— Exhibit 7 —

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Before the Nuclear Regulatory Commission

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

AFFIDAVIT OF ARTHUR JACKSON

CITY of Washington, D.C. SS

The above, being duly sworn, deposes and says:

My name is Arthur Jackson. I am presenting this affidavit freely and voluntarily to Mr. Thomas Devine, who has identified himself to me as the legal director of the Government Accountability Project. This statement provides my evaluation of the technical and potential public safety significance of issues raised in a November 15, 1984 affidavit enclosed as Attachment 9 to the November 15, 1984 amended petition of Messrs. James McDermott and Timothy O'Neill under 10 C.F.R. 2.206, with respect to the Diablo Canyon Nuclear Power Plant.

Based on my review, I believe that major errors in the FLUD computer program -- used at Diablo Canyon as the basis for designing the Heating, Ventilating and Air Conditioning (HVAC) and Instrumentation systems -- may lead to predictions up to 100% inaccurate of what those systems must withstand in the event of a high energy piping break. The inaccuracies may have caused

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underdesigning that could significantly increase the chances of damage at the facility, or lead to false alarms.

1. As qualifications, I am a Registered Professional Engineer in the state of Texas (Certificate Number 50592). I graduated from the University of Houston at Houston, Texas, with a Bachelor's Degree in Electrical Engineering, with emphasis during my undergraduate studies on direct digital control application and computer application of engineering problems. During my undergraduate studies I completed several special research problems with Professor T. Sneider of the University's Electrical Engineering Department, the developer of the digital control systems for the deep sea drilling vessel, Gulf's Glomar Challenger. These research problems consisted of the development of several computer-based design programs to be used by private industry.

After graduation I began working for the Exxon Corp. in their Baytown Refinery in Baytown, Texas. While with Exxon, I worked with their Instrumentation and Control Group developing and implementing new digital system approaches to refining control application, and developing computer-based design programs. Some of the digital systems developed during that time were for control and monitoring of vehicles. Several of this type are now employed by I.N.S. officials at border crossings. Other systems included digital gas (toxic) detection and evaluation, which was adopted as an Exxon Standard at all their facilities. Several digital design packages were researched and implemented by myself while with Exxon. One of these packages, on

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design heating systems for piplines, has been marketed commercially.

From 1982-1984 I was employed with Internorth, a diversified gas and petrochemical corporation. I worked with their Houston corporate staff group as a specialist in charge of digital systems and communications design and application for their Gulf Coast operations. While with Internorth I published three articles on computer-designed engineering packages with Hydrocarbon Processing, an international publication serving the oil and gas industry in 12 countries. I also co-authored with Dr. Jacob Bordon, Ph.D.-Chemical Engineering of the corporate staff group, several proposals for new control application techniques which are currently under consideration for commercial use. I also co-authored two (2) technical papers with Dr. Bordon for presentation to the Instrument Society of America, a technical group.

Aside from my work experience with these corporations, I have been active in promoting the use of computers to study various effects on ethnic populations in the Gulf Coast region. I worked with the Education Committee of the Houston Chamber of Commerce to develop statistical information and to write a report based on that information to determine the effects of economic diversification on ethnic populations in the Houston Area. That report is currently in use in Houston.

During the last six months of 1984 I was employed as a contract consultant, for Butler Telecommunications of Atlanta, Georgia. I was employed by Butler to work with G.T.E. Sprint's

Eastern Engineering Division to design and install digital microwave and fibre optic communication systems.

I am currently a full-time first-year law student at the Antioch School of Law in Washington, D.C.

2. My involvement with the design packages used at Diablo Canyon began with the review of an affidavit taken by the Government Accountability Project (GAP), associated with the Antioch School of Law. In particular, I am referring to the earlier-referenced affidavit enclosed as Attachment 9 to the petition filed on November 15, 1984. In that document, the affiant indicated that FLUD, a digital modelling program written in Fortran, used to determine temperature, pressure and humidity changes that would result from a steam line pipe break on compartments located near the break, a-2. had instabilities that could cause it to give erroneous results. A thorough review of the affidavit and subsequent phone conversations with the affiant indicate that if the facts are as he described, instabilities do exist within the design package and that they are significant in nature.

3. FLUD is a digital modeling program used by the Bechtel Corporation. It was designed to allow the user to model up to twenty-five (25) compartments around or near a compartment in which a steam line has ruptured. The user puts initial starting parameters for each compartment to be evaluated (pressure, size, temperature, etc.) and the time interval in which the program will determine a set of conditions for each compartment. A complete cycle for the program recalculates the resulting new temperatures, pressures and humidity for each compartment. The

final output, after all compartments have reached equilibrium, will provide the user with calculated temperatures that would result from a break lasting two (2) hours. These final calculations are then used by Instrumentation; Heating, Ventilating and Air Conditioning (HVAC) and safety engineers as the basis to design their system for the operating personnel. In other words, the FLUD output would be used by the HVAC engineer to determine maximum heat and cooling loads his system must handle; and by the instrument engineer to determine the safe operating parameter that his instrumentation in the control rooms and sensing lead lines and devices must withstand. Since FLUD is a general purpose modeling program it could and in all probability was used for design throughout Diablo Canyon, as well as other facilities designed by Bechtel.

4. One problem encountered with FLUD is the imput of the time step, the time interval in which the program calculates a new set of conditions for adjacent compartments. To run a calculation on several compartments to determine resultant temperature rise from a pipe break over a two (2) hour period, the user must be careful to use increments of fractions of a mili-second (.001 sec.) to get results that are accurate, i.e. that reflect the actual temperature after the break. A variation of the time step of 1/10 of a milisecond or greater will cause the results of the program to be significantly altered. The results calculated with a time stop of 1 ms and 0.1 ms are fundamentally different. A user who is unaware of this sensitivity will accept outputs from the program that will bear no relationship to what the actual

resultant temperature should be.

5. The reason that the time step for the program becomes so critical to correct calculates values given by it, is because of the failure of the designer to include an algorithm for gaseous diffusion through the structural member forming the compartments. During calculations with time steps significantly larger than 1 ms, the program loses track of the direction of the temperature and pressure flow within the compartments. The result is a flow oscillation where the program will alternately increase and decrease calculated temperatures and pressure within a compartment, because without the diffusion algorithm to point the direction the program cannot tell whether the temperature in some compartments is rising or falling. The resulting final calculated temperatures may be 50 to 100% lower than actual. Because of the time step sensitivity and the flow oscillation problem, calculated values given by FLUD runs for the 2 hour NRC requirement would contain significant errors.

6. Since FLUD's output is used as a design basis by other engineering groups, particularly HVAC and Instrumentation, these errors become amplified. For instance, an HVAC engineer using FLUD output as the basis for his calculations may significantly underdesign his system. Then during an actual pipe break that otherwise would be minor with an adequately designed HVAC system, the unexpected temperature and pressure rise would overload the system, causing shutdown. With the shutdown of the HVAC, temperatures would then rise higher and more quickly.

7. For the instrument engineer who has designed on the basis of FLUD output, the actual instrumentation installed and

the field mounted sensing devices and lines will be introduced to temperature swings (changes) that can cause sporadic and intermittent functioning or complete failure. Since FLUD has such a great impact on the HVAC system, upon which the survival of control instruments depend, calculated errors in temperature that cause extreme loading or failure will cause sporadic and unreliable measurements, measurements that in many cases will appear higher than the actual value. This resulting accumulation of errors can turn a minor incident into a major problem.

8. By using FLUD as it is presently configured, and relying on the calculation as the basis for other engineered systems, the errors produced by the program are amplified all the way to control room readings. Significant underdesigning of the HVAC system can result, which may cause system failure. HVAC failure or severe loading adversely affects the reliability of the instrumentation, causing failure and erroneous readings (high in many cases). If the resulting readings or measurements are acted upon, the operator may make an adjustment to correct a situation where none exists, further amplifying the error.

9. A possible solution, other than a redesign of FLUD, would be to require several runs of the program, varying the time step over a narrow range above and below the initial figure. This would allow a user to have verification of his output determined with each analysis using FLUD. It would also alert the user if the time step (increment) used initially was too large, since this data would be different with each incremental change. An additional check at several compartments within a run

on FLUD, compared to hand calculated values, would be wise.

10. As for designs already in place which were based on FLUD's output, additional runs on FLUD should be made, varying the time step to determine that the output was reliable. If it is, varying the time step in 00.1 ms increments around the time step for that run should produce essentially the same value for each run. If it is not, the time step should be moved in the direction that minimizes flow oscillation until the proper size time step is found.

11. In my professional opinion, it is important that an effort be made to verify designs based on FLUD's calculation. Until that is done, the potential for possibly serious damage is significant.

I have read the above 8-page affidavit, and it is true, accurate and complete, to the best of my knowledge and belief.

Arthur Jackson

Arthur Jackson

Washington D.C.
Subscribed and Sworn to before me
this 5th day of March 1985
Notary Public, D.C.

Gladys L Prescott

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NOTARY PUBLIC, D.C.
My Commission Expires November 30, 1986