEPR assessment.

   No changes recommended by CSSC.

CSSC Recommendations for Changes to the Background Text on Plant Vulnerability:

The CSSC notes that NRC regulations have not kept pace with rapid changes in other local, state and international seismic safety standards for nuclear plants. The NRC does not regulate non-safety-related portions of nuclear power plants, so utilities are left to self-regulate non-nuclear safety and reliability. In contrast, the CEC currently regulates the safety of non-nuclear power plants by requiring compliance with the California Building Code that is verified by regulators independent of plant owners. This Code includes restrictions on seismic evaluations, alterations, repairs and retrofits to existing power plants to ensure that such work is compliant with recognized codes and national standards.

After future earthquakes, the International Atomic Energy Agency (IAEA) will likely exert itself as the ultimate independent reviewer of the adequacy of seismic performance of affected nuclear

power plants and their pre- and post-disaster regulation. The IAEA's report titled "Seismic Evaluation of Existing Nuclear Power Plants," Safety Report Series 28, which is soon to be updated with a new IAEA Safety Standard titled "Seismic Evaluation of Existing Nuclear Installations", DS 383, both call for seismic evaluations and retrofits when conditions exist such as those relevant to California's plants including but not limited to: "New technical findings, such as vulnerability of selected structures and/or nonstructural elements and new experience from the occurrence of actual earthquakes." These internationally accepted standards address both the safety-related and non-safety related portions of the plants.

The CSSC recommends that the CEC revise its existing draft vulnerability recommendations as follows:

10. The state should consider independently regulating the non-safety-related portions of nuclear power plants to ensure their safety for plant occupants consistent with the manner in which the state currently regulates non-nuclear power plants in accordance with the California Building Code for new construction as well as for alterations to existing facilities in Chapter 34 of that Code. ~~PG&E and SCE should investigate and report their findings as part of future IEPR assessments on the extent to which their respective plants' non-safety-related systems, structures, and components (SSCs) comply with current building codes and seismic design standards for non-nuclear power plants.~~

    Rationale: CEC's recommendation for utilities to investigate their own power plants to determine if they meet safety requirements lacks independent oversight. In addition, the CEC's language would require existing plant components to retroactively meet code requirements intended for new construction, but that can be economically infeasible, unnecessary for safety and reliability, and not necessarily cost-effective. The above revised language will avoid these misperceptions and clarify the CEC's intent. Please note that the Code only specifies minimum safety requirements for new construction and alterations to existing non-safety-related components. The Code does not directly address post-earthquake reliability. Recommendations #11, 12, and 13 as revised below will provide additional measures beyond the Code to help achieve more reliable plant performance.

11. PG&E and SCE should evaluate the ~~implications for the~~ seismic vulnerability and reliability of the nuclear plants' non-safety related SSCs and changes to ~~of~~ seismic design standards ~~standard changes~~ that have occurred since the plants were ~~designed and~~ built and report on their progress as part of future IEPR assessments. Such analyses ~~an analysis~~ should be conducted consistent with IAEA Standards and Safety Reports, considering any retrofits that have occurred ~~that the plant owners may have undertaken~~, and focusing on those plant systems or components whose failure could lead to ~~an~~ extended outages.

    Rationale: Since neither the NRC nor the state has established reliability criteria, references to the IAEA Standards and Safety Reports are recommended.

12. PG&E and SCE should provide a description of plant component repair/replacement plans including initial estimates of time needed to repair or replace key plant systems or components that could cause a prolonged plant outage as a result of ~~being~~ earthquake damage ~~damaged~~. This should ~~include the time to repair or replace components that are likely to fail during an earthquake, and should~~ consider the fragility of components both in their operating positions and when relocated ~~removed from the reactor~~ for refueling or plant maintenance.

    Rationale: Portions of the CEC draft recommendation can be deleted to minimize redundancy.

13. Using research on lessons learned from the 2007 earthquake at the Kashiwazaki-Kariwa nuclear plant, PG&E and SCE should evaluate the implications for ~~California's operating~~ their nuclear power plants, including whether any additional pre-planning or mitigation could minimize plant outage times following ~~a~~ major seismic events, and report on their progress of implementing lessons as part of future IEPR assessments. ~~As part of their license renewal feasibility analyses for the CPUC, PG&E and SCE should summarize the lessons learned from the KK NPP experience in response to the 2007 earthquake and any implications for Diablo Canyon and SONGS.~~

    Rationale: The timeframe for accomplishing these can be shortened and it would be in the state's best interests to do so prior to the license renewal feasibility study due in 2011. Portions of the CEC draft recommendation can be deleted to minimize redundancy.

14. PG&E and SCE should return their spent fuel pools to open racking arrangements as soon as possible and report to the Energy Commission on their progress in doing so.

    CSSC Comment: This recommendation appears to be outside the state's jurisdiction.

15. The Energy Commission should continue to work with the Nuclear Regulatory Commission to obtain the necessary security clearances for selected California officials to review studies that assess the vulnerability of California's nuclear plants, spent fuel storage facilities, and spent fuel shipments to terrorist attacks or sabotage and the consequences of such attacks.

    No changes recommended by CSSC.

16. As part of license renewal efforts, PG&E and SCE should reassess the adequacy of access roads to the plants and surrounding roadways for allowing emergency personnel to reach the plants and local communities and plant workers to evacuate. The assessments should consider changes to the local populations since the plants were constructed.

No changes recommended by CSSC.

25. The Energy Commission, working with the CPUC as part of the CPUC's authority to fund and oversee utilities' plant relicensing feasibility studies, should develop a plan for reviewing the costs and benefits of nuclear plant license extensions, scope of evaluation, and the criteria for assessment. This review should include the adequacy of the plants' maintenance programs and safety cultures; plans for waste storage, transport and disposal; seismic hazards, vulnerability and reliability assessments; the cradle-to-grave evaluation of the nuclear plants compared with alternative generating and transmission resources; contingency plans in the event the state's nuclear power plants have prolonged outages; implications for grid reliability if these plants shut down; and the overall economic and environmental costs and benefits of license extension.

    Rationale: Please add seismic vulnerability and reliability assessments since they do not currently exist and will be necessary for evaluating the nuclear plants' futures.

Acknowledgements: We thank you for acknowledging the work of our AB 1632 Subcommittee that participated on the CEC's Seismic Vulnerability Advisory Team. We would like to recognize and thank Barbara Byron for her extraordinary efforts in managing this project, particularly with the CEC's short time constraints, limited budget and staffing.

Please contact me at 916-263-5506 if you would like to discuss these recommendations or arrange a meeting with our Commissioners for more formal discussions.

Sincerely,

Richard McCarthy
Executive Director