UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

Sept. 20, 1976

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 Nos. 1 and 2)	)	

AFFIDAVIT OF DR. LESLIE M. GRIMM

Leslie M. Grimm deposes and says under oath as follows:

1. I am a biologist and consultant to the Center for Law in the Public Interest for the purpose of evaluating the potential effects of the once-through cooling system on the marine environment of Diablo Cove. I received a Bachelor of Science degree in Zoology and Psychology from the University of Washington in 1965 and a Doctor of Philosophy in Biology from Stanford University in 1970. I was employed in the Departments of Fisheries, Botany and Zoology at the University of Washington from 1961 to 1965 and have been a member of the Scientific Advisory Board of Project Survival, a citizen's action group, for the past two years. My work with Project Survival has included a general study of the environmental impact of nuclear power plants.

2. The purpose of my testimony is to detail factual controversies that exist between intervenors on the one hand and the Staff and applicant on the other as to environmental contentions

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1C, 1D, 1F, 1G and 1J. These contentions are

1. Whether information developed subsequent to the Commission hearing in September 1973 demonstrates that the Staff's Final Environmental Statement (FES) adequately considers the extent or effect of the facilities' thermal plume on the environment, as to:

C. Quantitative data on turbidity.

D. Quantitative data on sublethal thermal effects.

F. Impingement and entrainment of organisms.

G. Species losses and regeneration of significant marine breeding areas including larval abalone.

J. Growth and concentration of bull kelp, as affected by heat, chlorine and foam emitted from the Diablo Canyon discharge structures, and its effect on abalone which feed on it.

I have reviewed data and documents available to intervenors, including the Staff Final Environmental Statement and Addendum, and portions of the applicant's Environmental Report and Supplements, and present my analysis below.

Contention 1C

3. Data presented by applicant and staff is insufficient to support the conclusion that there was no increase in turbidity when the circulating pumps were on. The summary data which was provided indicates that a very different conclusion might be reached; that turbidity was nearly doubled in the discharge area. Reference to Figures 1 and 2 of Supplement 6 to applicant's

Environmental Report (ER 6) shows that only one station (#4) was located in Diablo Cove. For this station (the one most directly affected by discharge-induced increases in turbidity) the maximum level of turbidity of surface samples found approaches 9mg/l, which is nearly double that found for stations 3 and 6 (5.5mg/l and 4mg.l respectively) which are the two stations located furthest from the cove and therefore less affected by discharge turbidity (ER 6, Fig. 1).

4. The decrease in light penetration which can be inferred from applicant's own data could have a serious effect on kelp and the benthic community, an effect for which no studies have been done. At no time was a comparison made between the level of turbidity within the cove when the pumps were running, and the level within the cove when they were not. This kind of comparison is necessary for an adequate assessment of the adverse environmental impacts of turbidity caused by the operation of the cooling system.

Contention 1D

5. Sublethal adverse effects caused by operation of the cooling system were assessed for only a few species (red abalone, bull kelp, some zooplankton) in the FES. Phytoplankton, zooplankton, larval fish and a fish egg, larval forms of zooplankton, and sea urchins should also be considered.

6. The sublethal studies presented in the FES are inadequate in both type and duration of observation. Observation for mortality after 6, 24, or even 125 hours is both too short a

time period for most species involved and ignores sublethal effects such as those listed below. A study of sublethal effects should include, but should not be limited to, the following general areas:

-shortened life span

-increased susceptibility to predators and/or disease

-reduced fecundity (this refers to both number and viability of offspring)

-slowed growth

-morphological changes such as loss of appendages, deformation of soft-bodied animals, changes in color or appearance

-reduced motility

-reduced feeding activity

Studies done by applicant and presented in the available documents fail to consider any of these effects.

7. Two specific sublethal effects which should be evaluated in determining mortality of red abalone are cessation of feeding activity at temperatures above 68° F (Study of Leighton, 1964, cited by Adams in ER 4, p. 177), and the fact that sudden temperature increases cause abalone to spawn.

Contention 1F

A) Abalone eggs and larvae, and zooplankton

8. Studies presented in the FES consider only thermal effects, not mechanical effects due to abrasion, pressure changes and turbulance. Mechanical processes could have substantial lethal and sublethal effects on important marine biota.

9. Conclusions as to entrainment are based heavily on comparison to four other power plants on the California coast. However, this data is not presented in the ER or the FES for idnependent analysis. The similarities of species, mechanical influences and temperatures therefore cannot be evaluated.

B) Fish

10. Studies presented in the FES on impingement of fish and other animals were done during the winter months. Since the maximum population of fish occurs in the fall (FES App. X p. 236) no adequate determination of the effects on the fish in the area can be made from those winter studies.

11. Diablo Cove is part of a 13 mile long rocky shoreline reef which is essentially a self-contained biological community due to the non-migratory behavior of indigenous species. (FES App. X, p. 228-229). Data on effects on particular species of fish during all seasons of the year is therefore extremely important if all adverse environmental impacts are to be adequately assessed. The area is predominantly a nursery area (juveniles comprised as much as 98% of some samples, and juvenile rockfish comprised 74% of all fish counted. FES App. X, p. 237.) Six deeper water fish were identified as using the area as a nursery also. The inshore and offshore fish studies (larval and egg collections by Icanberry and Warrick, ER 5 pp. 165-170) and cited in FES Addendum p. 2-4 are both outside Diablo Cove itself and outside the intake cove. At present the data presented by

the FES is inusfficient to determine the effect of loss through entrainment of fish eggs and larvae on coastal fisheries. FES Addendum p. 5-5.

Contention 1G

A) Phytoplankton

12. Tables 5.14 and 5.15 in the FES list temperature tolerances for 51 species of phytoplankton and algae. Of these 51, only one (Nerocystis luetkeana) is found in Diablo Cove. (Table 12 and 13, Diablo Canyon Environmental Report). No basis is given for the assumption that that Diablo Cove species will react similarily to changes in temperature to those species listed. There is therefore no data presented in the FES or by applicant upon which to base an evaluation of thermal tolerances and reactions of Diablo Cove phytoplankton.

13. The FES assumes that doubling rates of phytoplankton will be substantially similar to those found for Southern California. However, the species there were examined only during the spring and summer months, when light and water temperatures are optimal for reproduction. Also, these species occur in water which is naturally warmer, and could be expected to exhibit a higher doubling rate than the colder water organisms found in Diablo Cove. Any conclusions based upon studies of these species cannot be assumed to be valid for species of phytoplankton and macro algae endemic to Diablo Cove.

14. Besides its function as a food source for abalone, the kelp canopy provides a protective cover for many species of

fish and invertebrates. No data is presented by applicant or in the FES regarding the impact of a loss of several acres of the canopy on these dependent species, or the significance of that loss with respect to the oceanic ecology, particularly to fish which may depend on the area as a nursery.

Contention 1J

15. Conclusions by applicant and in the FES as to the effect of chlorine on bull kelp are not adequately supported by the studies presented. The tests were done on giant kelp, a different genus and species than bull kelp, and the five day exposure/observation period is too short a period of time for the discovery and adequate assesment of sublethal effects.

16. There are still major unanswered questions about the ultimate impact of chlorine in marine waters. ("Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments", EPRI SR-38 Vol. I, April, 1976 p.28-30.) It has been found that chlorine toxicity for fresh-water organisms is also time-dependent, and toxic levels may be as low as .01ppm at long exposures (op cit, Vol. II, p. 144). In addition, the organisms in Diablo Cove will be responding to the chlorine in combination with heat, and the synergistic effects have not been evaluated in the FES.

17. The FES includes no information on the sublethal effects of chlorine on Diablo Cove organisms. (See comments on sublethal effects, Contention 1D.) A concentration of 1.0 mg/l has been found to decrease mortality of zooplankton by 85%.

("Effects of Entrainment of Zooplankton at Three Mid-Atlantic Power Plants", Davies and Jensen, March 1974, EPRI No. 74-049-00-1, Cooling Water Discharge Research Project RP-49, report #10). Further data is needed to adequately assess the effects of chlorine on the Diablo Cove bull kelp, and other species such as zooplankton, larval/fish, and phytoplankton.

Conclusions

18. Studies done by applicant and presented in the FES inadequately assess the adverse effects on marine biota of the thermal, chemical, and mechanical changes the plant will cause. Studies should be done on species actually present in the Diablo Cove area to adequately determine not only apparent effects but also sublethal effects which may affect the long-term ability of the organism community to survive the many environmental changes the Diablo Canyon plant will produce.

19. Finally, I must note that, because I was retained as a consultant for intervenors only recently, I have not had sufficient time to conduct a fully satisfactory technical review regarding these contentions. In the short time available to me, I was able to review the Staff FES and Addendum, some, but not all of the applicant's Environmental Report and supplements; and the affidavits in support of both Staff and applicant motions for summary disposition in order to evaluate some of the inadequacies in these documents and to identify some internal inconsistencies on the Staff's and applicant's own submissions. However, I had insufficient time to conduct a full literature

search to find all documents and technical studies to support intervenors' contention that the Staff FES is inadequate. In addition, many of the relevant technical studies to which I found references are available only at specialized libraries in other parts of the country. Consequently, I have to send for them through the mails and therefore have not even seen them yet. Also, I had insufficient time to consult with other biologists working in the field regarding inadequacies in the Staff's environmental impact assessments.

Subscribed and sworn to before me this 20th day of September, 1976.

Leslie M. Grimm

LESLIE GRIMM

STATE OF CALIFORNIA,

COUNTY OF Santa Clara } ss.

ON September 20, 19 76,

before me, the undersigned, a Notary Public in and for said State, personally appeared Leslie M. Grimm

, known to me,

to be the person whose name subscribed to the within Instrument, and acknowledged to me that She executed the same.

WITNESS my hand and official seal.

DIANE MERWIN SMITH
NOTARY PUBLIC — CALIFORNIA
PRINCIPAL OFFICE IN
SANTA CLARA COUNTY
My Commission Expires November 6, 1977

Diane Merwin Smith

Notary Public in and for said State.

ACKNOWLEDGMENT—General—Wolcotts Form 233—Rev. 3-64