UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
SOUTHERN CALIFORNIA EDISON COMPANY, ET AL.	)	Docket Nos. 50-361 OL 50-362 OL
	)	
(San Onofre Nuclear Generating Station, Units 2 and 3)	)	

SUPPLEMENTAL TESTIMONY OF
ANTHONY THOMAS CARDONE

JUNE 1981

TESTIMONY OF ANTHONY THOMAS CARDONE

Q1. Please state your name and present occupation.

A1. My name is Anthony Thomas Cardone; NRC Staff Geologist in the Geosciences Branch, Division of Engineering, Office of Nuclear Reactor Regulation.

Q2. Please state your educational background and relevant work experience.

A2. I received a B.S. degree in geological engineering from the Colorado School of Mines and an M.S. degree from the University of Utah. I have been employed by the NRC since December 1967 in the area of geological and geotechnical engineering. Presently my primary responsibility is to perform geological evaluations of proposed nuclear plant sites. My qualifications and experience are shown on my attached Professional Qualifications.

Q3. Please describe the scope of your participation in the review of SONGS 2 & 3 for this proceeding.

A3. I began my review of the SONGS 2 & 3 PSAR in June 1970, and wrote the geology sections 3.1.4 and 3.1.4.2 of the Safety Evaluation Report relating to construction of SONGS 2 & 3, which was published on October 20, 1972. My participation in the review of the SONGS 2 & 3 operating license review has been as the geological reviewer. I served in the same capacity for the construction permit review and performed essentially the same function for both licensing reviews. I have coordinated the activities of the Geosciences Branch consultants and advisors on the SONGS 2 & 3 reviews and have

incorporated their contributions into the staff safety review reports. I prepared the geology section 2.5.1 of the operating license safety evaluation report dated February 1981, and presented our conclusions to the Advisory Committee on Reactor Safeguards in February and March, 1981. My review of the SONGS 2 & 3 site consisted of a review of all aspects of the geology and tectonics available in reports submitted to the NRC by the applications and our consultants and advisors and by independent review of pertinent literature. I have considered the range of views presented and have attempted to integrate these views into a Staff position.

Q4. Please summarize your assessment of geology in the region of SONGS 2 & 3.

A4. A report dated July 8, 1975 and entitled "Safety Evaluation of the Geologic Features at the Site of the San Onofre Nuclear Generating Station" presented our evaluation of the investigation by the applicants of several geologic discontinuities revealed in the excavations for the SONGS 2 & 3. These discontinuities referred to as features, A, B, C and D, are minor shear zones or minor faults. Additional investigations made by the applicants since the construction permit which were of discoveries of faulting in the site area and of new seismic activity which occurred near the Cristianitos Fault, were reviewed by the staff. The results of these reviews are reported in Sections 2.5.1.3, 2.5.1.4, 2.5.1.5, 2.5.1.6, and 2.5.1.7 of the Safety Evaluation Report NUREG-0712.

A summary of these conclusions is as follows:

1. The linear shear zones designated as geologic features A and B, which were discovered in the site excavation, were reported to the NRC on June 5, 1974. The minor faults designated as geologic features C and D, also discovered in the site excavation, were reported to the NRC on September 11, 1974. All of these observed features are truncated by the 120,000 year old wave-cut terrace. They are, based on Appendix A to 10 CFR Part 100, non-capable faults, and they therefore do not present a hazard to the SONGS site. (See SER Section 2.5.1.3 and U. S. Nuclear Regulatory Commission, 1975, Safety Evaluation of the Geologic Features at the Site of the San Onofre Nuclear Generating Station).
2. The slip rate vs. magnitude approach employed by the applicants is acceptable as one of several in a balanced multi-approach to the determination of the maximum earthquake magnitude for SONGS. We concur that the MEL line, which envelopes the lowest slip rate ranges and the maximum magnitude ranges of all the data points plotted in this relationship, represents a conservative estimate of the maximum magnitude of future earthquakes on the OZD (See section 2.51.10 and Appendix E to the SER).
3. Legg and Kennedy in their report, "Faulting Offshore San Diego and Northern Baja California" have implied a possible connection between the OZD and the Vallecitos San Miguel fault zone. The staff's and Dr. Slemmons' interpretations are that the OZD and Vallecitos-San Miguel fault zones are not continuous.

4. Legg and Kennedy have also implied a possible connection between the OZD and the Agua Blanca fault zone in Baja California. In the opinion of the staff some of the high activity on the Agua Blanca fault zone, characterized by a slip rate of 2.7 mm/yr and prominent geomorphic features compared to 0.5 mm/yr and moderate geomorphic features on the OZD, may be indirectly distributed to the OZD as a branch or conjugate fault to the Coronado Banks fault. The staff is of the opinion that the OZD may be a branch of the Coronado Banks fault zone and may ultimately connect with the Agua Blanca fault zone, but is of a lower order of tectonic activity.

5. Based on considerable evidence discussed in the SER, we conclude that the Cristianitos fault and the CZD are non-capable. Furthermore, it has been amply demonstrated that the CZD is non-capable even assuming a structural relationship between it and the OZD, based on the definition of a capable fault in Appendix A, 10 CFR Part 100. Appendix A states that in the case of a fault having a structural relationship to a known capable fault, the fault is considered capable if movement on the capable fault could be reasonably expected to be accompanied by movement on the fault in question. Movement on the OZD for at least the past 120,000 years has not been accompanied by movement on the CZD, therefore, we conclude the CZD is noncapable.

6. The 1978 report on a study by R. Shlemon entitled, Late Quaternary Rates of Deformation, Laguna Beach - San Onofre Beach, Orange and San Diego Counties, California, provides comparative rates of Late Quaternary uplift along the coastal area of southern California. Based on these comparative rates, the San Onofre region is viewed as being one of the most tectonically stable coastal areas of southern California.

Based on the above studies and conclusions, it is our position that the OZD is the controlling geologic structure in the site region.