DEC 21 1979

Distribution

NRC PDR	SHanauer	NSIC
Local PDR	JKnight	TIC
Docket File	RTedesco	ACRS(16)
LWR #2 File	RDeYoung	
DBVassallo	VMoore	
DFRoss	WKreger	
SAVarga	TMurphy	
FJWilliams	MErnst	
RLBaer	RDenise	
HRood	RHartfield	
JLee	ELD	
RMattson	IE(3)	

Docket Nos. 50-361
and 50-362

Mr. James H. Drake
Vice President
Southern California Edison Company
2244 Walnut Grove Avenue
P. O. Box 800
Rosemead, California 91770

Mr. D. W. Gilman
Senior Vice President - Operations
San Diego Gas and Electric Company
101 Ash Street
P. O. Box 1831
San Diego, California 92112

Gentlemen:

SUBJECT: ADDITIONAL QUESTIONS AND POSITIONS ON THE FINAL SAFETY ANALYSIS REPORT FOR THE SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3

As a result of our review of the Final Safety Analysis Report for the San Onofre Nuclear Generating Station, Units 2 and 3, we find that we need the additional information required listed in the Enclosure. Almost all of these questions and positions in the Enclosure have already been verbally transmitted to your staff.

Please contact us if you have any questions about the information requested.

Sincerely,

Original signed by
Robert Baer
Robert L. Baer, Chief
Light Water Reactors Branch No. 2
Division of Project Management

Enclosure:
Request for Additional
Information

ccs w/enclosure:
See pages 2 and 3

App
3

OFFICE	DPM:LWR #2	DPM:LWR #2				
SURNAME	HRood:ab	RLBaer				
DATE	12/20/79	12/21/79			8001090	

NRC FORM 318 (9-76) NRCM 0240 ☆U.S. GOVERNMENT PRINTING OFFICE: 1979-289-369

Mr. James H. Drake
Vice President
Southern California Edison Company
2244 Walnut Grove Avenue
P. O. Box 800
Rosemead, California 91770

Mr. B. W. Gilman
Senior Vice President - Operations
San Diego Gas and Electric Company
101 Ash Street
P. O. Box 1831
San Diego, California 92112

cc: Charles R. Kocher, Esq.
James A. Beoletto, Esq.
Southern California Edison Company
2244 Walnut Grove Avenue
P. O. Box 800
Rosemead, California 91770

Chickering and Gregory
ATTN: David R. Pigott, Esq.
Counsel for San Diego Gas & Electric Company and Southern California Edison Company
Three Embarcadero Center, 23rd Floor
San Francisco, California 94112

Mr. Kenneth E. Carr
City Manager
City of San Clemente
100 Avenido Presidio
San Clemente, California 92672

Alan R. Watts, Esq.
Rourke & Woodruff
1055 North Main Street
Suite 1020
Santa Ana, California 92701

Lawrence Q. Garcia, Esq.
California Public Utilities Commission
5066 State Building
San Francisco, California 94102

Mr. James H. Drake
Mr. B. W. Gilman

cc: Mr. R. W. DeVane, Jr.
Combustion Engineering, Inc.
1000 Prospect Hill Road
Windsor, Connecticut 06095

Mr. P. Dragolovich
Bechtel Power Corporation
P. O. Box 60860, Terminal Annex
Los Angeles, California 90060

Mr. Mark Medford
Southern California Edison Company
2244 Walnut Grove Avenue
P. O. Box 800
Rosemead, California 91770

Henry Peters
San Diego Gas & Electric Company
Post Office Box 1831
San Diego, California 92112

Ms. Lyn Harris Hicks
Advocate for GUARD
3908 Calle Ariana
San Clemente, California 92672

Richard J. Wharton, Esq.
Warton and Pogalies
2667 Camino Del Rio South
Suite 106
San Diego, California 92108

Phyllis M. Gallagher, Esq.
1695 West Crescent Avenue
Suite 222
Anaheim, California 92701

Mr. A. S. Carstens
2071 Caminito Circulo Norte
Mt. La Jolla, California 92037

Resident Inspector/San Onofre Nuclear Power Station
c/o U. S. Nuclear Regulatory Commission
P. O. Box 3550
San Onofre, California 92672

131.0 STRUCTURAL ANALYSIS BRANCH

131.34 Provide the following information pertaining to the structural design of the sea wall.

1) The load combination equation used in the design and the magnitude of the respective loads.

2) The applicable design codes and the load factors used

3) The ratio of the design capacity and the required capacity of the sea wall as per the criteria actually used

4) The ratio of the design capacity and the required capacity as per criteria contained in the Standard Review Plan (Section 3.8.4)

5) The properties of the materials used (compressive strength of concrete etc as related to the design of the structure.

212.0 REACTOR SYSTEMS BRANCH

212.158 Internally generated missiles - The analysis of internally generated missiles (inside containment) presented in the FSAR is incomplete. Provide the following information:

a. Provide a discussion of how gravity missiles (e.g., vessel refueling seal ring) and secondary missiles (which could result from the impact made by primary missiles) have been considered in the selection of potential missile sources. If these areas have not been included in the applicant's previous submittals, provide an updated Table 3.5-2 which takes into account these factors;

b. Identify all phenomena (e.g., gravity) factored into the calculation of missile energies;

c. Regulatory Guide 1.70, Revision 2, requires that safety systems be protected from potential internally generated missiles both under normal operating and accident conditions. Amend Table 3.5-2 in the FSAR to include rotating equipment which operates during emergency conditions;

d. Provide a discussion of how the applicant determines the level of energy required to perforate protective housing. Provide specific examples for a valve bonnet and the housing for a fan blade. Discuss how the effects of impact on protective housing by primary missiles have been accounted for;

e. Discuss why the "safety valve with flange" on the pressurizer as detailed in Table 3.5-2 cannot become a missile;

f. Footnote (b) to Table 3.5-2 states that all such footnoted potential missiles are either remote to essential systems or separated by adequate barriers from essential systems. The staff requires a discussion of the particular feature (placement or barrier) for each such potential missile which prevents the missile from incapacitating safety systems;

g. The staff contends that through the common mode failure due to impact of some primary or secondary internally generated missiles on a valve and its bonnet, a valve can be damaged and the valve stem and bonnet may become secondary missiles. Justify your exclusion of this possibility in your submitted analysis. Should such a secondary missile be generated, discuss the effect on safety systems.

220.0 ANALYSIS BRANCH, SYSTEMS ANALYSIS SECTION

222.34 The results of the submitted answer to the staff questions (Amendment 16 September 1979) are surprising. Therefore we would like to verify some of the results by performing in-house audit calculations. To expedite our audit calculations, provide the input data (actual input used in the CESEC and TORC codes) for the following cases.

Steam line break with offsite power from full power.

Steam line break without offsite power from full power.

Steam line break without offsite power from hot zero power.

Worst feedline break case.

222.35 In answer to staff question 222.28, a formula for calculating hot channel h_{in} was used. Justify the use of this formula.

222.36 In answering question no. 222.5 it is stated that steady-state axial and radial peaking factors were used to calculate minimum DNBR. Show that the use of steady-state axial and radial peaking factors give conservative heat flux compared to the actual heat flux on return to power during the steam line break accident with stuck rod configuration.

222.37 Are the core parameters used in the DNBR calculations within the limit of the applicability of the CE-1 correlation? If yes, show the range. If not provide an alternate calculation.

222.38 How does the initial steam generator secondary mass inventory uncertainty affect the results of the steam line break accident from the no load condition with and without offsite power? Answer 222.18 addresses only the full power condition which would be less sensitive to mass inventory.

222.39 In the answer to question 222.20, it is stated that the Dittus-Boelter correlation was used for the core heat transfer calculations. Show that the Dittus-Boelter correlation is applicable to heat transfer calculations for steam line break conditions. How does the CESEC code with point model take into account the asymmetric power distribution due to asymmetric coolant conditions at the core inlet in the calculation of heat transfer coefficients?

222.40 The answer to staff question 222.32 states that the feedwater line break analysis assumes a constant heat transfer area in the steam generator during the reduction in the secondary water level. Since the feedwater line break is a heat up accident, this assumption is not conservative. Reanalyze the feedwater line break by taking into account the reduction of heat transfer area in the steam generators following a feedwater line accident.

361.0 GEOSCIENCES BRANCH

361.37 Page 8 Throughout the Woodward-Clyde (WC) report the Offshore Zone of Deformation (OZD) is characterized as being segmented into the Newport-Inglewood Zone of Deformation (NIZD), South Coast Offshore Zone of Deformation (SCOZD), and Rose Canyon Zone of Deformation (RCZD) segments. On page 8 in Section 2.2, the report states "the hypothesized OZD is not a through going fault." In order to more clearly understand the bases for the tectonic model proposed in the report, provide:

a) the evidence for the postulated physical discontinuity in the fault between the NIZD and SCOZD, and between the SCOZD and RCZD in the Horizon C level of the Western Geophysical Company subsurface maps.

b) Any other evidence that demonstrates physical discontinuities between these fault segments.

361.38 Page 8 Why was this new methodology chosen to estimate the maximum earthquake instead of other more conventional methods? Any new methods must be compared to the results of conventional methods. For the Offshore Zone of Deformation compare the results of this new methodology (magnitude 6.5) with the results from conventional methods-for example, fault length vs maximum magnitude relationships, or maximum magnitude based on ranking of faults. Also consider comparison of probabilistic risk on the OZD with the San Andreas and San Jacinto fault zones in Southern California. For example, consider the return period of magnitudes 6.5, 7.0 and 7.5 on the OZD. Compare the return periods of these magnitudes on the OZD to the return period design earthquakes on major faults in Southern California.

361.39 Page 11 Has the December 8, 1812 Earthquake (M6.5) been considered as being associated with a local structural source in the analysis of the safe shutdown earthquake? If such is the case, how does this conclusion affect the determination (CDMG Open File Report 79-6 SAC)?

361.40 Page 11 Why hasn't the Coronado Banks-Palos Verdes fault been considered in the earthquake analysis? The fault has in excess of 50 feet of sea floor offset and shows youthful and long, continuous fault features (Unpublished report, "Final Technical Report, USGS, Office of Earthquake Studies, Contract No. 14-08-0001-17699, Kennedy et al.") The slip rate on this fault may contradict WC's view that all faults west of the San Andreas fault have lower slip rates with increasing westerly distance.

361.41 Page 11 Your seismotectonic model for southern California is based on an apparent decrease in activity to the west of the San Andreas fault zone. The figures shown in the report suggest this relation, but the data shown for the 200 mile radius about the site as given in the FSAR, the surface faulting and earthquake activity to the southeast on the same structural trends as the OZD do not necessarily support this model. The discussion of the seismotectonic setting should include an analysis of the relation of the OZD to faults and earthquake activity to the south in Baja California and into the offshore borderland to the west of Baja California. The discussion should include the apparent increase in level of activity toward the San Miguel and Agua Blanca fault zones, to the southeast along the strike of the OZD. The analysis should include discussions of the possible structural continuity, either at the surface or at depth, with the Vallecitos, Tres Hermanos, San Miguel, Agua Blanca and faults or structures between the seaward projection of the Agua Blanca fault zone. The discussion should include, where appropriate, the general relationships of conjugate faulting, earthquake mechanism, recurrence relations or other relevant data. In addition to the above features the following should be discussed:

a. Does the post-1975 earthquake activity within a 200 mile radius of San Onofre show any new patterns of activity for the greater than 3, greater than 4, and greater than 5 earthquake magnitude ranges, that is indicated by the San Onofre 2 & 3 FSAR Figures 2.5-15, 16, 17, and 18?

b. Describe the OZD in relation to major geomorphic, structural and topographic zones of Baja California and its adjoining offshore areas.

361.42 Page 11 There were many new reports presented at the November 1979 Geological Society of America meeting in San Diego. These reports include new onshore and offshore data on the major tectonic structures of the region west of California and Baja California. Those reports which are pertinent to the Woodward-Clyde Consultants study should be considered in your responses to these questions. Provide copies of the pertinent reports, including, as a minimum, the following:

Crowell, J. C., and Sylvester, A. G. (editors), November 1979, Tectonics of the juncture between the San Andreas fault system and the Salton Trough, southeastern California: Dept. Geol. Sci., Univ. Calif., Santa Barbara, 193 p.

Abbott, P. L., November 1979, Geological excursions in the southern California area: Dept. Geol. Sci., San Diego State University, 217 p.

Abbott, P. L., and Elliott, W. J., November 1979, Earthquakes and other perils, San Diego region: San Diego Association of Geologists, 227 p.

361.43 Page 16 On page 16 you state "Gravity data in the Los Angeles Basin exhibits a Bouguer anomaly coincident with the NIZD basement discontinuity. This Bouguer anomaly does not continue south to coincide with the SCOZD; however, a similar Bouguer anomaly exists 16 kilometers (10 miles) to the west of the SCOZD."

a) provide the evidence for the existence of the anomaly as described.

b) discuss the significance of the anomaly which exists 16 kilometers west of the SONGS site and its possible correlation with the Coronado Banks fault.

c) discuss the significance of this correlation.

361.44 Figure 7 Review of the data suggests possible corrections or additions to the data base used for the Woodward-Clyde Consultants report of June 1979. The following list includes those that have been noted during review of the report.

a. Ben-Menahem (1976) cites Girdler (1958) for a 10 mm/yr slip rate on the Jordan-Red Sea Fault Zone; this figure couldn't be found in this reference. The 6.5 and 7.5 mm/yr rates appear to be sound. The pre-instrumental earthquakes have suggestions of magnitudes of 6 to 7 (M_S); see p. 46.

b. The data of Dewey and the Woodward-Clyde Consultants study of the late 1960's suggests a mainly strike-slip mechanism on the Bocono Fault (Venezuela). More discussion of the style of faulting as a matter of debate is needed. The Woodward-Clyde Consultants study suggests 320 ft/10,000 years or 9.9 mm/yr, a similar value to the values of 7, 10, and 8-10 obtained by other workers. The macroseismic data suggests the 1812 earthquake had a magnitude of 8 ± 0.25. The data for this point appears to be as good as that of many of the other points used for the figures 6 and 7.

c. The data for 5 to 6 mm/yr slip rates and the 8.0 ± 0.25 magnitude for the Wairarapā Fault (New Zealand) appear to be fairly good values for plotting the data on figures 6 and 7. There should be a discussion of why this data point should be rejected. The magnitude is listed by Slemmons (1977) and is estimated in several New Zealand publications, including Clark and others (1965), who show much larger isoseismal areas than the 1929 earthquake of M_S = 7.6. The guidebook by Lensen (1973) shows two rates for the fault slip, with a preferred estimate of 9.4 mm/yr for the Waiohine terraces. The linearity of the fault shows a nearly vertical fault plane.

The many well studied terraces of this area should permit a rather accurate appraisal of the error bands.

d. The paper of Schwartz et al (1979) appears to support a slip rate of 1.5 to 6 mm/yr, rather than the 6-10 mm/yr rate cited for the Montague fault zone.

e. The data for the Tanna fault in Japan shows for Matsuda's (1976) figure 1, a 1 km displacement for 0.5 my. This suggests a rate of about 2 mm/yr, rather than the 3.2 mm/yr rate of WCC's Table G-1.

f. Kopet-Dagh should show M_S = 7.3 according to Gutenberg and Richter (1954). The best value for slip rate appears to be the 3.6 mm/yr for the irrigation systems. This appears to be a boundary zone event.

g. Calaveras fault should show Herd (1978) as 12 to 15 mm/yr rate. The source data for this should be checked. The NRC values for maximum design earthquake should be 7.0 to 7.5.

h. The San Jacinto should use new data from Sharp, if possible. May be possible to open file the data.

i. The San Andreas fault (Cholame to Cajon Pass sector) should recheck the data of Seih (1979) who now gives a $M_S = 8.25+$ for this zone, 37 mm/yr slip rate is a reasonable value.

j. The northern San Andreas does not have any satisfactory values for the average slip rate, although the figure 20 mm/yr is widely cited.

k. CDMG special report 123 shows a slip rate of 1-2 mm/yr on the Rose Canyon fault.

361.45 Figure 7 The relation of slip rate to maximum earthquake magnitude of Figures 6 and 7 of the WC report suggests that maximum earthquake magnitude to be expected for strike-slip faults may have upper bound limits of some type. Several of the values used require more detailed descriptions of rationale, definitions, and possible basic differences from relations from dip-slip faults. The values selected do not show the error bands or variation in determinations, or detailed descriptions of the methods of selecting or rejecting basic data. The design earthquake limits of Figure 7 do not include possible families of boundaries for such limiting values as maximum probable, maximum credible, maximum possible, or other defined types of boundary values. Some of the alternative types of boundary values include the definition of maximum earthquakes based on full fault length, fault half-length, fault third-length or other methods of establishing limiting values for fault zones. These relationships suggest the need for more complete discussions of the following questions:

a. What will be the effect on the San Onofre design basis, if the boundary of Figure 7 is changed by either refinement in current data points by newer studies, or by possible generation of new earthquakes of higher magnitude on faults of low slip rate?

b. Four faults, the San Andreas, San Jacinto, Hayward and Calaveras faults, are plotted by x marks for maximum design earthquake. Other values than those shown have been established by the U. S. Nuclear Regulatory Commission, or are given in U. S. Geological Survey or in other publications. What methodology should be used for selection or rejection of data points of this type and what results are obtained if other well studied faults also are included in this type of compilation?

c. What effect on the boundary limits is obtained if the limiting maximum design earthquakes are based on maximum probable, maximum possible, maximum credible or on other defined types of maximum design earthquakes?

d. What are the relations to maximum or limiting values? Is the procedure of using fault half-length, or fault third-length or other types of calculated limits used?

e. The data supporting the slip rate vs. magnitude points plotted should have a more thorough description of the details of data selection and rejection and the range in possible error, including the M_S determination. Describe any steps taken in this process that lead to results that provide conservatism in the results of the analysis. The range in slip rate rather than single values should be plotted.

f. The sparse nature of the data for faults with slip rates of less than about 5 mm/yr average slip rate may, in part, be due to a poor data base for faults with slow strain rates. Statistically, what effect does this factor have in the validity of the data base and on the results of the analysis?

g. The geologic time scale that was used should be tabulated for reference and the assumed age, where general terms are used in the primary literature, e.g. Holocene, lower Pleistocene, etc., show the methods used in assigning an absolute age and show the error bands in the result that develop from the assumptions.

361.46
Figure 7

The new data of the Woodward-Clyde consultants report included a thorough search of the conventional literature of major strike-slip faults and their recurrence intervals. Several additional sources of information should be included in order to provide a more accurate and up-to-date record for some of the major faults. These include:

a. Gerald Lensen, R.P. Suggate and H. Wellman for New Zealand and Iranian faults. Their data should be reviewed for the Alpine, Hope, Clarence, Awatere, East Wairarapa and West Wairarapa and possibly the Wellington (partly reverse-slip) faults. Many of these faults have new detailed strip maps of late Quaternary faulting. Some newer data may be available to scale the magnitudes of pre-instrumental earthquakes (e.g. Clark and others, 1965, Fig. 121; or more recent studies by the staff of the Geophysics Div. DSIR).

b. T. Matsuda, K. Nakamura and A. Sugimura of the University of Tokyo and the Earthquake Research Institute; and N. Ikebe of the Osaka City University. They have conducted a number of detailed studies that may supplement or modify the data provided for Tanna fault, or make it possible to add other strike slip faults of Japan (Atera, Median Tectonic Line, or others).

361.47 Figure 7 The relations shown by Figures 6 and 7 of the Woodward-Clyde Consultants report may not hold for dip-slip faults. The Pleasant Valley earthquake of 7.7 magnitude as listed by Gutenberg and Richter (1954) has a low normal-slip rate. This may also be true for reverse-slip faults. Provide a model to justify not including dip-slip faults.

361.48 Figure 7 Explain why certain of the data in Table G-1 for seemingly applicable faults, i.e. Bocono, Wairarapa, Magellanes, Kopet-Dagh, Hope, and Dasht-E-Bayas, are not included in Figure 7 of the Woodward-Clyde report. Provide the criteria which excluded these faults.

361.49 Figure 7 At the September 13, 1979 Menlo Park meeting between NRC, USGS, CDMG and SCE, Dr. E. Heath, consultant to SCE, referred to a statistical analysis that computed the number of earthquakes one would have expected to the right of the Design Earthquake Limit Line (DELL) assuming a 8 1/2 maximum magnitude for a) all of the faults plotted in Figure 7 and b) all California faults. Describe this statistical analysis in detail.

361.50 Figure 7 Based on the literature, some strike-slip faults fall well outside the "Design Earthquake Limit" line shown on figure 7. Matsuda (1977, table 1) gives slip rates for several strike-slip faults that have had large historic earthquakes, as follows:

Earthquake	Magnitude	Slip Rate, mm/yr
1891 Nobi	7.9 (probably from intensity)	1-5
1927 Tango	7.5	0.05-0.1
1943 Tottori	7.4	0.05-0.1
1974 Izu-Hanto	6.9	0.5-1.0

The slip rate of 20 mm/yr used by Woodward-Clyde for the North Anatolian fault has been modified in some recent literature. The 20 mm/yr rate is based on Pavoni's interpretation of 300-400 km displacement on the Anatolian fault, but this interpretation is strongly disputed by Ketin (1969) who concludes that the displacement is much less. A later report (Canitez, 1977) says the slip rate in the last 15 m.y. has been 5-6 mm/yr and in the last 1/2 m.y. has been "about 7 mm/yr" (abstract) or "greater than 7 mm/yr" (text).

The 1976 Tan Shan earthquake of magnitude 7.8 was a complex event that was predominantly strike-slip with about 1.5 meters of displacement. The Chinese were aware of the fault in the coal mines, but did not consider it active. Inasmuch as Chinese civilization has been centered near Tan Shan for several thousand years, the geologic slip rate on the fault is very probably less than 1 mm/year.

Kanamori (1973) states that the 1948 Fukui m 7.3 earthquake, predominantly strike-slip, occurred on a fault with a slip rate less than 0.3 mm/yr.

Please assess the impact of these comments on the slip-rate technique for estimating earthquake magnitudes.

References

Canitez, Nezihi, 1977, Dynamics of the North Anatolian Fault, in Proceedings of the CENTO seminar on recent advances in earthquake hazard minimization: Iran Tech. Research and Standards Bureau, Plan and Budget Organization, Publication 70, p. 353-366.

Kanamori, H., Mode of strain release associated with major earthquakes in Japan, Annual Review of Earth and Planetary Sciences, vol. 2, Donath et al. eds., 1973.

Ketin, Ihsan, 1969, Uber die nordanatolische horizontal-vershiebung: Mineral Res. and Exploration Inst. of Turkey, Bull. (Foreign Ed.), no.72, p. 1-28.

Matsuda, Tokihiko, 1977, Estimation of future destructive earthquakes from active faults on land in Japan: Journal of Physics of the Earth, v. 25, suppl., p. S251-S260.

361.51
Figure 7.

In Woodward-Clyde's empirical search for a correlation between geologic slip rate and maximum magnitude there is a serious sampling bias in restriction of magnitude data to historic earthquakes, even though there may be no alternative. A fault with a smaller geologic slip rate will have a smaller rate of seismic activity, on the average. Therefore, the largest earthquake experienced in historic time is less likely to be near the "maximum magnitude" for a fault with a small slip rate. Please explain how this concept impacts the confidence in the placement of the "Design Earthquake Limit" line on figure 7.

361.52 Page 25 Why was M_s used in Figure 6, but M_L used in the data collection?

361.53 Page 26 During the September 13, 1979 meeting, Ross Sadigh and David Hadley presented arguments for using the regression equation on page 25 and for choosing C equal to 20. Describe this analysis in detail, especially the synthetic seismogram modeling study. Show why the data at greater distances can be extrapolated back to a distance of 10 kilometers (See Question 361.62). Show how directivity (focussing) was accounted for in the modeling study and show sample theoretical seismograms that demonstrate directivity.

USGS indicates that there is a problem with the functional form $\alpha(R + C)^{\beta}$ used in the regression and with the value adopted for C. There is no physical basis for the form $\alpha(R + C)^{\beta}$. Futhermore, C= 20 has not been demonstrated to give a better fit than other values. Furthermore, it needs to be demonstrated not only that C = 20 gives a better fit but also that the better fit is statistically significant. Moreover, site-specific data set should be used to determine C. If C means anything at all, it should be considered a site-dependent property, since a likely mechanism for limiting acceleration is the finite strength of the near-surface materials at the recording site. Consequently please explain the validity of the quantity C = 20.

361.54 Chapter 5.0 Using the site ground motion methodology in Chapter 5.0, extrapolate the ground motion at the site for magnitudes 7 and 7 1/2 on the OZD, given site specific spectra for magnitudes 6.5, 6.0 and 5.5 on the OZD at a distance of 10 km (See Question 361.62) from the site.

361.55 Chapter 5.0 Strong motion data recorded at the base of large buildings have been included in the ground motion analysis. Work by Boore and others (1978) and Crouse (1978) suggests that the peak acceleration values recorded at such sites may be biased downward from the values that would have been recorded under free-field conditions. A number of records have been included from NW California earthquakes, the locations of which are subject to notoriously large uncertainties. The weighting scheme gives these data equal weight with the San Fernando data for which the distances are much more accurately known. Also, a large number of strong motion data points have been attained very near to the fault during the two recent California earthquakes (Coyote Lake August 6, 1979, and Imperial Valley October 15, 1979).

a. Please assess the impact of these comments and of the new data on your estimates of peak ground motion at the SONGS site.

b. Assess the impact of these comments and of the new data on the design response spectra at the SONGS site.

References

Boore, D. M., Joyner , W. B., Oliver, A. A. III, and Page, R. A., 1978, Estimation of ground motion parameters: U.S. Geological Survey Circular 795, 43 p.

Crouse, C. B., 1978, Prediction of free-field earthquake ground motions: Proceeding, ASCE Speciality Conference Earthquake Engineering and Soil Dynamics, v. 1, p. 359-379.

361.56 Chapte. 5.0 Consider the focusing effect in developing the design spectra for San Onofre reactors 2 and 3. Explore the possible design implications of this phenomenon. If the focusing effect significantly modifies the design peak acceleration, does this materially change the selection of the appropriate design spectra which would be adopted for construction?

361.57 Figure 11 List the available free field strong motion records from earthquakes of magnitude (Ms) greater than 6.7 on strike slip faults recorded at distances of less than 40 km from the rupture surface. Note the foundation conditions at the recording sites.

Plot the response spectra from these records and the SSE design spectrum for 2 percent of critical damping.

361.58 Page 24 Use USGS Circular 795 to determine the ground motion at the San Onofre site using earthquake magnitudes of 6 1/2, 7 and 7 1/2 on the OZD at a distance of 10 km (see Question 361.62) from the site.

361.59 Figure 11 Plot the results of the SONGS 1 modeling study on Figure 11.

361.60 Appendix A It is stated in Appendix A, page 10 of the Woodward-Clyde report "The full extent of the Rose Canyon Zone is not well known but is believed to die out toward the north in the vicinity of Oceanside and toward the south in the vicinity of San Diego Bay. However, both a northward extension to the SCOZD and southward extension to faults in Mexico have been suggested (Corey, 1954; Emergy, 1960; King, 1969; Wiegand, 1970; Moore and Kennedy, 1975; Moore 1972)."

a) Discuss in detail the basis for your belief that the Rose Canyon Zone dies out toward the south in the vicinity of San Diego Bay.

b) Summarize the evidence in each of the above references given which supports or suggests a southward extension of the Rose Canyon Zone to faults in Mexico.

c) Present your rebuttal of the evidence given in item b) above.

361.61 Appendix B — Appendix B of the WC report discusses the methodology of determining lateral displacements along the NIZD by matching sedimentary rocks facies and stratigraphic thicknesses across the fault; however, the field data i.e., pertinent electric logs, stratigraphic and lithologic interpretations used in the correlations are not provided in Appendix B. Since in this methodology extreme care is required in matching electric log correlations, the NRC staff must review the specific logs and correlations made in support of your determination of the 0.5 mm/yr slip-rate for the NIZD. Show logs for the holes that are correlated and for the adjoining holes that show greater mismatch or lack of correlation for each age bracket used to support the general slip rate. Show the error bands or spread for each determination. What are the error bands in absolute age for the sediments that have been correlated? What procedures or assumptions have been used and what is the effect on the conservatism in the result of the analysis?

361.62 Page J-3 — Justify the choice of source distance used in the WC study, instead of the more conventional shortest distance in km to the surface of fault slippage as used in USGS Circular 795. See also Figures 6-9 and 6-19 in Supplement 1 to the TERA Corp. study "Simulation of Earthquake Ground Motions for San Onofre Nuclear Generating Station Unit 1, July, 1979 which demonstrates the greater importance of receiver distance over hypocenter distance.

421.0 QUALITY ASSURANCE BRANCH

421.3 Describe the QA program controls that were applied to the design and construction of the sea wall, and the QA program controls that will apply to any potential work in the future (e.g., maintenance/modifications) during the operations phase. Your response should address the extent to which the QA program controls meet each of the applicable criteria of Appendix B to 10 CFR 50 and the Regulatory Guides, ANSI standards, and criteria identified in Section 17.1 of the Standard Review Plan (NUREG-75/087), "Quality Assurance During the Design and Construction Phases."

440.0 OPERATOR LICENSING BRANCH

441.3 (13.2) Provide a detailed description of the fire protection training and retraining for the initial plant staff and replacement personnel so that the findings addressed in Paragraphs II.6.A-E of Section 13.2 of NUREG-75/087 (Rev. 1), "Standard Review Plan..." can be made.

441.4 (13.5) Indicate your intention to provide Fire Protection Procedures.

FINANCIAL ANALYSIS STAFF

The following financial information is required for each of the two proposed municipal applicants (Anaheim and Riverside):

1. Provide a detailed statement of the projected sources of funds for each municipal applicant's capital contribution to the subject project showing both the timing and amounts that will be financed and advanced to Southern California Edison Company for the acquisition of the respective ownership interest of the facility. State in detail all other construction expenditures that are projected to be incurred during the acquisition period, including other capital requirements such as sinking fund requirements and redemptions of maturing bond issues. Indicate the expected breakdown between internally-generated funds and external financing during the acquisition period in the meeting of total capital requirements. Provide a detailed explanation of the assumptions upon which the projected sources of funds statement is based.

2. If any municipal applicant is to finance its ownership share with bonds, indicate the source of funds for payment of interest cahrges and principal. Indicate the legal authority by which each municipal applicant can issue bonds to provide financial support for the subject project . Show the effect of any restrictions to both project and total financing ability stating the amount of financing that may be presently performed under such restrictions.

3. Describe the nature, amount, ratings, and success of each municipal applicant's most recent revenue and general obligation bond sales. Indicate the current total outstanding indebtedness in each category for each entity.

4. Provide copies of the official statement for the most recent bond issue. Provide copies of the preliminary statement for any pending security issue.

5. Provide copies of the most recent annual financial report and the most recent interim financial statements for each municipal applicant. Continue to submit copies of the annual financial report for each year thereafter as required by 10 CFR Part 50.71 (b).

6. Is each participant's percentage ownership share in the facility equal to its percentage entitlement in the electrical capacity and output of the plant? If not, explain the difference(s) and any resultant effect on any participant's obligation to provide its share of design, construction and operating costs.

7. Describe the rate-setting authority of each municipal applicant and how that authority may be used to ensure the satisfaction of financial obligations related to both capital and operating costs of the facility. Describe any restrictions on such rate-setting authority and how this may affect the applicant's ability to satisfy its obligations to the project.

7. (Continued) Describe the nature and amount of each municipal applicant's most recent rate relief action and the anticiapted effect on revenues. Indicate the nature and amount of any pending rate relief action(s).

8. Indicate the total estimated cost of the units including nuclear production plant costs; transmission, distribution and general plant costs; and the nuclear fuel inventory cost for the first core.

9. What is the estimated dollar amount that will be payable by the applicant at the date of closing the sale? What is the total estimated dollar amount that the applicant will pay to Southern California Edison after closing the sale and through completion of the unit?