EXHIBIT 20

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In The Matter Of	)	
	)	
PACIFIC GAS & ELECTRIC COMPANY	)	Docket Nos. 50-275 O.L.
	)	50-323 O.L.
(Diablo Canyon Nuclear Power Plant - Units 1 & 2)	)	

AFFIDAVIT OF GREGORY C. MINOR

Concerning

ISSUES RELATED TO PORV'S AND BLOCK VALVES

STATE OF CALIFORNIA	)	
	)	ss.
COUNTY OF SANTA CLARA	)	

GREGORY C. MINOR deposes and says under oath as follows:

I. BACKGROUND OF AUTHOR

1. My name is Gregory C. Minor. I have twenty years of experience in the design, development, research, start-up, and management of nuclear reactor systems. I worked for sixteen years for the General Electric Company and for the past four years as an independent technical consultant. I was a founder in 1976,

and I am now vice president of MHB Technical Associates. I received a B.S. in electrical engineering from the University of California, Berkeley, and an M.S. in electrical engineering from Stanford University. My sixteen years with G.E. involved the design, development, and testing of safety and control systems for nuclear plants. Since 1976, I have participated in a variety of reactor studies addressing nuclear safety issues. I am presently a consultant on several nuclear plant cases concerning the adequacy of current designs to meet existing regulations. I am a member of the Nuclear Power Plant Standards Committee for the Instrument Society of America. Also, I participated in a Peer Review Group of the NRC/TMI Special Inquiry Group investigating the TMI accident. My complete experience record is appended to this affidavit as Attachment A.

II. PURPOSE

2. The purpose of this affidavit is to define the substantive issues related to the PORV's and block valves planned for use at Diablo Canyon.

III. DISCUSSION OF ISSUES

3. All PWR's are equipped with PORV's which are designed to prevent lifting of the code safety valves and to permit the reactor to ride through load rejection transients. The Westinghouse design for Diablo Canyon incorporates three PORV's. There

are also block valves in series with the PORV's. Although the Diablo Canyon PORV's and block valves have been seismically qualified, they are not safety grade and as of this writing have not been fully tested.

4. PORV's and block valves figured prominently in the TMI-2 accident; the stuck-open PORV contributed to the accident by producing a small LOCA, and the block valve was relied upon to control the small LOCA as part of the accident mitigation.

5. PORV's serve other safety-related functions such as relieving pressure during low temperature operation and, thus, preventing over-pressurization of the reactor vessel. During high temperature operation, the PORV's can be used as a means of bleeding the reactor during a "bleed-and-feed" mode of operation (as was the case during post-accident mitigation of the TMI-2 accident).

6. PORV's have a tendency to stick open and because they are a primary pressure boundary component, block valves are installed in-board of the PORV's to permit them to be isolated.

7. PORV's have also experienced problems with leakage past the valve, which may mask indications of an actual stuck-open valve (as was the case at TMI-2) or require block valves to be closed; sometimes for long periods of operation.[1/]

1/ There appears to be no Diablo Canyon Technical Specification limit on operation with the block valves closed.

8. Small break LOCA procedures call for closing the PORV block valves following PORV operation to relieve pressure.[2/]

9. Thus, the PORV's serve several safety-related functions and the block valves are called upon to back up or isolate unreliable PORV's. Further, there may be long periods of operation where one or more of the block valves may be closed and, thus, be required to open on command in the event of an operational transient or accident.

10. One of the most severe accidents demanding PORV (and block valve) operation is the ATWS accident. In calculating the over-pressure conditions during an ATWS accident, credit is taken for PORV discharge capability. The ATWS environment these valves may see ranges from operating pressure up to 2848 psi with an upper limit over 3000 psi upon failure of PORV's to open.[3/] The flow would likely be two-phase flow with some solid contaminants in a severe ATWS accident.[4/]

11. The Applicant has not verified performance by qualification testing of the PORV's and block valves for the environmental conditions under which they are assumed to operate and provide for ATWS mitigation.

2/ Affidavit of Hemminger at 6.

3/ NUREG-0460, Vol. 4, Appendix G, Table 6.1 gives peak RCS pressure of a 4-loop, W plant during an ATWS/LOFW accident as 2848 psi. Appendix D, Table D.1 shows a +320 psi increment in peak pressure due to unavailability of two PORV's.

4/ NUREG-0460, Vol. 4, Appendix A, page A-3, predicts that there will be approximately 25% vapor fraction in the primary loop at 250 seconds into a load rej./ATWS. On page A-19 the NRC assumes a 10% fuel rod failure due to PCI.

12. Samples of the types of valves used at Diablo Canyon are being tested as part of the EPRI test program in an effort to comply with NUREG-0737 item II.D.1. The Applicant states that only steam tests have been performed on the PORV samples and the single block valve sample.5/ No mention is made of the test conditions or limits except that the block valve tests are called "preliminary."

13. For the EPRI test results to be of significant value in proving qualification of the Diablo Canyon valves, they must meet several fundamental requirements.

a. Be conducted on a statistically significant number of samples of each valve type.

b. Perform a significant number of tests to evaluate degradation or valve life time (in terms of number of operations).

c. Cover the full range of operating and transient and accident conditions.

d. Be representative of the Diablo Canyon physical piping and arrangement.

Unfortunately, the Applicant has not provided data to show that these conditions are met as a result of the EPRI tests. In fact, they are not being met in several cases; the Applicant is not testing under ATWS conditions, the preliminary block valve test is on a sample of one, and only steam conditions (of unspecified

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5/ Affidavit of Hock (PG&E) at 2.

temperature and pressure) have been tested so far.

14. The Applicant's reluctance to qualify the PORV's and block valves to ATWS conditions appears to be contrary to the NRC staff's position on valve qualification for ATWS as stated in Supplement 13 of the SER:

> "Additionally, the functionability of the valves required for long-term cooling following the postulated ATWS event has to be demonstrated." 6/

15. IE Bulletin No. 81-02 states that the EPRI tests of block valves were designed to get background data and only covered the conditions set up for steam testing of the PORV's.7/ The Bulletin indicates that the PORV test conditions might not be the same as those required for qualification of block valves, but it has not yet been evaluated:

> "To date, there has been no similar specific determination by EPRI or the NRC staff as to the relevance of the Marshall block valve test conditions to the conditions of any specific PWR plant under which a block valve should be able to close to isolate a stuck-open PORV." 8/

This is significant because several of the block valves sampled failed to close when operating under a differential pressure of between 750 and 1500 psid. Thus, when the full range of pressures and steam quality conditions are tested and the plant-

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6/ NUREG-0675, Supplement 13, April, 1981, page 15-1. Also, NUREG-0737, page II.D.1-2, calls for the Applicant to "provide evidence supported by test that the block valves....can be operated, closed, and opened for all fluid conditions expected under operating and accident conditions."

7/ IE Bulletin No. 81-02, FAILURE OF GATE TYPE VALVES TO CLOSE AGAINST DIFFERENTIAL PRESSURE, April 9, 1981, pages 1 and 2.

8/ Ibid 7 at page 2.

specific operating (and accident) requirements are defined there may be additional functionability problems and failure modes to report. Given that three out of seven block valves failed the test at relatively low dP values, and compared to the higher pressures expected during operation, transients, and accidents and ATWS conditions, there is a high likelihood that these and other valves may not be able to operate correctly under all expected conditions.

16. The Applicant failed to mention the test failures of the three other block valves when selectively citing the limited results of the preliminary steam tests on the one block valve similar to those at Diablo Canyon.[9]

17. The failures in the EPRI tests cast serious doubt on the validity of allowing plants to start up while testing continues until July 1, 1982. Because there is little assurance that the tests will indeed result in verification of functionability over the full range of operating and accident conditions, successful completion of testing should be a condition of operation for Diablo Canyon.

18. The staff admits that there are deficiencies in the Applicant's compliance with standards for testing of relief valves[10] but they expect the EPRI tests to verify the assumed correct operation of the valves. They then state that if the

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9/ Affidavit of Hoch at page 2.
10/ Affidavit of Hemminger at page 3.

tests show that the valves are not qualified, the staff will require the licensee to take corrective action. Unfortunately, this correction may not occur until the plant has operated for some time. In view of the uncertainty of the EPRI test results, this schedule is not in the interest of public health and safety nor is it consistent with ALARA.

19. I disagree with the Applicant's statements on ALARA[11/] wherein they imply that it is not important <u>when</u> a modification is made, only that the task be completed with as low as reasonably achievable exposure starting with whatever plant condition exists at the time (or will exist). There is clearly an advantage in doing work on a plant <u>before</u> the plant goes into operation. Work which is deferred once may be deferred again (to a future refueling outage, for example), at which time the plant exposure levels may be considerably higher. An even less desirable outcome is that, once deferred, the work may never be completed.

V. CONCLUSIONS

20. Based on the above, there is considerable doubt regarding the qualification status of the Diablo Canyon PORV's and block valves. Recent failures in the EPRI preliminary block valve test program, at much less than worst-case conditions, justify completion of the testing over the full range of

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11/ Affidavit of Brown at pages 1 and 2.

transient and accident conditions prior to operation of Diablo Canyon. Further, there is concern that the classification of the PORV's and block valves should be safety-related. And finally, because of the need for PORV's to function during an ATWS event, there is a need to consider ATWS conditions in the testing of PORV's and block valves.

I have read the foregoing and swear that it is true and accurate to the best of my knowledge.

April 21, 1981

Gregory C. Minor
GREGORY C. MINOR

Subscribed and sworn to before
me this 21st day of April, 1981.

Linda L. Roberson
NOTARY PUBLIC

My commission expires: 8-29-83

OFFICIAL SEAL
LINDA L ROBERSON
NOTARY PUBLIC - CALIFORNIA
SANTA CLARA COUNTY
My comm. expires AUG 29, 1983

ATTACHMENT A

PROFESSIONAL QUALIFICATIONS OF GREGORY C. MINOR

GREGORY C. MINOR
MHB Technical Associates
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Suite K
San Jose, California 95125
(408) 266-2716

EXPERIENCE:

1976 - PRESENT

Vice-President - MHB Technical Associates, San Jose, California. Engineering and energy consultant to state, federal, and private organizations and indivdusals. Major activities include studies of safety and risk involved in energy generation, providing technical consulting to legislative, regulatory, public and private groups and expert witness in behalf of state organizations and citizens' groups. Was co-editor of a critique of the Reactor Safety Study (WASH-1400) for the Union of Concerned Scientists and co-author of a risk analysis of Swedish reactors for the Swedish Energy Commission. Served on the Peer Review Group of the NRC/TMI Special Inquiry Group (Rogovin Committee). Actively involved in the Nuclear Power Plant standards Committee work for the Instrument Society of America (ISA).

1972 - 1976

Manager, Advanced Control and Instrumentation Engineering, General Electric Company, Nuclear Energy Division, San Jose, California.

Managed a design and development group of thirty-four engineers and support personnel designing systems for use in the measurement, control and operation of nuclear reactors. Involved coordination with other reactor design organizations, the Nuclear Regulatory Commission, and customers, both overseas and domestic. Responsibilities included coordinating and managing the design and development of control systems, safety systems, and new control concepts for use on the next generation of reactors. The position included responsibility for standards applicable to control and instrumentation, as well as the design of short-term solutions to field problems. The disciplines involved included electrical and mechanical engineering, seismic design and process computer control/ programming.

1970 - 1972

Manager, Reactor Control Systems Design, General Electric Company, Nuclear Energy Division, San Jose, California.

Managed a group of seven engineers and two support personnel in the design and preparation of the detailed system drawings and control documents relating to safety and emergency systems for nuclear reactors. Responsibility required coordination with other design organizations and interaction with the customer's engineering personnel, as well as regulatory personnel.

1963 - 1970

Design Engineer, General Electric Company, Nuclear Energy Division, San Jose, California.

Responsible for the design of specific control and instrumentation systems for nuclear reactors. Lead design responsibility for various subsystems of instrumentation used to measure neutron flux in the reactor during startup and intermediate power operation. Performed lead system design function in the design of a major system for measuring the power generated in nuclear reactors. Other responsibilities included on-site checkout and testing of a complete reactor control system at an experimental reactor in the Southwest. Received patent for Nuclear Power Monitoring System.

1960 - 1963

Advanced Engineering Program, General Electric Company; Assignments in Washington, California, and Arizona.

Rotating assignments in a variety of disciplines:

- Engineer, reactor maintenance and instrument design, KE and D reactors, Hanford, Washington, circuit design and equipment maintenance coordination.
- Design engineer, Microwave Department, Palo Alto, California. Worked on design of cavity couplers for TWT's.
- Design engineer, Computer Department, Phoenix, Arizona. Design of core driving circuitry.
- Design engineer, Atomic Power Equipment Department, San Jose, California. Circuit design and analysis.
- Design engineer, Space Systems Department, Santa Barbara, California. Prepared control portion of satellite proposal.

- Technical Staff - Technical Military Planning Operation. (TEMPO), Santa Barbara, California. Prepare analysis of missile exchanges.

During this period, completed three-year General Electric program of extensive education in advanced engineering principles of higher mathematics, probability and analysis. Also completed courses in Kepner-Tregoe, Effective Presentation, Management Training Program, and various technical seminars.

EDUCATION

University of California at Berkeley, BSEE, 1960.

Advanced Course in Engineering - three-year curriculum, General Electric Company, 1963.

Stanford University, MSEE, 1966.

HONORS AND ASSOCIATIONS

- Tau Beta Pi Engineering Honorary Society.
- Co-holder of U.S. Patent No. 3,565-760, "Nuclear Reactor Power Monitoring System," February, 1971.
- Member: American Association for Advance of Science.
- Member: Nuclear Power Plant Standards Committee, Instrument Society of America.

PERSONAL DATA

Born: June 7, 1937
Married, three children
Residence: San Jose, California

PUBLICATIONS AND TESTIMONY

1. G.C. Minor, S.E. Moore, "Control Rod Signal Multiplexing," IEEE Transactions on Nuclear Science, Vol. NS-19, February, 1972.

2. G.C. Minor, W.G. Milam, "An Integrated Control Room System for a Nuclear Power Plant," NEDO-10658, presented at International Nuclear Industries Fair and Technical Meetings, October, 1972, Basle, Switzerland.

3. The above article was also published in the German Technical Magazine, NT, March, 1973.

4. Testimony of G.C. Minor, D.G. Bridenbaugh, and R.B. Hubbard before the Joint Committee on Atomic Energy, Hearings held February 18, 1976, and published by the Union of Concerned Scientists, Cambridge, Massachusetts.

5. Testimony of G.C. Minor, D.G. Bridenbaugh, and R.B. Hubbard before the California State Assembly Committee on Resources, Land Use, and Energy, March 8, 1976.

6. Testimony of G.C. Minor and R.B. Hubbard before the California State Senate Committee on Public Utilities, Transit, and Energy, March 23, 1976.

7. Testimony of G.C. Minor regarding the Grafenrheinfeld Nuclear Plant, March 16-17, 1977, Wurzburg, Germany.

8. Testimony of G.C. Minor before the Cluff Lake Board of Inquiry, Regina, Saskatchewan, Canada, September 21, 1977.

9. The Risks of Nuclear Power Reactors: A Review of the NRC Reactor Safety Study WASH-1400 (NUREG-75/0140), H. Kendall, et al, edited by G.C. Minor and R.B. Hubbard for the Union of Concerned Scientists, August, 1977.

10. Swedish Reactor Safety Study: Barsebäck Risk Assessment, MHB Technical Associates, January, 1978. (Published by Swedish Department of Industry as Document SdI 1978:1)

11. Testimony by G.C. Minor before the Wisconsin Public Service Commission, February 13, 1978, Loss of Coolant Accidents: Their Probability and Consequence.

12. Testimony by G.C. Minor before the California Legislature Assembly Committee on Resources, Land Use, and Energy, AB 3108, April 26, 1978, Sacramento, California.

PUBLICATIONS AND TESTIMONY

13. Presentation by G.C. Minor before the Federal Ministry for Research and Technology (BMFT), Meeting on Reactor Safety Research, Man/Machine Interface in Nuclear Reactors, August 21, and September 1, 1978, Bonn, Germany.

14. Testimony by G.C. Minor, D.G. Bridenbaugh, and R.B. Hubbard, 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.

15. Testimony of G.C. Minor, ASLB Hearings Related to TMI-2 Accident, Rancho Seco Power Plant, on behalf of Friends of the Earth, September 13, 1979.

16. Testimony of G.C. Minor before the Michigan State Legislature, Special Joint Committee on Nuclear Energy, Implications of Three Mile Island Accident for Nuclear Power Plants in Michigan, 10/15/79.

17. A Critical View of Reactor Safety, by G.C. Minor, paper presented to the American Association for the Advancement of Science, Symposium on Nuclear Reactor Safety, January 7, 1980, San Francisco, California.

18. The Effects of Aging on Safety of Nuclear Power Plants, paper presented at Forum on Swedish Nuclear Referendum, Stockholm, Sweden, March 1, 1980.

19. Minnesota Nuclear Plants Gaseous Emissions Study, MHB Technical Associates, September, 1980, prepared for the Minnesota Pollution Control Agency, Roseville, MN.

20. Testimony of G.C. Minor and D.G. Bridenbaugh before the New York State Public Service Commission, Shoreham Nuclear Plant Construction Schedule, in the matter of Long Island Lighting Company Temporary Rate Case, September 22, 1980.

21. Testimony of G.C. Minor and D.G. Bridenbaugh before the New Jersey Board of Public Utilities, Oyster Creek 1980 Refueling Outage Investigation, in the matter of Jersey Central Power and Light Rate Case, February 19, 1981.