

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

DOCKETED  
USNRC

ATOMIC SAFETY AND LICENSING APPEAL BOARD <sup>83</sup> OCT 11 AM 11:21

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

GOVERNOR DEUKMEJIAN'S SECOND SUPPLEMENTAL  
ANSWERS TO APPLICANT PG&E'S FIRST SET OF  
INTERROGATORIES

Governor George Deukmejian hereby provides this Second Supplement to his answers to applicant PG&E's First Set of Interrogatories. Only those interrogatories whose answers are being supplemented are reproduced here.

INTERROGATORY NO. 2:

Identify each and every person you intend to call as a witness during these proceedings. As to each such witness, state:

(a) Name, occupation, occupational address and telephone number.

(b) Whether the witness will render expert testimony.

(c) If the witness will render expert testimony, please list each specific subject matter about which the witness will be expected to testify.

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(d) If the witness will be called to give expert testimony, please list the specific qualifications of the witness that you contend would qualify the witness to give opinion testimony on each specific subject matter about which the witness will testify.

(e) List each and every professional article, book, or the like, if any, the witness has authored or co-authored concerning each specific subject matter set forth in your answer to 2(c).

(f) Identify each and every document the witness will rely on to reach any opinion testimony and corollate each such document to each specific subject matter on which the witness will render an opinion.

(g) As to each specific subject matter identified in your answer to 2(c), identify by docket number and case name each Nuclear Regulatory Commission licensing proceeding where the witness has previously given expert testimony concerning each specific subject matter.

(h) As to each proceeding identified in your answer to 2(g), please state:

(i) The date(s) the expert testimony was given.

(ii) Whether you have a copy of the testimony given.

(iii) Whether you have a copy of the transcript covering any or all of the witness'

examination and/or cross-examination for each such proceeding.

(iv) Whether you have a copy of the notes which the witness made in preparation for, or utilized during, the witness' examination or cross-examination in each such proceeding.

(i) As to each specific subject matter identified in your answer to 2(c), identify by docket number and court name each legal proceeding where the witness has previously given expert testimony concerning each specific subject matter.

(j) As to each proceeding identified in your answer to 2(i), please state:

(i) The date(s) the expert testimony was given.

(ii) Whether you have a copy of the transcript covering any or all of the witness' examination and/or cross-examination for each such proceeding.

(iii) Whether you have a copy of the notes which the witness made in preparation for, or utilized during, the witness' examination or cross-examination in each such proceeding.

(k) As to each specific subject matter identified in your answer to 2(c), identify committees and

organizations where the witness has previously given testimony concerning each specific subject matter.

(1) As to each committee or organization identified in 2(k), please state:

(i) The date(s) the testimony was given.

(ii) Whether you have a copy of the testimony given.

(iii) Whether you have a copy of the transcript covering any or all of the witness' examination and/or cross-examination for each such proceeding.

(iv) Whether you have a copy of the notes which the witness made in preparation for, or utilized during, the witness' testimony and/or examination and/or cross-examination in each such proceeding.

ANSWER TO INTERROGATORY NO. 2:

1. Richard Hubbard

See Governor Deukmejian's *Supplemental* Answers to Applicant PG&E's Third Set of Interrogatories, dated September 28, 1983, Answer to Interrogatory No. 1.

See attached Exhibit, "Professional Quaifications of Richard B. Hubbard".

2. Jose M. Roesset

See Governor Deukmejian's Answers to Applicant

PG&E's Third Set of Interrogatories, dated September 28, 1983, Answer to Interrogatory No. 1. Please note that the dates and fora for Dr. Roesset's testimony are wrongly listed. Dr. Roesset has appeared only at public meetings, in non-sworn proceedings, before the NRC staff and the Commission. The dates of his appearances were September 9, 1982 and November 10, 1982, respectively, and the subject of his remarks in both cases was the usefulness of the Brookhaven National Laboratory Study.

INTERROGATORY NO. 3:

Identify all examinations, reviews, studies, analyses, or the like, conducted, initiated, or anticipated to be conducted by or for you since September 1981 relating in whole or part to design qualify assurance or design activities at Diablo Canyon. As to each study, analysis, or the like, state:

- (a) The date of preparation or anticipated preparation.
- (b) The name of each and every person who has or will contribute to the effort.
- (c) The contribution of each person identified in your answer to 3(b).

ANSWER TO INTERROGATORY NO. 3:

The following should be added to Exhibit 3-1:

- 8/16/83 Curran Roller to Michael J. Strumwasser -  
Forwards Summaries of ITR's 45, 46, 47, 49 and  
Rev. 2 of ITR's 20, 22, 27.
- 9/13/83 Curran Roller to Michael J. Strumwasser -  
Forwards Summaries of ITR's 14, 19, 29 and 48.
- 9/20/83 Curran Roller to Peter H. Kaufman - Summary of  
GDC's.

All studies and reviews performed by Dr. Jose Roesset have been provided to counsel for PG&E at the September 29-30 deposition of Dr. Roesset.

All studies and reviews performed by Dr. George Apostolakis' will be provided to counsel for PG&E at the October 11, 1983 deposition of Dr. Apostolakis.

INTERROGATORY NO. 5:

Identify each and every structure at Diablo Canyon that you believe to be "important-to-safety", but which is not classified as design Class I. As to each such structure identified, state:

(a) The bases for your opinion that the structure should be considered "important-to-safety".

(b) Each regulation which, in your opinion, requires each such structure to be classified as "important-to-safety".

(c) The date upon which each such regulation required each such structure to be so classified.

ANSWER TO INTERROGATORY NO. 5:

The subject of this interrogatory is beyond the scope of the contentions admitted by the Board in its August 26, 1993 Order. For this reason, the Governor objects to providing further information in response to this interrogatory.

INTERROGATORY NO. 6:

Identify specifically each and every system at Diablo Canyon that you believe to be "important-to-safety", but which is not classified as design Class I. As to each such system identified, state:

(a) The bases for your opinion that each such system should be considered "important-to-safety".

(b) Each regulation which, in your opinion, requires each such system to be classified as "important-to-safety".

(c) The date upon which each such regulation required each such system to be so classified.

ANSWER TO INTERROGATORY NO. 6:

See response to Interrogatory No. 5. The Governor objects to providing further responses to this interrogatory on the grounds that the interrogatory seeks discovery of matters which are beyond the scope of the Board's Order of August 26, 1983.



INTERROGATORY NO. 7:

Identify specifically each and every component at Diablo Canyon that you believe to be "important-to-safety", but which is not classified as design Class I. As to each such component identified, state:

(a) The bases for your opinion that each such component should be considered "important-to-safety".

(b) Each regulation which, in your opinion, requires each such component to be classified as "important-to-safety".

(c) The date upon which each such regulation required each such component to be so classified.

ANSWER TO INTERROGATORY NO. 7:

See response to Interrogatories Nos. 5 and 6. The Governor objects to providing further responses to this interrogatory on the grounds that the interrogatory seeks discovery of matters which are beyond the scope of the Board's Order of August 26, 1983.

INTERROGATORY NO. 14:

List each ITR, with revision number, that you have reviewed to date. As to each ITR, state specifically:

(a) Each fact stated therein with which you disagree.

(b) The specific page(s) of each ITR where the fact(s) set forth in your answer to 14(a) is located.



(c) Each conclusion or opinion stated therein with which you disagree.

(d) The specific page(s) of each ITR where the conclusion(s) or opinion(s) set forth in your answer to 14(c) is located.

(e) The specific bases for your disagreement with each such fact, conclusion or opinion.

ANSWER TO INTERROGATORY NO. 14:

In general, the restated contentions of Governor Deukmejian and Joint Intervenors, dated September 8, 1983, set forth the requested information. Further, the Governor in his filing of September 29, 1983, identified additional contentions and statements of opinion expressed in recently issued ITRs.

Also, please see the additions to Exhibit 14-1, attached hereto.

INTERROGATORY NO. 15:

With respect to the PG&E Phase I Final Report, identify:

(a) Each fact stated therein with which you disagree.

(b) The specific page(s) of the Report where the fact(s) set forth in your answer to 15(a) is located.

(c) Each conclusion or opinion stated therein with which you disagree.

(d) The specific page(s) of the Report where the conclusion(s) or opinion(s) set forth in your answer to 15(c) is located.

(e) The specific bases for your disagreement with each such fact, conclusion or opinion.

ANSWER TO INTERROGATORY NO. 15:

The results of the Governor's review of the PG&E Phase I Final Report, including the identification of statements, conclusions, and opinions to which exception is taken, are set forth in the restated Conclusions of Governor Deukmejian and Joint Intervenors dated September 8 and 29, 1933.

INTERROGATORY NO. 24:

For each answer to these interrogatories, and all subparts thereto, identify each person who participated in the preparation of your answers pursuant to 10 C.F.R. § 2.740b(b).

ANSWER TO INTERROGATORY NO. 24:

Richard B. Hubbard of MHB Technical Associates participated in preparing these supplemental answers to Interrogatories Nos. 2, 3, 5, 6, 7, 14 and 15. Dr. Jose Roesset assisted in preparing the supplemental answers to

\* \* \*


Interrogatories Nos. 2 and 14. Deputy Attorneys General  
Peter H. Kaufman and Susan L. Durbin participated in  
preparing all supplemental answers

DATED: OCTOBER 7, 1983

Respectfully submitted,

JOHN K. VAN DE KAMP, Attorney General  
of the State of California  
ANDREA SHERIDAN ORDIN, Chief  
Assistant Attorney General  
MICHAEL J. STRUMWASSER, Special  
Counsel to the Attorney General  
SUSAN L. DURBIN,  
PETER H. KAUFMAN,  
Deputy Attorneys General

By

  
SUSAN L. DURBIN

Attorneys for Governor  
George Deukmejian

3580 Wilshire Boulevard, Suite 800  
Los Angeles, California 90010  
Telephone: (213) 737-2105

SUPPLEMENT TO INTERROGATORY NO. 14, FIRST SET

EXHIBIT 14-1

ITR 46

Area of Disagreement: Resolution of EOI's 8009, 8010, 8062.

Basis for Disagreement: ITR #46 reports that the concerns identified in the review of the Auxiliary Feedwater System have been verified to exist in other PG&E designed safety systems. The EOI's are "Closed" because the DCP has committed to a review of all PG&E designed safety systems. The resolution does not address:

- (a) Whether physical modifications will be made as a result of the review.
- (b) How future physical or documentation changes will be verified.
- (c) The relative safety significance of the concerns being identified.
- (d) The advisability of reviewing systems beyond the set of PG&E design systems.
- (e) The root cause of the errors identified in the original and additional verifications.

Therefore, the EOI files were closed prematurely.

ITR 47

Area of Disagreement:

Resolution of EOI 8001

Basis for Disagreement:

ITR #47 states that PG&E has developed new calculated environments for pipe breaks outside containment, and that the new environments will be incorporated in the plant design by the DCP's Iterative Design Program. The EOI file (and other EOI's which were combined under 8001) was therefore "Closed". The resolution does not address:

- (a) How the completion of the DCP remedial action will be verified.
- (b) Whether or not equipment qualification will actually be affected by incorporating the new calculated environments.
- (c) Whether physical modifications will be necessary and, if so, how the modifications will be verified.
- (d) The safety significance of the identified errors.
- (e) The root cause of the original errors.

Therefore, the resolution of EOI 8001 is premature.

ITR 48

Area of Disagreement:

Resolution of EOI 8065

Basis for Disagreement:

The resolution does not address the root cause of the identified errors.

ITR 49

Area of Disagreement: Resolution of EOI's 8017 and 8057.

Basis of Disagreement: ITR #49 reports that the DCP's review of all PG&E designed safety systems identified errors similar to the original errors described in EOI files 8017 and 8057. The IDVP verified the DCP's corrective modifications, and "closed" the EOI's. The resolution did not address:

- (a) The safety significance of the identified errors.
- (b) The advisability of extending the review beyond PG&E designed safety systems.
- (c) The root cause of the errors identified in the original and additional verifications.

ITR 54, Rev. 0

Area of Disagreement: Possible uplifting of the mat under the Hosgri.

Basis of Disagreement: No analysis of this effect is provided; it should be considered.

ITR 54, Rev. 0

Area of Disagreement: Discussion on page 17 of analysis for for Hosgri using finite elements.

Basis of Disagreement: The discussion does not make clear if geometry is axisymmetric but loading can be arbitrary (including several Fourier components in the circumferential direction). The

discussion does not make clear whether horizontal and vertical accelerations are both accounted for, and provides no justification if both are.

ITR 54, Rev. 0

Area of Disagreement:

The ITR states (page 16) that stresses were found using CECAP that exceed the allowable for non-Hostri load conditions by approximately 50 percent.

Basis of Disagreement:

No adequate justification is provided for this exceedance, nor does the ITR explain where it occurs.

ITR 55, Rev. 0

Area of Disagreement:

Use of soil springs in seismic modeling of auxiliary building.

Basis of Disagreement:

No adequate justification presented for values of or input motions to soil springs. Use of same input motions at elevation 85 and elevation 100 is not justified.

ITR 55, Rev. 0

Area of Disagreement:

Use of vertical and rotational springs to represent columns connected to slabs.

Basis of Disagreement:

No justification is presented for use of this model to represent the columns.

ITR 55, Rev. 0

Area of Disagreement:

Inplane flexibility of slabs.

Basis of Disagreement:

Inadequate justification is presented for the redistribution of stresses discussed in the PG&E Phase I Final Report, particularly in view of the statement in the ITR that allowable stresses were exceeded at one point at elevation 100.



ITR 57, Rev. 0

Area of Disagreement: ITR states (page 7) that the crane evaluation used in response spectrum (elevation 140) as input except that for the Hosgri vertical analysis a nonlinear time history was used.

Basis of Disagreement: No justification is provided for combining the response spectrum and time history methods.

ITR 57, Rev. 0

Area of Disagreement: Input at base of fuel handling building and selection of dynamic degrees of freedom for that building.

Basis of Disagreement: Inadequate justification is presented for each of these factors. Although SER, Supp. 18 (page C.3-26) indicates that parametric studies to justify each factor should be done by the DCP and evaluated by the IDVP, such have not been done.

ITR 58, Rev. 0

Area of Disagreement: IDVP concurrence (page 7 of ITR) with DCP method of performing member evaluations, in that Hostri event is deemed controlling over DE and DDE for equal damping and material properties.

Basis for Disagreement: The section of the PG&E Phase I Final Report referred to (Table 2.1.5-1, page 2.1.5-21 of 3-15-83 version) specifies different damping values and material properties for the Hosgri, DE and DDE.

ITR 58, Rev. 0

Area of Disagreement: Flow straighteners were found to have stresses within allowables when ductility considerations were applied (page 17 of ITR). A post yield analysis was performed.

Basis of Disagreement: No information on the post yield analysis, or how it agrees with Hosgri criteria, is provided.

ITR 58, Rev. 0

Area of Disagreement: ITR states (page 17) that conservative results were not obtained from use of 10 percent amplification of horizontal spectra, rather than use of imposition of 5 percent accidental eccentricity, to generate member forces. The ITR states that the resulting increase did not cause stresses to exceed allowables.

Basis of Disagreement: ITR does not present values of stresses or allowables, or provide assurance that said lack of conservatism may not cause exceedances when other loads are included.

ITR 58, Rev. 0

Area of Disagreement: Effects of sloshing and of hydrodynamic pressure on seaward face of structure.

Basis of Disagreement: These effects are not discussed.

ITR 58, Rev. 0

Area of Disagreement: Generally, ITR lacks detailed information on procedures, methodology and other technical issues.

Basis of Disagreement: Lack of information precludes independent reviewer from evaluating technical sufficiency of conclusions.

ITR 59

Area of Disagreement: Conclusions on page 9-1.

Basis of Disagreement: Considering small sample size, and considering number of errors found, conclusions are too positive and too broad. No assurance is provided that all criteria were met in areas beyond the sample.

ITR 67, Rev. 0 (Equipment)

Area of Disagreement: Consideration of sloshing loads in tanks (page 6).

Basis of Disagreement: Local effects are not considered, only total inertial loads. Analysis should be done for sloshing, as well as for full tank.

ITR 67, Rev. 0 (Equipment)

Area of Disagreement: Resolution of EOl #1136.

Basis of Disagreement: Resolution of EOl does not adequately address possible generic implications. Other tanks should be checked.

ITR 67, Rev. 0 (Equipment)

Area of Disagreement: Resolution of EOl #1125.

Basis of Disagreement: Resolution does not adequately address possible generic implications. The other compressor should be checked.

ITR 67, Rev. 0 (Equipment)

Area of Disagreement: ITR lacks detailed information on assumptions and documentation of procedures.

Basis of Disagreement: Lack of information precludes independent reviewer from evaluating technical sufficiency of conclusions.

ITR 67, Rev. 1

Area of Disagreement: Allowable stresses for cast iron.

Basis of Disagreement: No explanation of justification is given for the resolution of the concern raised in Revision 0 dealing with allowable stresses for cast iron.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION  
BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Docket Nos. 50-275 O.L.
	)	50-323 O.L.
(Diablo Canyon Nuclear Power	)	
Plant, Units 1 and 2)	)	

CERTIFICATION

I, Susan L. Durbin, hereby certify:

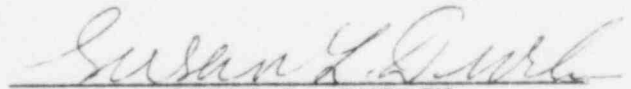
1. I am one of the attorneys for Governor George Deukmejian in the above-entitled matter and, as such, am authorized to execute this certification.

2. I have read the foregoing Governor Deukmejian's Second Supplemental Answers to Applicant PG&E's First Set of Interrogatories and know the contents thereof.

3. I am informed and believe the answers to said Answers to 2, 3 & 14 to be true and correct.

I certify under penalty of perjury that the foregoing is true and correct.

Executed at Los Angeles, California, on October 7,  
1983.

  
\_\_\_\_\_  
SUSAN L. DURBIN

PROFESSIONAL QUALIFICATIONS OF RICHARD B. HUBBARD

RICHARD B. HUBBARD  
MHB Technical Associates  
1723 Hamilton Avenue  
Suite K  
San Jose, California 95125

EXPERIENCE:

9/76 - PRESENT

Vice-President - MHB Technical Associates, San Jose, California.  
Founder, and Vice-President of technical consulting firm. Specialists in independent energy assessments for government agencies, particularly technical and economic evaluation of nuclear power facilities. Consultant in this capacity to California, Massachusetts, Oklahoma and Illinois Attorney Generals, Minnesota Pollution Control Agency, German Ministry for Research and Technology, Governor of California, Swedish Energy Commission, Swedish Nuclear Inspectorate, Suffolk County, Ohio Consumer's Counsel, New Jersey Public Advocate, and the U. S. Department of Energy. Also provided studies and testimony for various public interest groups including the Center for Law in the Public Interest, Los Angeles; Public Law Utility Group, Baton Rouge, Louisiana; Friends of the Earth (FOE), Italy; and the Union of Concerned Scientists, Cambridge, Massachusetts. Provided testimony to the U.S. Senate/House Joint Committee on Atomic Energy, the U.S. House Committee on Interior and Insular Affairs, the California Assembly, Land Use, and Energy Committee, the Advisory Committee on Reactor Safeguards, and the Atomic Safety and Licensing Board. Performed comprehensive risk analysis of the accident probabilities and consequences at the Barseback Nuclear Plant for the Swedish Energy Commission and edited, as well as contributed to, the Union of Concerned Scientist's technical review of the NRC's Reactor Safety Study (WASH-1400).

2/76 - 9/76

Consultant, Project Survival, Palo Alto, California.  
Volunteer work on Nuclear Safeguards Initiative campaigns in California, Oregon, Washington, Arizona, and Colorado. Numerous presentations on nuclear power and alternative energy options to civic, government, and college groups. Also resource person for public service presentations on radio and television.

5/75 - 1/76

Manager - Quality Assurance Section, Nuclear Energy Control and Instrumentation Department, General Electric Company, San Jose, California. Report to the Department General Manager. Develop and implement quality plans, programs, methods, and equipment which assure that products produced by the Department meet quality requirements as defined in NRC regulation 10 CFR 50, Appendix B, ASME Boiler and Pressure Vessel Code, customer contracts, and GE Corporate policies and procedures. Product areas include radiation sensors, reactor vessel internals, fuel handling and servicing tools, nuclear plant control and protection instrumentation systems, and nuclear steam supply and Balance of Plant control room panels. Responsible for approximately 45 exempt personnel, 22 non-exempt personnel, and 129 hourly personnel with an expense budget of nearly 4 million dollars and equipment investment budget of approximately 1.2 million dollars.

11/71 - 5/75

Manager - Quality Assurance Subsection, Manufacturing Section of Atomic Power Equipment Department, General Electric Company, San Jose, California. Report to the Manager of Manufacturing. Same functional and product responsibilities as in Engagement #1, except at a lower organizational report level. Developed a quality system which received NRC certification in 1975. The system was also successfully surveyed for ASME "N" and "NPT" symbol authorization in 1972 and 1975, plus ASME "U" and "S" symbol authorizations in 1975. Responsible for from 23 to 39 exempt personnel, 7 to 14 non-exempt personnel, and 53 to 97 hourly personnel.

3/70 - 11/71

Manager - Application Engineering Subsection, Nuclear Instrumentation Department, General Electric Company, San Jose, California. Responsible for the post order technical interface with architect engineers and power plant owners to define and schedule the instrumentation and control systems for the Nuclear Steam Supply and Balance of Plant portion of nuclear power generating stations. Responsibilities included preparation of the plant instrument list with approximate location, review of interface drawings to define functional design requirements, and release of functional requirements for detailed equipment designs. Personnel supervised included 17 engineers and 5 non-exempt personnel.

12/69 - 3/70

Chairman - Equipment Room Task Force, Nuclear Instrumentation Department, General Electric Company, San Jose, California. Responsible for a special task force reporting to the Department General Manager to define methods to improve the quality and reduce the



installation time and cost of nuclear power plant control rooms. Study resulted in the conception of a factory-fabricated control room consisting of signal conditioning and operator control panels mounted on modular floor sections which are completely assembled in the factory and thoroughly tested for proper operation of interacting devices. Personnel supervised included 10 exempt personnel.

12/65 - 12/69

Manager - Proposal Engineering Subsection, Nuclear Instrumentation Department, General Electric Company, San Jose, California.

Responsible for the application of instrumentation systems for nuclear power reactors during the proposal and pre-order period. Responsible for technical review of bid specifications, preparation of technical bid clarifications and exceptions, definition of material list for cost estimating, and the "as sold" review of contracts prior to turnover to Application Engineering. Personnel supervised varied from 2 to 9 engineers.

8/64 - 12/65

Sales Engineer, Nuclear Electronics Business Section of Atomic Power Equipment Department, General Electric Company, San Jose, California.

Responsible for the bid review, contract negotiation, and sale of instrumentation systems and components for nuclear power plants, test reactors, and radiation hot cells. Also responsible for industrial sales of radiation sensing systems for measurement of chemical properties, level, and density.

10/61 - 8/64

Application Engineer, Low Voltage Switchgear Department, General Electric Company, Philadelphia, Pennsylvania

Responsible for the application and design of advanced diode and silicon-controlled rectifier (SCR) constant voltage DC power systems and variable voltage DC power systems for industrial applications. Designed, followed manufacturing and personally tested an advanced SCR power supply for product introduction at the Iron and Steel Show. Project Engineer for a DC power system for an aluminum pot line provided to Anaconda beginning at the 161KV switchyard and encompassing all the equipment to convert the power to 700 volts DC at 160,000 amperes.

9/60 - 10/61

GE Rotational Training Program

Four 3-month assignments on the GE Rotational Training Program for college technical graduates as follows:

- a. Installation and Service Eng. - Detroit, Michigan  
Installation and startup testing of the world's largest automated hot strip steel mill.
- b. Tester - Industry Control - Roanoke, Virginia  
Factory testing of control panels for control of steel, paper, pulp, and utility mills and power plants.
- c. Engineer - Light Military Electronics - Johnson City, New York  
Design of ground support equipment for testing the auto pilots on the F-105.
- d. Sales Engineer - Morrison, Illinois  
Sales of appliance controls including range timers and refrigerator cold controls.

EDUCATION:

Bachelor of Science Electrical Engineering, University of Arizona, 1960.

Master of Business Administration, University of Santa Clara, 1969.

PROFESSIONAL AFFILIATION:

Registered Quality Engineer, License No. QU805, State of California.

Member of Subcommittee 8 of the Nuclear Power Engineering Committee of the IEEE Power Engineering Society responsible for the preparation and revision of the following national Q.A. Standards:

- a. IEEE 498 (ANSI N45.2.16): Requirements for the Calibration and Control of Measuring and Test Equipment used in the Construction and Maintenance of Nuclear Power Generating Stations.
- b. IEEE 336 (ANSI N45.2.4): Installation, Inspection, and Testing Requirements for Class 1E Instrumentation and Electric Equipment at Nuclear Power Generating Stations.
- c. IEEE 467 : Quality Assurance Program Requirements for the Design and Manufacture of Class 1E Instrumentation and Electric Equipment for Nuclear Power Generating Stations.

I am currently a member of the IEEE Committee which is preparing a standard relating to the selection and utilization of replacement parts for Class 1E equipment during the construction and operation phase.

PUBLICATIONS AND TESTIMONY:

1. In-Core System Provides Continuous Flux Map of Reactor Cores, R. B. Hubbard and C. E. Foreman, Power, November, 1967.
2. Quality Assurance: Providing It, Proving It, R. B. Hubbard, Power, May, 1972.
3. Testimony of R. B. Hubbard, D. G. Bridenbaugh, and G. C. Minor before the United States Congress, Joint Committee on Atomic Energy, February 18, 1976, Washington, D.C. (Published by the Union of Concerned Scientists, Cambridge, Massachusetts.) Excerpts from testimony published in Quote Without Comment, Chemtech, May, 1976.
4. Testimony of R. B. Hubbard, D. G. Bridenbaugh, and G. C. Minor to the California State Assembly Committee on Resources, Land Use, and Energy, Sacramento, California, March 8, 1976.
5. Testimony of R. B. Hubbard and G. C. Minor before California State Senate Committee on Public Utilities, Transit, and Energy, Sacramento, California, March 23, 1976.
6. Testimony of R. B. Hubbard and G. C. Minor, Judicial Hearings Regarding Grafenrheinfeld Nuclear Plant, March 16 & 17, 1977, Wurzburg, Germany.
7. Testimony of R. B. Hubbard to United States House of Representatives, Subcommittee on Energy and the Environment, June 30, 1977, Washington, D.C., entitled, Effectiveness of NRC Regulations - Modifications to Diablo Canyon Nuclear Units.
8. Testimony of R. B. Hubbard to the Advisory Committee on Reactor Safeguards, August 12, 1977, Washington, D.C., Risk Uncertainty Due to Deficiencies in Diablo Canyon Quality Assurance Program and Failure to Implement Current NRC Practices.
9. The Risks of Nuclear Power Reactors: A Review of the NRC Reactor Safety Study WASH-1400, Kendall, et. al., edited by R. B. Hubbard and G. C. Minor for the Union of Concerned Scientists, August, 1977.
10. Swedish Reactor Safety Study: Barseback Risk Assessment, MHB Technical Associates, January 1978 (Published by Swedish Department of Industry as Document DSI (1978:1)).
11. Testimony of R. B. Hubbard before the Energy Facility Siting Council, March 31, 1978, in the matter of Pebble Springs Nuclear Power Plant, Risk Assessment: Pebble Springs Nuclear Plant, Portland, Oregon.

12. Presentation by R. B. Hubbard before the Federal Ministry for Research and Technology (BMFT), August 31 and September 1, 1978, Meeting on Reactor Safety Research, Risk Analysis. Bonn, Germany.
13. Testimony by R. B. Hubbard, D. G. Bridenbaugh, and G. C. Minor before the Atomic Safety and Licensing Board, September 25, 1978, in the matter of the Black Fox Nuclear Power Station Construction Permit hearings, Tulsa, Oklahoma.
14. Testimony of R. B. Hubbard before the Atomic Safety and Licensing Board, November 17, 1978, in the matter of Diablo Canyon Nuclear Power Plant Operating License Hearings, Operating Basis Earthquake and Seismic Reanalysis of Structures, Systems, and Components, Avila Beach, California.
15. Testimony of R. B. Hubbard and D. G. Bridenbaugh before the Louisiana Public Service Commission, November 19, 1978, Nuclear Plant and Power Generation Costs, Baton Rouge, Louisiana.
16. Testimony of R. B. Hubbard before the California Legislature, Subcommittee on Energy, Los Angeles, April 12, 1979.
17. Testimony of R. B. Hubbard and G. C. Minor before the Federal Trade Commission, on behalf of the Union of Concerned Scientists, Standards and Certification Proposed Rule 16 CFR Part 457, May 18, 1979.
18. ALO-62, Improving the Safety of LWR Power Plants, MHB Technical Associates, prepared for U.S. Department of Energy, Sandia National Laboratories, September, 1979, available from NTIS.
19. Testimony by R. B. Hubbard before the Arizona State Legislature, Special Interim House Committee on Atomic Energy, Overview of Nuclear Safety, Phoenix, AZ, September 20, 1979.
20. "The Role of the Technical Consultant", Practising Law Institute program on "Nuclear Litigation", New York City and Chicago, November, 1979. Available from PLI, New York City.
21. Uncertainty in Nuclear Risk Assessment Methodology, MHB Technical Associates, March, 1980, prepared for and available from Swedish Nuclear Power Inspectorate, Stockholm, Sweden.
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