IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

OFFICE OF THE DIRECTOR

April 10, 1964

Mr. Harold L. Price
Director of Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Price:

In response to your letter of April 1 Julius Schlocker of our staff is preparing a final report on Bodega Head. This report will be in draft form and will be patterned along the guidelines given to Mr. Anderson by Dr. Beck of your staff. We plan to have Mr. Schlocker available to discuss it with your staff on April 16 in accordance with the arrangements discussed with you by telephone on April 9.

It is our plan to have Mr. Schlocker and Mr. Lemmon from our Menlo Park office in Washington a day or two in advance of your ACRS meeting. Mr. Lemmon is one of our senior geologists with wide professional experience in the western States and he has studied the Bodega Head reactor site in company with Mr. Schlocker and Mr. Bonilla.

Sincerely yours,

Arthur A. Baker
Acting Director

Rec'd Of. Dir. of Regn.
Date 4-13-64
Time 11:20
H ST Beck

DR-

Letter dtd 4/14/66

~~K. A. Williamson~~

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Job 4004 50-205 only

Comments on PG&E Amendment No. 6

This amendment differs from Amendment No. 4 principally in the deletion of certain material, augmenting of existing material to amplify the data on damping factors, and expansion of the spectrum in the short period end. In addition, a requirement has been added for insuring safe shutdown under earthquake ground motions, resulting in spectrum functions twice as great as those used for design. All in all, there has been very little modification to the original position of PG&E as described in Amendment No. 4. The following are specific comments:

There has been some concern, particularly on the part of Dr. Newmark, with the shape of the spectrum in the low period region. A rough spot check of the spectrum presented in Amendment No. 6 for curves representing 0% and 2% damping indicates that the ordinates of the curve for 0% damping are somewhat lower than those obtained from TID 7024. This variation is perhaps academic in the sense that no real structure has a damping as low as 0%. However, it may be significant because the 0% curve is used to interpolate the ordinates for other curves having finite values of damping. These variations are as follows:

Period (sec)	Acceleration, %g Amendment 6	TID 7024
0.10	125	140
0.08	92	120
0.05	50	58
0.03	38	38

There was considerable discussion at the September 16 meeting relating to the approaches to be used where response of the building itself is a factor in modifying the response of equipment items within. This point is not even mentioned in Amendment 6 It should at least be specified that interaction effects with the building will be taken into account where such interaction is significant. Otherwise, if this feature is left to the discretion of the designer it is quite probable that the basic spectrum will be used without modification for all cases.

It should be noted that such interaction may become a significant factor if PG&E modifies their design to allow for slippage on the fault or faults which run beneath the reactor foundation. If this modifications involves providing an annular space surrounding the structure, the response of the structure is thereby modified and with it the response of all equipment items within. This fact is also true, although to a lesser degree, if the annular space contains a frangible material. Consequently, building

response should be one of the items mentioned in the criteria.

The criteria presented applies to horizontal ground motion. The criteria relating to vertical ground motion is not mentioned, and should be stated.

In the course of various meetings between the Atomic Energy Commission and PG&E representatives, notably on September 16 and August 6, the Atomic Energy Commission had expressed a desire for having an extra margin of strength for ground motions in excess of 66%g. Amendment No. 6 provides no assurance that there is such a margin, and in fact, as now worded, would permit strains beyond the yield point at 66%g in critical items, including control rods.

The effectiveness of energy absorption through inelastic strains in overstressed structures is widely recognized as a principal factor in their ability to survive earthquakes. However, it should be realized that design approaches which attempt to quantitatively consider energy absorption through inelastic strains are embryonic in nature and are not accepted engineering practice. Hence, there is an element of experimentation involved in their use. Consequently, if the design approach of PG&E for critical equipment components is based on this concept, such design should

be backed up by more than computation. There are a number of elements of uncertainty here which call for caution. The combination of a basic spectrum curve which conceivably might be too low, ~~in this region~~ and uncertainties in estimating the effect of the building response on the basic input to accelerations which are too low.

These, coupled with a design which permits inelastic strains, could lead to malfunction of the control rods. Another possibly significant factor could be radiation embrittlement with its unfavorable effect on ductility. Hence, strains should be maintained within the elastic range at 66%g unless sufficient conservatism is incorporated in the earthquake forces applied to critical equipment items and unless ~~adequate~~ suitable tests are made to verify adequacy of the inelastic design approach.

88TH CONGRESS
2D SESSION

S. J. RES. 167

IN THE SENATE OF THE UNITED STATES

APRIL 13 (legislative day, MARCH 30), 1964

Mr. MCNAMARA (for Mr. ENGLE) introduced the following joint resolution; which was read twice and referred to the Joint Committee on Atomic Energy

JOINT RESOLUTION

With respect to the proposed location of a nuclear power plant at Bodega Head, California.

Whereas the Pacific Gas and Electric Company proposes to construct a nuclear power plant at Bodega Head, Sonoma County, California, within one thousand feet from the rift zone of the San Andreas fault, and has already expended almost $4,000,000 for excavation and other site development for such plant;

Whereas the Good Friday earthquake of 1964, centering in Alaska, with tremors reaching into California, is the latest of many in the Pacific Basin that have demonstrated over the years the continuing danger of earth movement along the major faultlines of the basin;

Whereas the San Andreas fault, which traverses Bodega Head,

is one such major fracture in the earth's crust whose movement caused the San Francisco earthquake of 1906;

Whereas Doctor J. P. Eaton, the seismic hazards investigator of the Geological Survey, Department of the Interior, in a report prepared in September 1963 for the Atomic Energy Commission, concluded that Bodega Head "is not an adequately safe location for a nuclear power plant";

Whereas, subsequent to the period covered by Doctor Eaton's study, a fault was observed in the sediments above bedrock at said site, and still later in October 1963 when the Pacific Gas and Electric Company's excavation at the site reached forty feet below sea level it was discovered that this geologic fracture extends into the bedrock foundation of the proposed power plant;

Whereas the Atomic Energy Commission then requested a second study of said site by the Geological Survey, resulting in a second report prepared in December 1963 by Doctor Julius Schlocker and Doctor Manuel G. Bonilla who summarized the situation as follows:

"Faults that occurred on Point Reyes peninsula in rock similar to that of Bodega Head as a result of the earthquake faulting that occurred in 1906 indicate that if some future earthquake, in which fault displacements comparable to those that occurred on the San Andreas fault zone in 1906, took place near Bodega Head, rupturing of near-surface granitic bedrock would be expected somewhere on Bodega Head."

Whereas an internationally known seismologist, Doctor Pierre Saint-Amands, head of the Earth and Planetary Sciences Division, Naval Ordnance Test Station, China Lake, California, has publicly stated with respect to said site that "a

worse foundation situation would be difficult to envisage;" and

Whereas despite these warnings and despite the fact that no construction permit yet has been obtained for such plant, the Pacific Gas and Electric Company is proceeding with its plans and preparations for use of said site for such plant: Now, therefore, be it

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Atomic Energy Commission is directed to make a full and complete report to the Joint Committee on Atomic Energy of the Congress with respect to the extent of the Commission's investigation into the risks to the public health and safety involved in locating a nuclear powerplant at said site, including in such report an account of the consideration given to the dangers cited in the reports with respect to the site by the Geological Survey; and be it further

Resolved, That the Atomic Energy Commission shall withhold the granting of any permit for construction of a nuclear powerplant at Bodega Head until the Commission can certify to the Congress, with reasonable scientific assurance, the geologic adequacy and seismic safety of said site.

88TH CONGRESS
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JOINT RESOLUTION

With respect to the proposed location of a nuclear power plant at Bodega Head, California.

By Mr. MCNAMARA (for Mr. ENGLE)

APRIL 13 (legislative day, MARCH 30), 1964

Read twice and referred to the Joint Committee on Atomic Energy

FROM:
U. S. Dept. of Interior
Geological Survey
Washington 25, D. C. (Arthur A. Baker
Acting Director)

TO:
H. L. Price

CLASSIF.: U

POST OFFICE

REG. NO.:

DESCRIPTION: (Must Be Unclassified)
Ltr. advising that Schlocker is preparing a final report on Bodega Head in draft form and will be available to discuss it with Mr. Price's staff on April 16..,

ENCLOSURES: (In response to Mr. Price's ltr. of 4-1-64)

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CONCURRENCE ☐ COMMENT ☐

DATE ANSWERED:

BY:

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