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K. P. BASKIN
MANAGER OF NUCLEAR ENGINEERING, SAFETY, AND LICENSING

TELEPHONE
(213) 572-1401

December 31, 1981

Mr. Darrell G. Eisenhut
Director
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20014

Subject: Transmittal of CEN-189, "Evaluation of Pressurized Thermal Shock Effects Due to Small Break LOCA's with Loss of Feedwater for the Combustion Engineering NSSS," December, 1981

References: (A) NUREG-0737, "Clarification of TMI Action Plan Requirements," November, 1980.

(B) Letter from K.P. Baskin, C-E Owners Group, to H.R. Denton, NRC, "Communications Between the Combustion Engineering Owners Group and the Nuclear Regulatory Commission," dated December 2, 1980.

Dear Mr. Eisenhut:

The purpose of this letter is to transmit to you report CEN-189. This report was prepared by Combustion Engineering for the C-E Owners Group in response to NRC TMI Action Plan Requirement II.K.2.13 as clarified in Reference A.

This transmittal by the C-E Owners Group is made in order to assist you and the C-E Owners Group members in reaching resolution of requirement II.K.2.13. The transmittal is made according to the terms stated in Reference (B), a copy of which is attached for your convenience. In particular, this submittal is not applicable to any individual licensee or license applicant until the submittal is referenced by that licensee or license applicant for use in his docket. Please send copies of any correspondence concerning this submittal to individuals identified in the attached list.

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A046 S15 3 cys Advanced To Guy Vissing

The enclosed report addresses the subject of pressurized thermal shock of reactor vessels in Combustion Engineering designed Nuclear Steam Supply Systems during recovery from a small break loss of coolant accident with extended loss of feedwater. The main body of the report describes the analysis methods employed and provides results of generic analyses. Individual appendicies of the report address specific plants as indicated in the appendix titles. Please note that two different approaches were used to specify materials properties for the fracture mechanics evaluations. For some plants detailed spacial distributions of these properties were used; for other plants bounding values were used. The principal conclusion from all analyses is that each of the plants analyzed can safely withstand a small break loss of coolant accident with extended loss of feedwater for the assumed design life of the plant without crack initiation.

We would be glad to meet with you and your staff to resolve any remaining concerns on this issue should you desire. If I can be of further assistance to you on this matter, please feel free to contact me at 213-572-1401.

Very truly yours,

M. D. Medford
for K. P. BASKIN

Chairman
C-E Owners Group

Enclosure: CEN-189, "Evaluation of Pressurized Thermal Shock Effects Due to Small Break LOCA's with Loss of Feedwater for the Combustion Engineering NSSS, December, 1981"(Five copies are included. An additional 35 copies will be sent separately.)

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December 2, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Communications Between the Combustion Engineering Owners Group and the Nuclear Regulatory Commission

Dear Mr. Denton:

The Combustion Engineering Owners Group has requested that I advise you of its recently established policy regarding the subject communications. This policy will assist in reducing the uncertainty in determining the communicants on issues and thereby improve the effectiveness of all parties concerned.

Submittals made by the C-E Owners Group to the NRC will not be applicable to any individual licensee until the submittal is referenced by that licensee for use on his docket. Should the NRC have questions within the scope of any C-E Owners Group submittal, they should be addressed to the Owners Group Chairman with copies to the appropriate Owners Group Subcommittee Chairman, C-E and each Owners Group member. The individuals to whom copies should be addressed will be identified with each future Owners Group submittal.

Questions from the NRC on issues beyond the scope of previous submittals made by the C-E Owners Group should be addressed only to the individual licensees. The licensees will then consider the extent of the C-E Owners Group involvement, if any, in an appropriate response.

The C-E Owners Group feels that this communication policy serves the best interests of the Owners Group, individual licensees, and the NRC.

8012160503

If you or your Staff have any questions concerning this topic, please contact me.

Very truly yours,

KPB

K. P. Baskin
Chairman
C-E Owners Group

jkb
cc: D. G. Eisenhut
R. H. Vollmer
D. F. Ross
S. S. Hanauer
F. Schroeder

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MEMORANDUM FOR: Darrell G. Eisenhut, Director
Division of Licensing, NRR

FROM: Richard H. Vollmer, Director
Division of Engineering, NRR

SUBJECT: TRANSMITTAL OF REPORT ENTITLED "REVIEW OF PHIFER ALLEGED FAULTS"

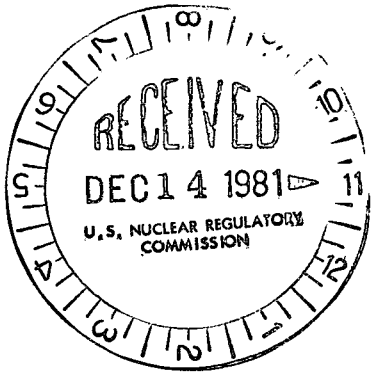
Attached is the staff's review of the October 8, 1981 letter from David Phifer to NRC and the applicant's evaluation (dated November 25, 1981) as requested by the staff. The report of Phifer was the subject of a Board Notification by R. L. Tedesco on November 19, 1981. This review was conducted by Tom Cardone of the Geosciences Branch and concludes that on the basis of Mr. Phifer's letter and the applicant's evaluation, the conclusions reached in the Safety Evaluation Report remain valid.

We suggest that the staff review (Attachment 1) and the applicant's evaluation (Attachment 2) be forwarded to the Board.

Original signed by:
Richard H. Vollmer

Richard H. Vollmer, Director
Division of Engineering

Attachments:
As stated



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OFFICE	DE:GSB	DE:GSE	DE:GSB	DE:AD:C&SE	DE:D		
SURNAME	ATCardone:sl	CBrocoum	REJackson	JPKnight	RHVollmer		
DATE	12/4/81	12/4/81	12/4/81	12/7/81	12/9/81		

Review of Phifer's Alleged Faults
San Onofre 2 & 3
December 5, 1981

The staff has reviewed Mr. David Phifer's letter to NRC dated October 8, 1981 and the applicants evaluation of this letter made at our request which is entitled "Report on the 'Aliso Canyon Fault' and the Alleged 'Mountain Top Fault Zone', Camp Pendleton, California, November 25, 1981." The staff did not attend the September 19, 1981 field trip. For the sake of clarification, the staff was not invited to attend the September field trip by Mr. Phifer or anyone else, and contrary to Mr. Phifer's comment on page 3 in his October letter, the staff did not agree with the conclusions he expressed on the July 17, 1981 field trip.

In his letter Mr. Phifer listed 11 zones of deformation observed or inferred by him based on his geologic interpretations. They are:

- Cristianitos
- Rose Canyon/Newport Inglewood
- Offshore Zone of Deformation (OZD)
- San Onofre Mountain
- Horno Summit
- Mateo Canyon
- San Onofre Canyon
- Horno Canyon
- Pulgas Canyon/Piedre de Lumbre Canyon
- Aliso Canyon
- Mountain Top

As stated by Mr. Phifer the first three zones have been evaluated in detail and are well documented in the NRC staff's Safety Evaluation Report and in testimony given at the seismic safety hearing.

The fourth through the ninth zones listed were evaluated by the applicant and staff at the time of the safety hearing. As stated by the staff at that time, we agreed with the applicant's findings and conclusions that the fourth through ninth zones of deformation as postulated by Mr. Phifer either do not exist, or are minor faults and therefore not significant to the San Onofre site in the context of 10 CFR Part 100, Appendix A.

The remaining Aliso Canyon and Mountain Top zones of deformation are addressed in detail in the applicant's evaluation report of November 25, 1981. The applicant concluded:

1. If the Aliso Canyon fault zone exists, it is over 9 miles southeast of the site. Since the OZD is 5 miles from the site, it controls the seismic design. Therefore, the Aliso Canyon fault zone is of no significance to the safety or seismic design of San Onofre Nuclear Station.
2. They find no evidence for Mr. Phifer's Mountain Top Fault Zone. The alleged structure is not supported by the geologic evidence and is considered speculation.

We have reviewed the applicant's evaluation and agree that the alleged Aliso Canyon fault is at a greater distance from the site than the OZD and, therefore, it is of no seismic significance to the San Onofre site. With regard to the applicant's second conclusion, the staff did not attend the September 19th field trip to visit the area of Mr. Phifer's Mountain Top Fault Zone. However, based on our confidence in the mapping and interpretations of this area contained in earlier reports of investigations by Messrs. Ehlig, Shlemon, and West, we also find that the conclusion presented on this fault is reasonable.

In view of the above, we find no reason to change the conclusions reached in our Safety Evaluation Report.

REPORT ON THE "ALISO CANYON FAULT" AND THE ALLEGED "MOUNTAIN TOP FAULT ZONE" CAMP PENDLETON, CALIFORNIA

November 25, 1981

SOUTHERN CALIFORNIA EDISON COMPANY AND
SAN DIEGO GAS AND ELECTRIC COMPANY

During the Atomic Safety Licensing Board hearings for San Onofre Nuclear Generating Station Units 2&3, Mr. D. W. Phifer, a retired Marine Corp Colonel, identified what he believed to be six previously undisclosed geologic structures that he alleged were new and could influence the seismic safety of the plant. The Applicants examined his features with Mr. Phifer and then in the field independently and later again with Mr. Phifer and the NRC staff. Documentation in "Report on Limited Appearance of Mr. D. W. Phifer and Alleged Geologic Features" dated July 29, 1981, was then prepared by the Applicants and it discussed in detail each of his alleged new geologic discoveries.

The features discussed and the conclusions reached are:

- "Horno Summit Fault" pp. 4-15
  - Mr. Phifer's suggestion of as much as 20 miles of right lateral displacement is speculative and is contrary to the fact that bedrock formations and contacts are continuous across the hypothesized trend of the fault. It is Applicants opinion that the fault does not exist.
- "Horno Canyon Fault" pp. 16, 17
  - Marine Terraces at elevation 325 project across the fault at Horno Canyon without offset. This surface is 300,000 years old and any fault would be that age or older and not be capable.
- "San Onofre Mountain Fault" pp. 17, 18
  - The inferred "San Onofre Mountain Fault" is not a tectonic feature; but rather a collection of geomorphic and sedimentary feature mis-identified as a fault.
- "Piedre de Lumbre/Las Pulgas Canyon Fault" pp. 15, 16
  - Sediments deposited between these two canyons were layed down as fluvial sediments on a Pleistocene floodplain that is lower in elevation than the adjacent marine terraces. The lower elevation of the fluvial sediments represents a depositional sequence, not faulting.

- o "Mateo Canyon Fault" pp. 19-21
  - Paired fluvial terrace surfaces can be matched across San Mateo Canyon and the age of these terraces are judged to be 100,000 years old. Thus any faulting, if present, would be at least that old.
- o "San Onofre Canyon Fault"
  - Vertical offset of 20 feet is unsubstantiated. Stream cutting across resistant San Onofre breccia and eroding soft strata of the Monterey Formation is a normal erosional process and doesn't require faulting to achieve an offset.

The report concludes that these "are not capable faults" and have no significance relative to the seismic design of the San Onofre Units. Further, Mr. T. Cardone, of the NRC Staff in the response to reviewing the field evidence and the Applicants report on the alleged features states that "...I don't see anything in Mr. Phifer's postulated faults or presentation that poses a hazard to the site..." and that he agrees with the evidence and interpretation by the Applicants (Cardone, Tr. 6024:6-18).

On August 17, 1981, Mr. Phifer forwarded to Edison a draft of a letter and supporting maps and photographs he proposed sending to the Nuclear Regulatory Commission. This information was essentially the same as that submitted to the Commission on October 8, 1981. Contrary to the comment by Mr. Phifer on pg. 3, Mr. McNey and Dr. Ehlig were not in agreement with his conclusions regarding the July 17, 1981 field trip. In addition to the features discussed in the limited appearance report described above, Mr. Phifer identified:

- o Cristianitos Fault
- o Offshore Zone of Deformation

- Rose Canyon/Newport Inglewood (Fault Zones) which have been analyzed by the Applicants in detail as apart of the licensing proceedings. The Cristianitos fault is not capable, the offshore Zone of Deformation is 5 miles west of the site and the Rose Canyon/Newport Inglewood (Fault Zones) are the south and north ends of the offshore Zone of Deformation. Mr. Phifer agreed on page 5 of his October letter they have been studied.

New concerns raised in the letter of October 8, 1981 were:

- "Mountain Top Fault Zone"

- "Aliso Canyon Fault"

These latter two features are discussed in subsequent paragraphs of this report.

A field trip was then hosted by Mr. Phifer on September 19, 1981 and several members of the geologic community as well as consulting firms were invited.

Attendees were:

Mr. Larry Carlson, USMC Natural Resources Office
Mr. M. W. Hart, Geocon Consulting Engineers and Geologists
Mr. G. T. Farrand, Geocon Consulting Engineers and Geologists
Mr. A. E. Farcas, Geocon Consulting Engineers and Geologists

Mr. D. W. Phifer, Coastal and Nearshore Consultant

Mr. J. L. McNey, Southern California Edison

Dr. P. L. Ehlig, Consultant

The trip included revisiting those locations identified in the limited appearance report. They were:

- Vandergrift Boulevard landslide
- Piedre de Lumbre/Las Pulgas Canyon fluvial sediments
- Las Pulgas Ammo Dump area of the Horno Summit Fault
- Horno Summit Ridge
- Rifle Range 214 Fault

and

- Fault F location
- San Onofre Mountain
- Horno Canyon landslide at the beach.

The latter three stops were to observe features of the alleged "Mountain Top Fault Zone." While visiting the stops along the "Mountain Top Fault Zone", origin of the tuff bed, minor faulting and conditions leading to the development of the landslide at the mouth of Horno Canyon were described in detail by the Applicants. Dr. Ehlig and Mr. McNey believe that the interpretation of the geology is in error and without technical merit. The Aliso Canyon Fault was not visited.

"Mountain Top Fault Zone"

As described by Mr. Phifer on page 3 of his October 8, 1981, letter to the NRC, the "Mountain Top Fault Zone" (MTFZ) which trends NE-SW, is longer than 3 miles, has a vertical displacement of greater than 600 feet with the east side up, and a width of about 1 1/2 miles. The map signed by David Phifer and dated August 14, 1981 accompanying the subject letter shows the MTFZ bounded by two nearly north-south trending faults. All of the eastern fault and most of the western fault are portrayed on the map by dashed lines which indicates the faults are inferred according to the map legend. Between the bounding faults, the map shows seven short faults with trends ranging from about north 30 degrees west to north 15 degrees east. In pages 4-5 and 4-6 of Enclosure 1, accompnaying the subject letter, Mr. Phifer provides additional information on his MTFZ.

The central part of the fault bounding Mr. Phifer's MTFZ is the same as the F fault which is described along with the E fault (Ehlig, Written Testimony, Contention #3, pp. 1-4; Tr. 2898-2905). The F fault is exposed in a quarry on the northeast side of the old Coast Highway. Here the fault is a discrete nearly planar feature with a strike of about north 15 degrees west and an average dip of 78 degrees to the west. The age of the fault is imprecisely known, but it cuts rocks 14 to 15 million years old and shows no evidence of cutting the coastal terrace. The fault is most likely 4 to 10 million years old. The unconformity (erosional surface) separating the base of the Monterey Formation from the underlying San Onofre breccia is about 25 feet lower in elevation on the west side of the fault than on the east side. Striations produced by fault movement occur in more than one direction on the fault

surface but steeply inclined striations predominate suggesting movement was primarily down the dip of the fault. The age of this fault is uncertain but it was most likely active sometime between ten million years ago and four million years ago based on regional tectonic relationships (Written Testimony, Contention #3, Ehlig, p. 3:21-26; and p. 4:1-2).

The fault shown on the east side of the MTFZ by Mr. Phifer appears to be conjectural. The Applicants know of no mappable faults along the alignment shown on his map. Where his inferred fault crosses the mouth of Horno Canyon, two marine terraces project directly across the canyon with shoreline angles at about 275 feet and 325 feet above sea level. Based on association with the marine isotope chronology (Shlemon, 1978) the 325 foot platform is at least 300,000 years old. Thus, if any fault were present it would be that age or older, and it would not be considered capable according to 10CFR100 Appendix A. On page 4-5 of Enclosure 1 accompanying his letter to the NRC, Mr. Phifer presents reasons for believing significant faulting has occurred within his MTFZ. His principal reasons include:

1. The presence of a tuff bed at an elevation of about 800 feet southwest of San Onofre Mountain which he believes is similar to tuff at an elevation of about 200 feet near the mouth of Horno Canyon.

2. Marine Terraces Qt2, Qt3 and Qt4 (Phifer designations) are continuous across his MTFZ but end abruptly near fault F.

3. There is a zone of extensive landslides along the coastal projection of his MTFZ.

4. Capistrano Formation is exposed at similar elevations as younger San Mateo Formation along the coastal projection of his MTFZ.

5. Offshore bathymetry at depths of 30 and 60 feet appears displaced.

In regard to the tuff bed, it is Applicants' understanding that Mr. Phifer is suggesting that a tuffaceous bed in the San Onofre breccia exposed at an elevation of about 920 feet in the cut along San Onofre Peak trail correlates with a tuff bed which crops out in the breccia a few hundred feet northeast of the old Coast Highway in the area extending from 1/2 miles northwest of Horno Canyon to 2 miles southeast of Horno Canyon. The latter tuff contains pumice lapilli indicating a nearby source and is about 15 feet thick whereas the tuff on San Onofre Mountain is fine-grained and only a few feet thick. The Applicants find no basis for correlating the two tuff beds. Fine-grained tuff beds have a scattered occurrence within the San Onofre breccia. They indicate volcanism was active in the region simultaneous with deposition of the San Onofre breccia.

Mr. Phifer is correct in noting that remnants of marine terraces are aligned across his MTFZ from Horno Canyon to near fault F. There are four terraces in this area, not three as indicated by Mr. Phifer. They have shoreline angles at elevations of about 275, 325, 375 and 450 feet. Terraces are present northwest of fault F and have shoreline angle elevations correlative with those to the southeast of fault F; however, the degree of terrace preservation is less because the area was a headland. The Applicants have observed nothing which would indicate the terraces are offset by faulting.

The extensive landslides along the coast are rotational failures which have occurred where wave erosion has removed lateral support from clay-rich beds in the seaward dipping Monterey Formation. Terrace deposits resting on the Monterey Formation have been extensively deformed within these landslides. However, no deformation or faulting is visible in the in-place terrace deposits exposed in scarps on the landward side of the landslides. The landslides such as that exposed at Horno Canyon are controlled by the lithology and seaward dip of the Monterey Formation and are not a manifestation of a deeper seated deformation as suggested by Mr. Phifer.

Mr. Phifer's suggestion that both the Capistrano and San Mateo Formations are exposed where his MTFZ projects to the coast is based on the mapping of Moyle (1973). Dating by microfossils demonstrates that the Monterey Formation constitutes bedrock beneath the terrace deposits along the entire coast from the Cristianitos Fault to Las Pulgas Canyon (Ehlig, 1977). The exposed part of the Monterey Formation includes lithologies similar to parts of the Capistrano Formation and the San Mateo Formation which is a submarine fan facies of the Capistrano Formation (Ehlig, 1979).

Contrary to Mr. Phifer's belief, the Applicants see no evidence suggesting displacement of offshore bathymetry at depths of 30 and 60 feet.

In conclusion, the Applicants find no evidence for Mr. Phifer's Mountain Top Fault Zone. The F fault which forms the west side of the hypothesized zone was previously mapped and reported. The eastern boundary fault appears to be hypothetical. We find no evidence indicating a through going fault along the

trend shown on Mr. Phifer's map. In particular, the contact between the San Onofre breccia and underlying Eocene sandstone appears to be undisplaced where Mr. Phifer places his inferred fault on the northeast side of San Onofre Mountain. As indicated by Mr. Phifer, minor faults are locally present within the San Onofre breccia; however, the Applicants attribute this to the massive, brittle nature of the breccia and not to the presence of a zone of faulting. We agree with Mr. Phifer's observation that a group of marine terraces remnants extend across his hypothesized Mountain Top Fault Zone in an undisturbed alignment. Because the older terraces are at least 300,000 years old, we find no evidence to support the contention that there are capable faults within the hypothesized Mountain Top Fault Zone nor does the MTFZ intersect the Horno Canyon Fault to form a deformed zone expressed by landsliding. Thus, the alleged structure is not supported by the geologic evidence and is considered speculation.

Aliso Canyon Fault

The feature described as the "Aliso Canyon Fault" by Mr. Phifer has been analyzed by the Applicants using geomorphic expression of the marine terraces and drainage and inspecting aerial photographs. This fault is shown on his map accompanying the October 8, 1981 letter, and shows a dashed line and querries representing an inferred or questionable fault for essentially the length of the feature. Access to Aliso Canyon is limited due to military activities and because the north-east portion is within a Camp Pendleton firing range. The Applicants analysis of the feature determined that marine terrace break-in-slope at the 300, 400 and 500 ft. contours project across Aliso Canyon without deflection. Remnant marine terrace surfaces between

elevation 460 and 520 are about 1,000 feet wide occur east and west of Aliso Canyon, projecting across with no discernable vertical or horizontal separation. The continuity of topographic expression along trend of the terrace break-on-slope surface and the presence of accordant elevations in the uniform soils argues for no major structural deformation since the terrace formation. Terrace surfaces at this elevation north of Las Pulgas were developed over 400,000 years ago (Shlemon, 1978, Figure 12). If the same relationship holds at this location, any faulting along Aliso Canyon would be older.

The Applicants find no evidence for offset bathymetry contours on the offshore axis of Aliso Canyon.

Aliso Canyon is over 9 miles southeast of the site and trends about N40E. If a fault is present, the orientation will not intersect the arc of the 5 mile radius from the site and lies at least 4 miles beyond such a boundary. Geomorphic evidence for significant deformation is absent and even if faulting were present, the Offshore Zone of Deformation 5 miles from the site controls the seismic design. The "Aliso Canyon Fault", if present has no significance to the safety or seimic design of San Onofre Nuclear Generating Station.

The Applicants are not aware of any other geologic disclosures since conclusion of the Atomic Safety and Licensing Board hearings on August 4, 1981.

JLMcNey:npm

DEC 8 1981

Docket Nos.: 50-361/362

MEMORANDUM FOR: The Atomic Safety and Licensing Board for the San Onofre Nuclear Generating Station, Units 2 and 3

FROM: Robert L. Tedesco, Assistant Director for Licensing, DL

SUBJECT: BOARD NOTIFICATION - RECENT SEISMIC ACTIVITY - LOW POWER OPERATION, SAN ONOFRE UNITS 2 AND 3 (Board Notification 81-45)

On Thursday, November 19, 1981 the NRC staff issued Board Notification 81-43 which provided information on a notification by Southern California Edison (SCE) of a recent swarm of small seismic events near the San Onofre site, and stated that SCE was preparing a report for the NRC staff which would be forwarded to the Board when it is received.

By letter dated November 30, 1981, SCE submitted a supplemental report, in question and answer format, on the earthquake swarm. Also included with the November 30, 1981 letter was a report relating to information presented by Mr. David W. Phifer. This report was mentioned in Board Notification 81-42, issued on November 19, 1981.

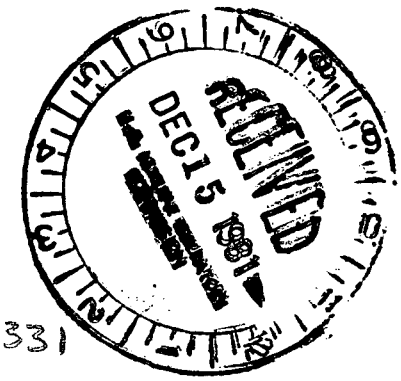
Because they relate to issues discussed in previous Board notifications, the above-mentioned reports are being forwarded for the Board's information.

Robert L. Tedesco, Assistant Director
for Licensing
Division of Licensing

Enclosures:
1. SCE report dated November 18, 1981.
2. SCE report dated November 30, 1981.

cc: See attached lists.

Contact:
H. Rood
X28427



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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 8 1981

Docket Nos.: 50-361/362

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FROM: Robert L. Tedesco, Assistant Director for Licensing, DL

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Because they relate to issues discussed in previous Board notifications, the above-mentioned reports are being forwarded for the Board's information.

Elinor G. Adensam for

Robert L. Tedesco, Assistant Director
for Licensing
Division of Licensing

Enclosures:
1. SCE report dated November 18, 1981.
2. SCE report dated November 30, 1981.

cc: See attached lists.

Contact:
H. Rood
X28427

DISTRIBUTION OF BOARD NOTIFICATION

San Onofre

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SAN ONOFRE UNITS 2 & 3 (BN-81-45)

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