TESTIMONY OF DR. WILLIAM J. HALL

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-275 O.L.
PACIFIC GAS AND ELECTRIC COMPANY	)	50-323 O.L.
(Diablo Canyon Nuclear Power Plant, Units No. 1 and 2)	)	

TESTIMONY OF WILLIAM J. HALL

Q1. What is your name, address, occupation and professional registration status?

A1. My name is William J. Hall. I am a Professor of Civil Engineering at the University of Illinois at Urbana-Champaign, Illinois, and am a self-employed consulting engineer with offices at 3105 Valley Brook Dr., Champaign, Illinois. I am a registered structural and professional engineer in the State of Illinois and a registered professional engineer (Civil) in the State of California.

Q2. Will you please outline your educational and professional background?

A2. My education and experience are described in some detail in the attachment entitled "Biographical Data -- William J. Hall" dated March 1978, and made a part of the testimony. I have been engaged in research and teaching in the general areas of structural engineering, structural materials, and structural dynamics (including design consideration of such hazards as blast, shock, earthquakes, wind and related hazards) since 1949. In cooperation with Dr. N. M. Newmark I participated in the development of the seismic design criteria for the trans-Alaska Oil Pipeline, and participated in

overseeing its implementation during design and construction; similarly I aided with development of seismic criteria for the proposed Canadian Arctic Gas Pipeline. Independently I am serving as a consultant in development of the seismic design criteria for the proposed uranium hexafluoride gas centrifuge project to be constructed near Portsmouth, Ohio.

In 1973-76 I served as a member of two technical committees (structural design, details, and quality assurance committee, and ground motion and site effects committee) of the Applied Technology Council project to develop "Tentative Provisions for the Development of Seismic Regulations for Buildings"; these provisions are intended to be used throughout the United States for buildings of all kinds with maximum effective ground accelerations up to 0.4 g and with provision for inelastic behavior. Also I am currently a member of a similar committee of the Applied Technology Council working on design provisions for bridges. Currently I am chairman of the committee developing recommendations for studies to improve the seismic siting of critical facilities (including nuclear power plants, offshore platforms, industrial facilities, underground installations) under auspices of the Committee on Seismology, National Research Council, NAS/NAE.

Since 1964 I have been a consultant to the Atomic Energy Commission and the Nuclear Regulatory Commission in cooperation with N. M. Newmark in helping develop design criteria for nuclear power plant facilities, and in aiding with the review of the adequacy of the design criteria of many such plants.

Q3. What is the scope and purpose of your testimony?

A3. The scope of my testimony is directed to Contentions 5, 6 and 7, with particular reference to Contentions 5 and 7.

The purpose of my testimony is to detail my participation in the review process and my findings.

Q4. Please describe your participation in the Diablo Canyon Nuclear Power Plant Project.

A4. My first association with the project started in March 1967 when I began to undertake review of Unit No. 1. Review continued thereafter through September 1969 when we issued our final report on the adequacy of the structural criteria for Unit No. 2 for an SSE of 0.4 g.

My next involvement began in late 1975 with the reevaluation of Units 1 and 2 for an SSE of 0.5 g and immediately thereafter for the magnitude 7.5 earthquake on the Hosgri Fault. The review process involved attendance at a number of meetings with the NRC staff and their consultants, including USGS personnel, and in some cases with the applicant present. Supplementing these meetings were transmission of documents for study, and numerous telephone calls with the staff and/or staff and applicant as the review progressed. I participated as a consultant to the NRC SEB audit review team in January 1978 in San Francisco. Thereafter I have been in frequent consultation with the SEB staff, particularly Dr. P. T. Kuo, on technical matters, as requested, in resolving technical points arising out of the detailed audit procedure.

Also I attended the ACRS subcommittee meetings in Los Angeles in June 1977, again in Washington, D.C. in June 1978, and attended a portion of the ACRS full committee meeting in July 1978.

A site visit and facility inspection was made in January 1975.

Q5. In particular, with which aspects of the SEB review did you participate?

A5. Throughout I assisted Dr. N. M. Newmark with his evaluation, including assessment of the seismic hazard and review of the criteria to be employed in the reevaluation. In later phases of the reevaluation I was involved with SEB in the seismic structural review of the containment structure, the auxiliary building, the turbine building, the intake structure, the outdoor tanks, and critical items associated therewith. I was not directly involved in the latest mechanical and electrical equipment audit, but have kept generally abreast of these evaluations insofar as they interface with the structural evaluation.

Q6. How did you carry out your review?

A6. My review of the facility design in the 1967-69 time period, in conjunction with Dr. N. M. Newmark, involved study of the PSAR documents, participation in meetings with NRC staff and/or staff and applicant, development of questions and evaluation of answers, and in general evaluation that the criteria proposed were adequate and in keeping with the state of the art at that time.

My review, beginning in 1975, was carried out in the same manner, beginning with meetings with the NRC staff and USGS personnel, review of Amendment 50 to the FSAR, and review of other supporting documentation, made available by the NRC staff. Also it involved participation in the SEB audit and following thereafter, ACRS meetings, etc., as documented in Question 4.

As a part of the review we examined the design loadings and loading combinations, allowable stresses and deformations, sketches and drawings

of actual details of the structure as constructed, and descriptions of calculational procedures (including actual numerical values in many cases). Final evaluation in any case is based on judgmental review of the calculations as made by the applicant and in some cases an examination of the details of actual construction.

Q7. What was the nature of your findings arising from the 1967-69 evaluation and the 1975-78 reevaluation.

A7. It was my finding in 1967-69, in light of the applicant's seismic hazard and the state of the art design approaches employed, that the facility possessed adequate resistance to meet the seismic hazard (SSE of 0.4 g) along with other applicable loadings for achieving safe shutdown and containment, and possessed an adequate margin of safety.

The reevaluation carried out in 1975-78 for a higher seismic hazard and in the light of updated knowledge generally about seismic resistance requirements showed that most of the structures and components could meet the new criteria and evaluation approaches without difficulty, attesting further to the margin of safety assessment made in 1967-69.

Obviously the margin of safety of the facility in the light of the new SSE criteria will not be quite as great as it was for the earlier (lower) hazard, especially when compared to a new plant design to 1978 standards with 1978 calculational approaches. The reevaluation in the light of the new hazard suggests that in a few cases elements of structures, such as the turbine building and intake structure, may experience limited acceptable local inelastic deformation.

Q8. Do you believe the facility, with the design modifications currently being completed and/or under consideration, possesses a sufficient margin of safety to permit it to operate with reasonable assurance that nuclear safeguards will be met?

A8, On the basis of my review and studies in the areas identified herein, and assuming that a continuing surveillance and maintenance program will be carried out, yes, I do.

I hereby certify that the information above is true and accurate to the best of my knowledge.

William J. Hall

Subscribed and sworn to before me this

9th day of November, 1978

D. E. McCulley

Notary Public