F.15

Joe Fouchard, News Service Branch
Division of Public Information, HQ

May 6, 1964

Rodney L. Southwick, Assistant to the
Manager for Public Information, SAS

PG&E STATEMENTS ON EARTHQUAKES
50-205
FI:RLS

Pacific Gas and Electric conducted a news conference this morning on their findings as a result of a trip to Alaska, comparing earthquake effects there with those which might be expected at Bodega Head. Attached are statements prepared for the news conference. Clips from local papers will be forwarded as they become available.

Attachment:
As stated

cc: Harold Price, Director of Regulation, HQ, w/attach.
Robert Lowenstein, Asst. Director of Regulation, HQ, w/attach.
E. W. Smith, Compl. C., SAS, w/attach.

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

BIOGRAPHICAL NOTES

F. F. MAUTZ

Mr. F. F. Mautz is the Chief Civil Engineer for P. G. and E. He has responsibility for the structural design of the Bodega atomic plant. Mr. Mautz has been an engineer with P. G. and E. for 28 years, ever since his graduation with honors as a civil engineer from the University of California at Berkeley in 1936. Since 1946 his responsibilities in the Company have included all phases of P. G. and E.'s thermal power plant design program, and certain civil structural design responsibilities for hydroelectric projects. At an early date, Mr. Mautz assumed a prominent role in the Company's nuclear studies and projects, including since 1957 studies and design of the Bodega atomic plant.

# # #

5/6/64

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

REMARKS BY F. F. MAUIZ

Our purpose in going to Alaska was to observe directly the extent of damage to structures caused by the Alaskan earthquake and to determine, to the extent possible, the reason for damage or lack of damage to structures there.

We were particularly interested in finding the relationship, if any, between the damage done by the Alaskan earthquake and our plans for the Bodega Bay nuclear plant. Our preliminary information about the Alaskan earthquake had indicated that the damage in Alaska was largely due to unstable soil conditions, such as do not exist at our Bodega site. But, in the interest of completeness, and in order to learn all that might possibly bear upon our studies of the safety of the Bodega Head reactor site, we wished to make a first hand inspection of the damage in Alaska.

We found essentially that the damage in the Alaskan quake was due to a combination of two factors: (1) poor foundation conditions, and (2) failure to follow known structural design and construction standards for earthquake areas.

Major damage to structures, and usually the more spectacular type of damage, was due primarily to soils failures -- that is, massive slumping and sliding of the ground made possible by the presence of a bluff. This ground was of a type that would be expected to act in such a manner during heavy earthquake shocks. Such type of ground, as I have indicated, is not found at the Bodega reactor site.

Of particular interest was the manner in which important major structures designed to resist earthquakes, such as power generating stations in the

(more)

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

REMARKS BY DR. GEORGE W. HOUSNER

My conclusions from our inspection trip to Alaska may be summarized as follows:

1. The intensity of ground shaking in Anchorage in the frequencies pertinent to the design of nuclear power plants was not at all severe, as evidenced by the fact that very few one story buildings were damaged and only a very small fraction of un-reinforced masonry chimneys were toppled by the shock.

2. I saw no evidence of significant damage to any buildings designed and constructed in accordance with approved practice. On the contrary, even some relatively poorly designed and relatively weak buildings survived with only moderate damage.

3. Most of the serious damage to buildings was the result of large landslides in areas adjacent to bluffs. The landslides were the consequence of failure of a thick layer of clay which is very soft and slippery when saturated. News reports dramatized those buildings which were damaged by landslides. These reports have distorted the over-all picture of the earthquake effect. I estimate that at least 80% of the buildings in Anchorage survived undamaged.

4. Although there were few structures founded on rock in the region severely shaken by earthquake, those that were apparently came through without trouble.

5. There was nothing anomalous about this earthquake. The ground motions were consistent with our expectations of what such an earthquake should produce. Judging from the damage observed at Anchorage and that reported at Cordova, Seward and Whittier, a structure designed according to the criteria

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

BIOGRAPHICAL NOTES

DR. GEORGE W. HOUSNER

Dr. George W. Housner is a Professor of Applied Mechanics and Civil Engineering at California Institute of Technology. His special field is earthquake engineering, and he is an international authority in this field. Among Dr. Housner's professional associations are: President of the Earthquake Engineering Research Institute; Director of the International Association of Earthquake Engineering; and a Director of the International Institute of Seismology and Earthquake Engineering. As a consultant his experiences include assignments for the Atomic Energy Commission, the National Aeronautics and Space Administration, and the California Water Plan. He has consulted on the seismic design of practically every nuclear reactor proposed for location in seismic areas, such as the five built or proposed in California and others in Nevada, New York, New Jersey, Tennessee, and Japan.

# # #

5/6/64

area, withstood the earthquake and subsequent shocks. These structures gave a good account of themselves. For example, none of the power plants in the earthquake area was forced out of operation during the earthquake because of mechanical, electrical or structural failure.

Our observations indicated that in every case where structures of any type were built on good foundations, particularly on rock, they suffered little or no damage, while those erected on unconsolidated materials or poor foundations suffered the greatest amount of damage.

Where the likelihood of earthquake forces was taken into account by the application of known principles in design and in selection of foundation conditions, as we are doing at Bodega, structures withstood the earthquake and the resulting after-shocks without ceasing to perform their primary function and with safety to persons in and about them.

# # #

5/6/64

being used for the Bodega Bay plant would have survived without any damage and with relatively low stresses. In fact, the structure being designed for the Bodega Bay plant would withstand earthquake forces approximately five times those developed at Anchorage.

6. There was nothing about the Alaskan earthquake that would indicate a necessity for reconsidering the earthquake design criteria for the Bodega Bay plant.

5/6/64

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

BIOGRAPHICAL NOTES

DR. HUGO BENIOFF

Dr. Hugo Benioff is Professor of Seismology at the California Institute of Technology. (Seismology is the scientific study of earthquakes.) He is an international authority on the mechanisms of earthquakes and on seismic instruments. He has been associated with the Seismological Laboratory of the California Institute of Technology for 40 years. He has contributed chapters in scientific treatises and articles for the Encyclopaedia Britannica on the subject of earthquakes. Dr. Benioff is also the author of numerous scientific papers on this subject. He is a member of the National Academy of Sciences as well as a number of geological, seismological, geophysical and astronomical societies, and has served as a consultant for the U. S. State Department and the U. S. Air Force as well as acting as chairman of the Consulting Board for Earthquake Analysis for the State of California's Department of Water Resources.

# # #

5/6/64

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

REMARKS BY DR. HUGO BENIOFF

Our trip to Alaska has reaffirmed much that we already know about earthquakes. Nothing shown by the Alaskan earthquake would indicate that the Bodega Head site is not safe. In my opinion the Bodega Head site is an excellent location for a nuclear reactor from the point of view of earthquake hazards. The reasons very briefly are these. Bodega Head provides granitic rock into which the reactor can be buried. Although the site is situated near the San Andreas fault, this is not cause for alarm. Indeed, locations near active faults often provide better foundations for structures from the standpoint of earthquake hazards than do locations farther away. It is important for the public to realize that proximity to a fault is not the most important factor in determining the safety of a site from earthquake hazards.

I should like to speak somewhat reassuringly to the public about the San Andreas fault. This fault, which is a major and well-defined geologic feature of California, is an old geologic structure, having existed for some 60 to 70 million years. The entire fault structure extends over 1000 miles and varies in width from about 400 to 2000 yards. In the Bodega area the 1906 break was 1.3 miles east of the plant site. The possibility of the San Andreas fault shifting its course and rupturing elsewhere, such as through the Bodega Head reactor site, is so remote that for all practical purposes it may be disregarded.

I do not believe an earthquake on the San Andreas fault could be very much greater than the 1906 earthquake. Yet, the Bodega reactor structure, I am informed, will be designed to withstand an earthquake force even twice that of the 1906 shock.

(more)

Some observers have suggested that during a major movement of the San Andreas fault the reactor structure might be damaged by possible associated movement along a small auxiliary fracture that traverses the bedrock in the reactor site. This fracture, however, has not moved significantly during the past 40,000 years. During that time there have been perhaps 200 to 400 movements along the San Andreas fault of the general magnitude of the San Francisco earthquake. This is strong evidence that the stresses which gave rise to this fracture dissipated long ago and that no further movement along it is to be expected. The reactor structure, however, will be designed to accommodate auxiliary fracturing should it occur.

I have treated the subject of the Bodega site at some length to make clear that any concern on the part of the public that the Alaskan earthquake shows the Bodega Head site to be unsafe is wholly unfounded. The Alaskan earthquake merely reaffirmed knowledge we already had concerning the mechanisms by which earthquakes cause damage. It is our understanding of these mechanisms, and particularly our understanding of the San Andreas fault system, that permits us to state confidently that the Bodega site is safe for a properly designed plant.

Indeed, from the standpoint of earthquake hazards, I repeat that the Bodega Head site is an excellent location for a nuclear reactor. It would be unfortunate if public misunderstanding about the nature of earthquake movements were to lead to the impression that the site is unsafe.

# # #

5/6/64

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

BIOGRAPHICAL NOTES

E. C. MARLIAVE

Mr. E. C. Marliave is an engineering geologist. From 1939 to 1956 he was Chief Engineering Geologist and was in charge of all geologic work for the California Department of Water Resources. In that work one of his primary responsibilities was to determine the safety of sites for dams, tunnels, canals and power plants from the point of view of safety from earthquake hazards. The foundation conditions for most of the major dams proposed or constructed in California during this period were required to be approved by Mr. Marliave. Since 1956 Mr. Marliave has been engaged in private consulting work. Among his many professional associations, he has been honored by election to fellowship in the Geological Society of America and by election as counsellor to the Engineering Geology Division of that Society. He has also been appointed as that Division's liaison representative to the Hydraulic Division of the American Society of Civil Engineers. He is presently retained for special consulting work by the California Department of Water Resources, the Delaware River Basin Commission, the City of Los Angeles and other California municipalities, as well as by a number of private organizations, such as P. G. and E., and by engineering firms, several of which have engaged him on assignments in foreign countries.

# # #

5/6/64

P. G. and E. NEWS BUREAU
245 MARKET STREET
SAN FRANCISCO 6, CALIF.
TELEPHONE SU 1-4211

REMARKS BY MR. MARLIAVE

In view of what has already been said by the other participants on the Alaskan trip, I can be very brief.

The recent Alaskan earthquake again confirms certain facts previously known. One of the most important items in resisting earthquake damage is a good foundation. This is far more important than distance from an epicenter or the surface break of a fault.

In the Anchorage area 70 miles west of the epicenter a soft slippery clay underlying much of the residential section slid out from bluffs and severely damaged many homes and buildings. In Valdez, 120 miles east of Anchorage, and 40 miles east of the epicenter, the saturated soft glacial material underlying the town and dock area slumped and slid out into the harbor, destroying the dock and severely cracking ground in the town.

In contrast, the City of Cordova, 75 miles southeast of the epicenter, which is founded on rock that is severely jointed, fractured and faulted, was undamaged. Even dishes and tall lamps on shelves did not fall. No damage to buildings old or new was observed or reported.

This and other shocks such as the 1906 shock near San Francisco clearly demonstrate the importance of a firm foundation.

It is fallacious to suggest that damage that occurred at Anchorage and Valdez could occur on Bodega Head. Those foundation materials are markedly different and it would be more appropriate to compare foundation rock at Bodega Head with the rock at Cordova, where no damage occurred.

# # #

5/6/64