

10. Lockheed Center for Marine Research (LCMR). 1978. San Onofre Nuclear Generating Station Unit 1, Environmental Technical Specifications, Annual Operating Report, Volume III - Biological Data Analysis - 1977. Prepared for Southern California Edison Company, 125 p.
11. Marine Biological Consultants, Inc., 1978. Construction Monitoring Program, San Onofre Nuclear Generating Station, Units 2 and 3, December, 1976- December, 1977. Prepared for Southern California Edison Company, 78RD-21. n.p.
12. North, W. J., 1960. The effects of waste discharges on kelp. University of California Inst. Mar. Res., IMR Ref. 60-4:1-44.
13. North, W. J., 1976. Introducing warm tolerant Macrocyctis to the vicinity of a thermal discharge. Summary report of the 1975 activities. 64 p.
14. North, W. J. and C. L. Hubbs, 1968. Utilization of kelp-bed resources in Southern California. California Department of Fish and Game, Fish Bull. (139):1-264.
15. Phillips, R. C., 1974. Kelp beds in : Coastal ecological systems of the United States. The Conservation Foundation, Washington, D.C., Volume II, pp. 442-487.
16. Scripps Institute of Oceanography (SIO), 1978a. Surface water temperatures at shore stations - U.S. West Coast, 1977-1976. SIO Ref. 78-5. 77 p.
17. Scripps Institute of Oceanography (SIO), 1978b. Surface water temperatures at shore stations - U.S. West Coast, 1977. SIO Ref. 78-16. 45 p.
18. North, W. J., 1958. The effects of waste discharge on kelp. University of California Inst. Mar. Res., IMR Ref. 59-1:1-27.
19. Southern California Edison Company, "Biennial Forecast of Electric Loads and Resources Report," March 17, 1976.
20. Southern California Edison Company, "Revised Resource Plan submitted to Energy Commission," September 22, 1976.
21. North, W. J., January 25, 1979, letter to Mr. T. Sciarrotta, Southern California Edison Company.
22. Brown and Caldwell, 1977. San Onofre Nuclear Generating Station Unit 1, Environmental Technical Specifications, Annual Operating Report, Volume 1. Oceanography Data Summary-1976.
23. Brown and Caldwell, 1978. San Onofre Nuclear Generating Station Unit 1, Environmental Technical Specifications, Annual Operating Report, Volume 1. Oceanographic Data Analysis-1977.
24. Brown and Caldwell, 1977. San Onofre Nuclear Generating Station, Unit 1, Environmental Technical Specifications, Annual Operating Report, Volume III. Oceanographic Data Analysis-1976.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX
215 Fremont Street
San Francisco, Ca. 94105

Project # D-NRC-K06002-CA

William H. Regan, Jr., Chief
Environmental Projects, Branch 2
Division of Site Safety & Environmental
Analysis
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Regan:

FEB 13 1979

The Environmental Protection Agency has received and reviewed the draft environmental statement for the SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 and 3, SOUTHERN CALIFORNIA EDISON COMPANY, SAN DIEGO GAS AND ELECTRIC COMPANY.

EPA's comments on the draft environmental statement have been classified as Category ER-2. Definitions of the categories are provided on the enclosure. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequence of the proposed action and the adequacy of the environmental statement.

EPA appreciates the opportunity to comment on this draft environmental statement and requests three copies of the final environmental statement when available.

If you have any questions regarding our comments, please contact Betty Jankus, EIS Coordinator, at (415)556-6695.

Sincerely,

Charles M. Prindiville

for Paul De Falco, Jr.
Regional Administrator

Enclosure

Water Quality Comments

1. In Section 5.3.1.1., some assessment is made of the effects of the discharge of heated cooling water on the receiving coastal waters with regards to the California State thermal standards. When evaluating thermal discharge, all effects of Units 2 and 3 should be considered in conjunction with the effects of Unit 1. The natural background is a situation where none of the three units is operating. The natural receiving water temperature as defined by California Thermal Plan (see next paragraph) is "the temperature of the receiving water at locations, depths, and times which represent conditions unaffected by any elevated temperature waste discharge". Unless Units 2 and 3 are not planned to operate concurrently with Unit 1, their effects will occur in concert. All modeling, graphs, and maps produced from models should include Unit 1 effects when evaluating SONGS' effects on the receiving water temperature.

Under Section 316(a) of the Federal Water Pollution Control Act of 1972 (FWPCA) and under the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (1975 Thermal Plan) (EPA approved State water quality standards), there are several criteria which discharges to coastal waters must fulfill. These should be addressed in any EIS on operating a new coastal discharge of elevated temperature wastes. These are as follows:

- a. In part 3.B.(3.) of the Thermal Plan, it is stated that "the maximum temperature of thermal waste discharges shall not exceed the natural temperature of receiving waters by more than 20°F." Part 3.2.2. of the DEIS states that the cooling water "experiences an 11.1°C (20°F) temperature rise across the condenser." Since the waters in the vicinity of the intakes for Units 2 and 3 are close to the discharge structures for these units, it is possible that these intake waters are already heated beyond their natural temperature. Some evaluation of this effect must be included in the FEIS. The influence of the heated discharge from Unit 1 must also be described. In addition, the intake

and discharge facilities and their depths and how temperature stratification profiles relate to the 20°F requirement should be discussed.

- b. In Part 3.B.(4) of the Thermal Plan, it is stated that "the discharge of elevated temperature wastes shall not result in increases in the natural water temperature exceeding 4°F at (a) the shoreline, (b) the surface of any ocean substrate, or (c) the ocean surface beyond 1,000 feet from the discharge system. The surface temperature limitation shall be maintained at least 50 percent of the duration of any complete tidal cycle." Figure 5.3 of the DEIS represents projected incremental increases above natural surface temperatures for the study area. This figure should be changed in the FEIS to include the Unit 1 intake and discharge structures and the increase of surface temperatures already caused by Unit 1 discharges in conjunction with those of Units 2 and 3 so as to compare the increases with the true natural surface water temperature.
- c. In addition, the FEIS should document the estimate (Section 5.3.1.2) of the increase in temperatures at the surface of the ocean substrate around the discharges. This estimate indicates that "violations of the state thermal standards are unlikely." Again, such estimates should compare natural temperatures to the combined effects of Units 1, 2, and 3. These temperatures are of special concern because of the importance of low basal temperatures to maintaining the nearby kelp bed.
- d. Finally, the Thermal Plan and Section 316(a) of the FWPCA assert the need to "assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made". In Section 5.4.2.1 of the DEIS, biological/ecological evaluations refer to the effects of the discharges on various types of organisms, indicating the effects to be minimal and acceptable. For plankton, the effects will be "species composition changes" and

"greater respiration rates", also, "significant effects should be localized". For fish, the effects will be mainly "shifts in the types of species (and their numbers) which inhabit the area". For benthic fauna, adverse effects may be expected if "weekly mean temperatures of 22°C prevail for one month or more or where daily temperatures reach or exceed 24°C. It is not, however, anticipated that temperatures averaging 22°C will occur for more than 2 to 3 weeks or that the area experiencing temperatures of 24°C or greater as a result of SONGS operation will be considerably larger than the area experiencing these temperatures under natural conditions". For kelp, the information "suggests that the thermal discharges from SONGS 1, 2 and 3 may result in the destruction of at least a portion of the San Onofre Kelp Bed during the summer months". All of these statements indicate that the indigenous populations will be altered, giving no specific documentation that these effects will be minimal or acceptable. A detailed evaluation of how the aquatic ecosystem will be affected, over what area each species or type of fauna may be influenced, and what constitutes a significant adverse effect should be made and presented clearly in the FEIS.

2. Section 5.4.2.1. Thermal Effects, mentions a final report due on December 29, 1978. This study, provided for under the Thermal Plan and Section 316(a) of the FWPCA, is to be used in evaluating the heat-treatment process which is used to clear the intake facilities of biological growth. EPA considers this study to be an integral part of the assessment of the environmental effects of the thermal discharges from the Units. As such, it must be distributed, along with biological and water quality assessments and conclusions (perhaps in the form of a supplement to the DEIS) to all recipients of this DEIS, with the allowance of a comment period prior to incorporation in the Final EIS.

3. Section 5.4.2.2 includes a discussion of the potential effects of chlorine discharges. The discussion evaluated potential "significant impacts" of the periodic 15-minute chlorine dosing period. The FEIS should include a comparison of effluent concentrations with the State Standards contained in the Water Quality Control Plan for the Ocean Waters of California (1978 Ocean Plan), Table B and Footnote 11, should appear in the EIS. Should the comparison predict that the discharges exceed the requirements, the plans to lower the discharge concentration to agree with the State Standards must be described in the FEIS.
4. No assessment appears in the DEIS of the potential seismic effects of nearby faults on the units, although there is a fault within a mile of the plant (the Christianitos Fault and others in the vicinity). The FEIS should address the potential of seismic events and the resultant damage from fault movement, with particular emphasis on the water quality and off-site radiological contamination.

Radiological Comments

Beach Regulation

This DEIS gives little information on the anticipated beach population. The presence of thousands of daytime beach users and hundreds of overnight campers within 1.5 miles from the reactors has significant security, emergency planning, and radiation dose implications. Consequently, we believe this issue warrants a thorough discussion in the Final EIS so that those reviewers who will not read the Environmental Review and Emergency Plan will be aware of this situation and have an opportunity to evaluate it.

We agree with the decision to restrict usage of the beach in front of the reactors since it will simplify the security and emergency planning problems and will reduce the radiation doses to the population from routine release. However, the practical effectiveness of this restriction should be addressed in the FEIS (e.g., is the prohibition against restricting the area seaward of mean high water, coupled with permitting viewing and pedestrian passage going to make enforcement difficult?).

It would be helpful to briefly mention the Emergency Response Plan that is in effect for the Nuclear Station and relate it to the transient population.

As mentioned under the Dose Commitment section, it is not clear whether beach users and Visitor Center users are included in the individual and population dose calculations.

Environmental Dose Commitments

Page 5-31-34 of the DEIS:

The estimated maximum individual dose and the population dose were independently checked by EPA with results similar to those presented in the DEIS. However, we do have several questions about assumptions used in the DEIS calculations. The FEIS should clarify the following items:

1. The manner in which the individual and population dose to users of the beach is calculated is unclear. For example, what allowance is made for direct radiation doses, especially to those using the walkway between the south and north beaches, and to those at the Visitors Center? Do the individual and population doses include these users of the beach and the Visitors Center and, if so, what assumptions were made on hours of exposure, shielding factors, etc.? Also, it would be helpful if the habits of "a maximum individual" were described so it could be determined to what extent these various pathway dosages are additive.
2. The actual maximum individual dose from present operation of Unit 1 should be described. This dose should be added to those being projected for Units 2 and 3 (from all pathways). This, in turn, should be compared with the 25 millirem per year limit (75 millirem per year to the thyroid) of the Uranium Fuel Cycle Standard (40 CFR 190).

EPA is encouraged that the NRC is now calculating annual population dose commitments to the U.S. population, which is a partial evaluation of the total potential environmental dose commitments (EDC) of H-3, Kr-85, C-14; iodines and "particulates." This is a big step toward evaluating the EDC which EPA has urged for several years. However, it should be recognized that several of these radionuclides (particularly C-14 and Kr-85) will contribute to long-term population dose impacts on a world-wide basis, rather than just in the U.S. To the extent that the draft statement (1) has limited the EDC to the annual discharge of these radionuclides, (2) is based on the assumption of a population of constant size, and (3) assesses the doses during 50 years only following each release, it does not fully provide the total environmental impact. Assessment of the total impact would (1) incorporate the projected releases over the lifetime of the facility (rather than just the annual release), (2) extend to several half-lives or 100 years beyond the period of release, and (3) consider, at least qualitatively or generically, the world-wide influences on the total environmental impact or specify the limitations of the model used.

Environmental Monitoring

The pre-operational and operational radiological environmental monitoring program (as described in Section 6.1.5 of the Environmental Report) appears adequate with the following exceptions which the FEIS should address:

1. A delay of 8 days before analyzing charcoal filter air samples would permit over 99% of the Iodine-133 and 50% of the Iodine-131 to decay before being counted. The decay would be much greater for contamination occurring at the beginning of the 7-day sampling period. The maximum time before analyzing filters should be shortened significantly in order to detect as many incidences of sporadic contamination as possible.
2. It is not clear why a minimum of only ten 7-day air particulate samples are required per quarter. The intent should be to monitor all 13 weeks in a quarter.
3. No TLD stations are indicated for the walkway along the seawall or the mean high water exclusion area in front of the reactors. It would be desirable to include TLD's at these locations to monitor the direct radiation at a site boundary where the public has access.

Reactor Accidents

The EPA has examined the NRC's analyses of accidents and their potential risks. The analyses were developed by NRC in the course of its engineering evaluation of reactor safety in the design of nuclear plants. Since these issues are common to all nuclear plants of a given type, EPA accepts NRC's generic approach to accident evaluation in the DEIS. However, the NRC is expected to continue to ensure safety through plant design and accident analyses during the licensing process on a case-by-case basis.

In 1972, the AEC initiated an effort to examine reactor safety and the resultant environmental consequences and risks on a more quantitative basis. The final report of this effort was issued in October 1975 by the U.S. Nuclear Regulatory Commission as the Reactor Safety Study, WASH-1400 (NUREG-75/014). The EPA's review of this study

included in-house and contractual efforts, and our comments were released in a report in June, 1976. In subsequent discussion with NRC we determined that of the concerns we expressed, those having the most significance with regard to the results of the study were on (1) the latent cancer health effects and (2) the probability of BWR scram failure where we differed by factors of four and a maximum of ten, respectively. We believe that the methodology of the Reactor Safety Study should continue to be used as a tool in the evaluation of nuclear systems that vary from the models chosen for the study, and that a generic analysis should be made of the acceptability of the present risks and the necessity for increased levels of safety.

High-Level Waste Management

The techniques and procedures used to manage high-level radioactive wastes will have an impact on the environment. To a certain extent, these impacts can be directly related to the individual projects because the spent fuel from each new facility will contribute to the total waste. The AEC, on September 10, 1974, issued for comment a draft statement entitled "The Management of Commercial High-Level and Transuranium-Contaminated Radioactive Waste" (WASH-1539). In this regard, EPA provided extensive comments on WASH-1539 on November 21, 1974. Our major criticism was that the draft statement lacked a program for arriving at a satisfactory method of "ultimate" high-level waste disposal. At present, DOE is preparing a new draft statement which will discuss waste management and emphasize ultimate disposal in a more comprehensive manner. EPA concurs with this decision and will review and comment on the new draft statement replacing the September 10, 1974 version when it is available.

EPA is cooperating with both NRC and DOE to develop an environmentally acceptable program for radioactive waste management. In this regard, on November 15, 1978, EPA issued proposed environmental radiation protection criteria (43 FR 53262) for the management of all radioactive waste and will propose environmental radiation protection standards for high-level waste in 1979.

Transportation

In its earlier reviews of the environmental impacts of transportation of radioactive material, EPA agreed with AEC that many aspects of this program could best be treated on a generic basis. The NRC has codified this generic approach (40 FR 1005) by adding a table to its regulations (10 CFR Part 51) which summarizes the environmental impacts resulting from the routine transportation of radioactive materials to and from light-water reactors. These regulations permit the use of the impact values listed in the table in lieu of assessing the transportation impact for individual reactor licensing actions if certain conditions are met. Since San Onofre appears to meet these conditions and since EPA agrees that the routine transportation impact values in the table are reasonable, the generic approach appears adequate for this plant.

The impact value for routine transportation of radioactive materials has been set at a level which covers 90 percent of the reactors currently operating or under construction. However, the basis for the impact, or risk, of transportation accidents is not as clearly defined. At present, EPA, DOE, and NRC are each attempting to more fully assess the radiological impact of transportation risks. The EPA will make known its views on any environmentally unacceptable conditions related to transportation. On the basis of present information, EPA believes there are no unique characteristics of the San Onofre site which would result in greater accident risks than from the "typical" site being studied generically.

Fuel Cycle and Long-Term Dose Assessments

EPA is responsible for establishing generally applicable environmental radiation protection standards to limit unnecessary radiation exposures and radioactive materials in the general environment resulting from normal operations that are part of the total uranium fuel cycle as well as those of the facilities. The EPA has concluded (in 40 CFR 90) that environmental radiation standards for nuclear power industry operations should take into account the total radiation dose to the population, the maximum individual dose, the risk of health effects attributable to these doses (including the future risks arising from the release of long-lived radionuclides to the environment), and the effectiveness and costs of effluent

control technology. EPA's Uranium Fuel Cycle Standards are expressed in terms of dose limits to individual members of the general public and limits on quantities of certain long-lived radioactive materials released to the general environment.

A document entitled "Environmental Survey of the Uranium Fuel Cycle" (WASH-1248) was issued by the AEC in conjunction with a regulation (10 CFR 50, Appendix D) for application in completing the cost-benefit analysis for individual light-water reactor environmental reviews (39 FR 14188). This document is used by NRC in draft environmental statements to assess the incremental environmental impacts that can be attributed to fuel cycle components which support nuclear power plants.

Recently, the NRC decided to update the WASH-1248 survey. We believe this is a prudent step and commend the NRC on initiating this update. In providing comments to the NRC on this subject, dated November 14, 1978, we encouraged NRC to express environmental impacts in terms of potential consequences to human health, since for radioactive materials and ionizing radiation the most important impacts are those ultimately affecting human health. We believe the presentation of environmental impact in terms of human health impact fosters a better understanding of the radiation protection afforded the public.

A second major concern of EPA deals with the discharge and dispersal of long-lived radionuclides into the general environment. In the areas addressed in WASH-1248, there are several cases in which radioactive materials of long persistence are released into the environment. The resulting consequences may extend over many generations and constitute irreversible public health commitments. This long-term potential impact should be considered in any assessment on health impact. EPA has consistently found inadequate the NRC's estimates of population doses for these persistent radioactive materials. In particular, the NRC has generally limited their analysis to the population within 50 miles of a facility or, in rare cases, to the U.S. population, and to doses committed for a 50-year period by an annual release. These limitations produce incomplete estimates of environmental impacts and underestimate the impact in some cases, such as from releases of tritium, Krypton-85, Carbon-14, Technetium-99, and Iodine-129. The total impact of these

persistent radionuclides should be assessed, qualifying such estimates as appropriate to reflect the large uncertainties. In this regard, we note that NEA is addressing this approach in making assessments and that NRC is represented in this effort.

Another major consideration in updating WASH-1248 is the health impact from Radon-222 from the uranium mining and milling industry. Estimates made by EPA, among others, indicate that Radon-222 contributes the greatest fraction of the total health impact from nuclear power generation. In preparing an updated WASH-1248, we believe NRC should:

1. include the Radon-222 contribution from both the uranium mining and milling industries;
2. determine the health impact to larger populations, not only the local populations;
3. recognize the persistent nature of the Radon-222 precursors (Th-230 and Ra-226) by estimating the health impact for a period reflecting multi-generation times.

Decommissioning

The NRC has published a proposed rulemaking on Decommissioning Criteria for Nuclear Facilities in the Federal Register on March 13, 1978. EPA comments were sent to NRC on July 5, 1978, dealing with the decommissioning issue.

In summary, we believe that one of the most important issues in the decommissioning of nuclear facilities is the development of standards for radiation exposure limits for materials, facilities, and sites to be released for unrestricted use. We have included the development of such standards among our planned projects. The work will require a thorough study to provide necessary information, including a cost-effectiveness analysis for various levels of decontamination.

The development of standards for decommissioning must, of course, include consideration of the many concurrent activities in radioactive waste management and radiological protection. EPA has developed proposed Criteria for Radioactive Waste for management of all

radioactive wastes which will provide guidance for decommissioning standards. From the decommissioning view, probably the most important criterion is that limiting reliance on institutional controls (guards and fences) to a finite period. EPA believes that the use of institutional control to protect the public from retired nuclear facilities until they can be decontaminated and decommissioned should be limited at the most to 100 years and preferably less than 50 years. This includes nuclear reactors shut down and mothballed or entombed for a period of time under protective storage. After the allowable institutional care period is over, the site will have to meet radioactive protection levels established for release for unrestricted use. We believe EPA's proposed criteria would be directly applicable, as above, to decommissioning of nuclear facilities and should be given serious consideration by the Nuclear Regulatory Commission (NRC).

The availability of adequate funds when the time to decommission arrives is also most important; it should be the responsibility of the NRC to assure that such provisions are made. We recognize the great complexity of providing funds at construction for decommission in 40 years. However, if it can be determined that the total cost of decommissioning in current dollars is a very small fraction of initial capital costs, provision of escrow funding may not be necessary. Therefore, we urge the NRC to conduct the necessary studies and assessments to determine unequivocally costs of decommissioning and to compare such costs to initial capital costs. It is only through a definitive analysis, and perhaps through realistic demonstrations, that this issue can be resolved.

EIS CATEGORY CODES

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objection to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

Marvin I. Lewis
6504 Bradford Terrace
Phila. PA 19149
3-6-79.

Director, Division of Site Safety Environmental Analysis
Office of Nuclear Reactor Regulation
USNRC
Washington, D.C. 20555

Sir:
NUREG 0490 does a lot of things, but it does not in any way justify the operation of the San Onofre Nuclear Generating Station.

Although the NUREG does provide a lot of good information, this information actually contradicts the usefulness of the SONGS, San Onofre Nuclear Generating Station. For instance, the growth rate in Table 2.2, Page 2-2, is 3.5 % or less for the period 1976 to 1990. The growth rate in Table 8.3 and 8.4 on Pages 8-4 and 8-5 is close to 5% for the same period. In other words, the growth rates in various parts of the report are 'selected' to provide justification for whatever the writer wishes to justify in any particular part of the report. This technique is called 'fiction'.

In Appendix D-23 Page 2.5 Seismology is dismissed in a few paragraphs. Considering the recent and continuing seismic discoveries at the Hosgri fault at Diablo Canyon (which is in a similar -in fact same- geological domain), passing off seismology this cavalierly is indefensible.

Page 5-37. First you state in a Table that the Commissioner has directed that Radon 222 will be reconsidered elsewhere; then, the Staff includes Radon 222 in this Nureg in a convoluted and artificial manner which does not in any way investigate or acknowledge Radon 222's full period of toxicity as required by NEPA.

Page 5-39 Tailings are not required to be stabilized forever, and even if it ~~were~~ were required, forever stabilization is a God like requirement which may be impossible to mortal men.

Chapter 7. This is based entirely on the Rasmussen Wash 1400 . Commissioner Kennedy has already stated on October 18, 1978, "It (Rasmussen Report) found some deficiencies which suggest that the absolute values of the risks presented in the Study should not be used uncritically either in the regulatory process or for public policy purposes."

The DES for operation of SONGS proves unequivocally that this nuclear power plant is unnecessary and dangerous. This is despite the Stall evaluation which ignores all important negative effects.

DO NOT LICENSE THIS NUCLEAR POWER PLANT TO OPERATE AT THE EXPENSE OF HUMAN LIVES.

Marvin I. Lewis



Southern California Edison Company

P. O. BOX 800

2244 WALNUT GROVE AVENUE
ROSEMead, CALIFORNIA 91770

April 6, 1979

SCE

TELEPHONE
813-578-2288

J. H. DRAKE
VICE PRESIDENT

Director, Office of Nuclear Reactor Regulation
Attn: Wm. H. Regan, Jr., Chief
Environmental Projects Branch 2
Division of Site Safety and
Environmental Analysis
U.S. Nuclear Regulatory Commission
Washington, DC 20555

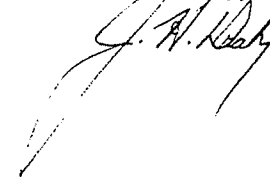
Gentlemen:

Subject: San Onofre Nuclear Generating Station
Units 2 and 3
Docket Nos. 50-361 and 50-362

Mr. Oliver Lynch, Jr., of the NRC staff called on March 27, 1979, to request clarification of Applicants' Comment 6-4 to the Draft Environmental Statement for San Onofre Nuclear Generating Station, Units 2 and 3. Applicants' Comment 6-4 was submitted with other comments by letter to you dated February 2, 1979.

In response to Mr. Lynch's request, a revised Comment 6-4 is enclosed for your information. If you have additional comments regarding this comment, please contact me.

Sincerely,



Enclosure

7904240 399

Cooper

6.3.1 Water Quality Monitoring Program
Comment 6-4 (Revised April 6, 1979)
(Page 6-6)

The first five paragraphs of this section of the DES describe a proposed operational monitoring program which was presented in the ER-OLS (Section 6.2) and was based upon the proposed preoperational monitoring program also presented in the ER-OLS. The ER-OLS was developed in 1976 and submitted in 1977 to the NRC.

Since that time, the Preoperational Monitoring Program has been revised to incorporate the latest site specific study results and recent developments in marine ecological study techniques. The revised Preoperational Monitoring Program was approved by the NRC and implemented in 1978. It is the Applicant's intention to develop an operational monitoring program which incorporates results of the Preoperational Monitoring Program and submit it in the near future for approval. It was the intention of Comment 6-4 to indicate that the specific details of the operational monitoring program proposed in the ER-OLS in 1976 (and contained in the DES) should not be considered to represent the program which will actually be implemented. While the program which will ultimately be implemented will be similar to the one included in the ER-OLS, it will not be identical, and the differences between the two cannot be specified at this time because the development process is still underway.

1 RICHARD J. WHARTON
Attorney at Law
2 4655 Cass St., Suite 304
San Diego, CA 92109
3 (714) 488-2828

4 Attorney for Intervenors

5
6
7
8 UNITED STATES OF AMERICA

9 NUCLEAR REGULATORY COMMISSION

10 BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

11 In the Matter of) Docket Nos. 50-361 OL
50-362 OL

12 SOUTHERN CALIFORNIA)
EDISON COMPANY, et al.,)

13 (San Onofre Nuclear Generating) COMMENTS ON DRAFT ENVIRONMENTAL
14 Station, Units 2 and 3)) STATEMENT - SAN ONOFRE NUCLEAR
AND 3

15
16 We have carefully reviewed the above draft environmental
17 statement in relation to the requirements imposed by Section
18 102(2)(c) of the National Environmental Policy Act (NEPA) and
19 10 CFR Part 51 of the NRC Regulations, and have set forth below
20 intervenors' comments on the proposed action and on this draft
21 statement pursuant to 10 CFR Part 51.25. Intervenors find this
22 draft statement inadequate in a) the discussion and assessment of
23 environmental effects, both beneficial and adverse, associated
24 with the operation of the San Onofre Nuclear Generating Station,
25 Units 2 and 3, and b) the discussion and consideration of avail-
26 able alternatives to the proposed action. Intervenors specifically
27 identify the following deficiencies:

28 1. The evaluation of cooling water discharge impacts is

1 inaccurate and misleading. The heated water will very likely
 2 result in the destruction of at least a portion of the San Onofre
 3 kelp bed during the summer months, the long-term thermal impacts
 4 are likely to be severe, and violations of the state standards
 5 will occur. On page 5-7 of the DES it is stated: "The staff
 6 concludes that although there exists a remote possibility that
 7 state thermal standards could be violated by the operation of
 8 Units 2 and 3, violations would, at worst, be infrequent and for
 9 short periods. There is no evidence in available drift data to
 10 indicate that such an occurrence would take place during the summer
 11 when thermal impacts would be most severe." This conclusion was
 12 apparently based on applicants' "worst case" modeling theory;
 13 however, in light of recent findings as a result of studies pre-
 14 sently being performed by the Marine Review Committee (MRC) at the
 15 request of the California Coastal Commission, it has been determined
 16 that the state thermal standards will not be met. The following
 17 excerpts from the "Supplemental Staff Report And Recommendations -
 18 Review of Thermal Requirements For San Onofre Nuclear Generating
 19 Station, Units 2 and 3" prepared by the California State Water
 20 Quality Control Board staff are appropriate: "The Report of the
 21 MRC confirms the previous prediction that, under normal operating
 22 conditions, the proposed discharge will violate the 20 degree F
 23 temperature differential in the "receiving waters" i.e., waters
 24 at the location and depth of the diffusers of Units 2 and 3. This
 25 Report notes: "...if the "receiving" waters are defined as in
 26 this paragraph, the standards of the State Thermal Plan will
 27 probably be exceeded by the operation of Units 2 and 3." Although
 28 the Report indicates that the discharge will "likely" or "probably"

1 or "may" violate the temperature differential, there really is no
 2 question that such violations will occur." (pp. 4-5)

3 In a hearing for the purpose of interpreting the term "re-
 4 ceiving waters" held on December 21, 1978, the California State
 5 Water Quality Control Board held that "...the temperature at the
 6 intake point does not represent conditions at the receiving
 7 waters," (p. 3 of Opinion of Chairman Bryson and Board Member
 8 Mitchell) contrary to applicants' requested interpretation. The
 9 net result of this ruling is that the state thermal discharge
 10 limitation will be exceeded by operation of SONGS Units 2 and 3.

11 The DES states at p. 5-27 "The greatest threat of SONGS to
 12 the long-term survival of the San Onofre kelp bed is the
 13 possibility of injury to the basal tissues from which the canopy
 14 is regenerated each year...under extreme worst case conditions
 15 (e.g., several days with high ambient temperatures and slack
 16 currents, and with all the plants operating continuously),
 17 destruction of the basal regenerative tissues might result." The
 18 DES further states: "...the community (kelp bed), if destroyed
 19 frequently, could never achieve a stable state characteristic of
 20 other kelp beds in the area. Furthermore, constant temperature
 21 increases coupled with added turbidity would be inimical to
 22 interim reestablishment...The perennial occurrence of worst case
 23 conditions seems highly unlikely and the staff thus concludes that
 24 the long-term thermal impacts from normal station operation are
 25 not likely to be severe." (p. 5-27) It is clear that since the
 26 state thermal discharge limitation will be exceeded during normal
 27 operation of SONGS 2 and 3, the staff's conclusion was based on
 28 a faulty premise. Dischargers' normal plant operation will result

1 in continuous high temperature discharge approximating the worst
 2 case conditions and resulting in both short and long-term thermal
 3 impacts on the San Onofre kelp beds. The DES states at p. 5-27
 4 "It has been rather well established that temperatures above
 5 18-20 degrees C. (64-68 degrees F) cause deterioration of kelp,
 6 and the degree of degradation is directly related to the duration
 7 of the exposure to these temperatures."

8 2. The DES is inadequate in its discussion of the 316(a)
 9 exception process as related to thermal pollution caused by the
 10 proposed action. Section 6.4.1 of the DES discusses the "thermal
 11 exception studies" as related only to periodic "heat treatment" to
 12 control fouling organisms. The DES fails to consider the 316(a)
 13 exception required for continuous high ambient temperature
 14 discharges during the normal operations of Units 2 and 3. It is
 15 highly likely that a 316(a) exception request will be forthcoming
 16 from applicants in light of the recent denial by the California
 17 State Water Quality Control Board of applicants' requested
 18 interpretation of the term "receiving waters" as used in the
 19 State Thermal Plan. Had applicants' interpretation been approved,
 20 it would have obviated applicants' need for a 316(a) exception to
 21 the requirements of the FWPCA. Because a 316(a) exception is
 22 necessary for the operation of Units 2 and 3 in their present
 23 design mode, the DES is inadequate for failure to consider the
 24 implications, both short and long-term, on the aquatic environment
 25 if such an exception is granted. With respect to the maximum
 26 temperature of thermal waste discharges, and contrary to the
 27 requirements of 10 CFR Part 51.23(c), due consideration was not
 28 given to "...compliance of the facility construction or operation

1 and alternative construction and operation with environmental
 2 quality standards and requirements which have been imposed by
 3 Federal, State, regional, and local agencies having responsibility
 4 for environmental protection, including applicable zoning and
 5 landuse regulations and water pollution limitations or requirements
 6 promulgated or imposed pursuant to the Federal Water Pollution
 7 Control Act."

8 3. The DES is inadequate in its evaluation and analysis of
 9 the social and economic impact of operating SONGS 2 and 3.

10 A. With respect to the environmental impact of SONGS
 11 on recreational resources, the DES recognizes the failure of
 12 applicants to comply with the terms and conditions of the
 13 construction permit: "The current plan to restrict the use of
 14 approximately 25% of the 3 1/2 mile San Onofre Beach for the 30-
 15 year operating life of the plant is a significant loss of valuable
 16 recreational and scenic space and represents a substantial change
 17 in action between issuance of the FES-CP and application for an
 18 operating license." (Section 5.6.5) Staff reiterates previous
 19 statements made in the FES-CP that "the beach...is considered to
 20 be a unique and scarce recreational resource," (FES-CP, p. 2-11)
 21 and "that closure even for a brief period is objectionable"
 22 (FES-CP, p. 8-11). Despite the re-affirmation of these
 23 judgments, staff concludes that the social and economic impact of
 24 operating SONGS 2 and 3 - with the significant exception of
 25 restricting public use of the beach - will be only "moderate".
 26 The overall impact will be more severe than "moderate" if the
 27 beach access restriction is factored into the balancing process.
 28 Staff's treatment of this issue is misleading and inconsistent

1 with the purpose and intent of NEPA, section 102(2)(c), which
 2 calls for preparation of a detailed statement on, among other
 3 things, any irreversible and irretrievable commitments of
 4 resources which would be involved in the proposed action should
 5 it be implemented. Restriction of the public's use of this beach
 6 is such an irreversible and irretrievable commitment of resources.

7 B. With respect to the economic impact of SONGS 2 and 3,
 8 the DES provides no analysis of the effects of the Jarvis-Gann
 9 Amendment (Proposition 13). The DES states that "The applicant
 10 should reassess the potential tax benefits accruing to these
 11 jurisdictions and districts in light of Proposition 13."

12 (p . 5-44) This is a wholly inadequate treatment of the economic
 13 impact of SONGS 2 and 3, inasmuch as the revenue from the plant
 14 and its allocation within communities will be "significantly
 15 different from what was assumed" - to use the staff's own words -
 16 in this economic impact analysis. (p . 5-44, section 5.6.4)

17 4. The DES inadequately evaluates the environmental impact
 18 of postulated accidents in that Class 9 occurrences were omitted
 19 from consideration. (Section 7-1) The DES states on p. 7-2 with
 20 respect to Class 9 occurrences that "Their consequences could be
 21 severe." The DES fails to discuss the probability of Class 9
 22 occurrences in a complete and comprehensive manner. In view of
 23 the recent earthquake fault discoveries near the San Onofre site
 24 and the existence of the dewatering-well cavities found beneath
 25 the site, a full discussion of failures more severe than those
 26 required for consideration in the design bases of protective
 27 systems and engineered safety features (Class 9) is warranted.
 28 Further, the estimated dose of 1400.00 man-rem to population in

1 the 50-mile radius for a large-break loss of coolant accident
 2 (Table 7.2, p. 7-3, Class 8.1) is substantial and inadequately
 3 discussed, if at all, in the text.

4 5. The DES is inadequate in that it fails to discuss the
 5 environmental impacts to the region in the event of an accidental
 6 release of radiation requiring evacuation. No discussion is
 7 contained in the DES as to the adaptability of the San Onofre site
 8 to adequate evacuation processes including evacuation of the
 9 nearby beach areas during times of peak use; no discussion is
 10 contained in the DES as to the suitability of existing evacuation
 11 plans; no discussion is contained in the DES as to the effects
 12 which adoption of the NRC/EPA Task Force Report on Emergency
 13 Planning (NUREG-0396) will have on evacuation within the new and
 14 expanded Emergency Planning Zone as distinct from the presently
 15 designated Low Population Zone (NRC Regulations 10 CFR Part 100).

16 6. The DES is inadequate in that it fails to reassess the
 17 seismic design basis for SONGS 2 and 3 in light of a) the
 18 dewatering-well cavities and b) the recent earthquakes and faults
 19 discovered since the current design basis was established.

20 7. The DES is inadequate in that the cost/benefit analysis
 21 fails to provide consideration for the greatest possible
 22 escalation of uranium prices, based on recent occurrences, for
 23 SONGS 2 and 3 over the operating life of the plant. The projected
 24 fuel costs identified as \$87,900,000/yr for 1981 (Table 10.1,
 25 p. 10-2), will possibly escalate to a prohibitively high level
 26 since long-term uranium contracts are generally tied to market
 27 price at delivery or 7¢ per year escalation, whichever is greater
 28 Staff admits (section 10.3) that since the issuance of the FES-CP

1 the fuel, operating, and maintenance costs of nuclear plant
 2 operation have escalated more rapidly than anticipated. The DES
 3 does not discuss adequately the possibility of additional future
 4 escalation of costs with respect to the fuel requirements of San
 5 Onofre, and does not utilize a "worst possible case" approach to
 6 determine total fuel costs over the operating life of the plant.
 7 The cost/benefit analysis contained in the DES is therefore
 8 invalid.

9 8. The DES is inadequate in that it fails to discuss the
 10 possibility that decommissioning costs may escalate to
 11 prohibitively high levels by the end of the operating life of the
 12 plant, at which time the applicant is required to prepare a
 13 proposed decommissioning plan for review by the NRC. (Section 9.4)
 14 Although NRC regulations do not require the applicant to have
 15 developed a decommissioning plan at the time an operating license
 16 is obtained, the discussion of alternative decommissioning methods
 17 and their associated costs found in the DES is misleading and does
 18 not present an accurate projection of what the actual decommission-
 19 ing costs for SONGS will be. Staff calculations for determining
 20 decommissioning costs per unit of electricity generated do not
 21 utilize a start-up date of 1981 or an escalation rate based on the
 22 current rate of inflation. Staff's projection that "For the
 23 SONGS Units 2 and 3 the decommissioning costs would be about
 24 double that indicated for all of the decommissioning one-unit
 25 alternatives" (p. 9-17) is wholly inadequate for purposes of
 26 making an informed cost/benefit judgment. As a consequence, the
 27 cost/benefit analysis for SONGS 2 and 3 is invalid.

28 9. The DES is inadequate in that it fails to comprehensively

1 discuss the temporary storage of nuclear waste materials,
 2 including the interim storage of spent fuel, on site.

3 10. The DES is inadequate in that it fails to discuss the
 4 issue of plant security and provide assurances that all nuclear
 5 materials will remain accounted for and protected from the risk
 6 of terrorist or criminal activity or sabotage.

7 Because due consideration was not given to compliance with
 8 the requirements of 10 CFR Part 51.23(c), and because this DES
 9 fails to consider all environmental impacts of the proposed action
 10 and alternatives to the proposed action as required by Section
 11 102(2)(c) of NEPA, staff's conclusion that the action called for
 12 is the issuance of operating licenses for Units 2 and 3 of SONGS
 13 is premature and founded on insufficient and inaccurate data.

14 For the foregoing reasons, intervenors request that the NRC
 15 either a) adequately address the issues raised above in the final
 16 environmental statement for SONGS 2 and 3, or b) deny applicants'
 17 request for licenses to operate SONGS 2 and 3.

18 Dated: Jan 30, 1979

Respectfully submitted,

19
 20 
 21 RICHARD J. WHARTON
 22 Attorney for Intervenors
 23
 24
 25
 26
 27
 28

**COMMENTS ON
SUPPLEMENT TO
DRAFT ENVIRONMENTAL STATEMENT**

Table of Contents

Federal Energy Regulatory Commission.....	A-56
U.S. Department of Agriculture, Economics and Statistics Service.....	A-52
Mr. Frank H. Arundel.....	A-53
U.S. Department of Agriculture, Soil Conservation Service.....	A-54
U.S. Department of the Interior.....	A-55
Richard J. Wharton.....	A-55
Union of Concerned Scientists.....	A-63
U.S. Environmental Protection Agency.....	A-65
San Diego Association of Governments.....	A-68
Southern California Edison Company.....	A-71

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

IN REPLY REFER TO:

January 23, 1981

Mr. Frank J. Miraglia
Acting Chief, Licensing Branch
No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555


Dear Mr. Miraglia:

A-52
I am replying to your request of January 16, 1981 to the Federal Energy Regulatory Commission for comments on the Supplement to the Draft Environmental Impact Statement related to the operation of the San Onofre Nuclear Generating Station, Units 2 and 3. This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

This staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

Thank you for the opportunity to review this statement.

Sincerely,


Jack M. Heinemann
Advisor on Environmental Quality



United States
Department of
Agriculture

Economics
and Statistics
Service

Washington, D.C.
20250

January 26, 1981

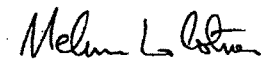
Mr. Frank J. Miraglia
Acting Chief, Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Miraglia:

Thank you for forwarding the Supplement to the Draft Environmental Statement for the San Onofre Nuclear Generating Station, Units 2 and 3.

We have reviewed the material, Docket Numbers 50-361 and 50-363, and have no comments at this time.

Sincerely,


MELVIN L. COTNER
Director, Natural Resource
Economics Division

COPIES
10/10
1/10

COO2
5
1/10

810100408

8102020412

Office of Nuclear Reactor Regulation (2) February 6, 1981

3.- To be complete and legally valid, we believe that all elements relating to the subject need to be included in the EIR. Apparently the subject of potential enemy action on these nuclear plants was not included and it needs to be discussed.

In closing, may I request an answer to the position expressed in the letter. I will be extremely grateful. Sincerely,

Very sincerely

Frank H. Rundel

1888 Blackhawk St.

Oceanside, Calif 92054

Oceanside, California
February 6, 1981

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

I wish to comment on the environmental impact report your organization supplied on the installation and licensing of the nuclear installations at San Onofre which are practically in our backyards:

1.- From what I read in the Oceanside Blade. Failure to mention war made us, the extreme hazards and the potential of submarines from an enemy action shelling these huge nuclear cores with down, shattering them thereby releasing that deadly nuclear radiation which could wipe out this entire area. We think this is a tremendous oversight and needs to be studied along with earth quake and radiation.

1a.- A remedy in the area of earthquakes and war-time action would be to lift some of that 1,00 trillion cubic feet of natural gas that CBS & Amstar and export under the U.S. contract. (President Reagan's own people admit to this). And fire the San Onofre steam boilers with the gas and eliminate all of the dangers on which you debate. I pray to God that you consider this alternative and act upon it. People's lives and health are more important than corporate profit.

2.- We believe that due to the fact that SA H&E will control only 20% of the nuclear output and Southern California Edison will control 80% and by grid move all of the 80% of the generated power to areas that are not threatened by radiation that there should be (if these plants are authorized) from 60% to 30% rate discounts for people who live close to this operation. This proposal is now before the only Public Utilities Commission. If you license these plants we would appreciate your recommendation to the PUC. Dooms and Gloom forecasts are allowing this type of discount due to the hazards of nuclear energy. The proposal does have precedent. 8102110284

C-4 TIMES-ADVOCATE, ESCONDIDO, CA., SUNDAY, JAN. 25, 1981

Nuclear neighbor asks for discount

By DECK PHILLIPS

T-A Staff Writer

OCEANSIDE — An Oceanside man is working to achieve a considerable reduction in utility rates for those living near the San Onofre nuclear power plant.

Frank Arundel, 1888 Blackhawk St., proposed the compensation for those residents he thinks live in a danger zone — near San Onofre. He thinks they should get a 50 percent discount in electrical rates.

Residents within 30 miles should receive 50 percent rate reduction, he says, and those within a 30- to 40-mile radius a 40 percent rate reduction; people living in a 40- to 50-mile radius should have their rates cut by 30 percent.

"People here are being gouged to death by utility rates," said Arundel, 73. "With this plan, the next time they build a nuclear plant, they'll put it out of the umbrella of people where it wouldn't be troublesome in case of earthquake or war. They wouldn't put these plants at our backdoor."

"If we have to live here and bear the brunt of nuclear power, we should be beneficiaries of cheap electricity, particularly if 50 percent of the energy produced there will be transmitted outside this area anyway."

Arundel's plan did not impress the Public Utilities Commission, which has indicated there is little chance of seeing the policy implemented statewide.

The "chances of this plan flying are slim" because it would be discriminatory ratemaking, one PUC spokesman said.

San Onofre, 18 miles north of Oceanside, has one operating nuclear plant, which was shut down for repairs through most of 1980. Units 2 and 3 are nearing completion, at a cost of \$2.3 to \$3 billion. Both are designed to produce 1,100 megawatts of electricity.

Southern California Edison, based in Los Angeles, holds 80 percent interest in the nuclear plant and SDG&E has 20 percent. The SDG&E service area consumes about 2,300 megawatts of electricity.

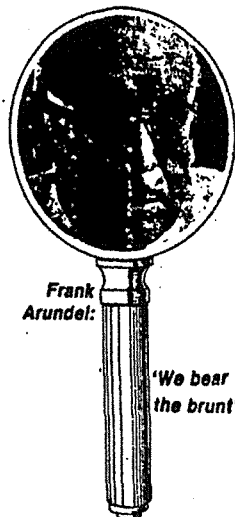
Martin Mattes, legal adviser to John Bryson, PUC chairman, said copies of Arundel's proposal have been given to the commissioners for study. "But, I don't know of any action planned on the subject," Mattes said.

He said the commission reaches decisions in three ways. Under one, a consumer may apply for a rate change. "This is one way Arundel could intervene and advocate his proposal," Mattes said.

"Or, he could file a complaint against a utility for discriminatory rates, for example. But, the burden of proof is upon the complainant and it's difficult to win a case this way," Mattes said.

The commission can also initiate an investigation into an area of interest. "It's possible the PUC may decide to pursue this and investigate," Mattes said.

In his reply to Arundel, Mattes said he discussed several problems with the discounted rate plan. "If the PUC adopts rate discounts based on unfavorable aspects of having a utility



company in the neighborhood, people will make other demands based on similar situations," the adviser said.

For example, those living near an operating fossil fuel plant suffer because of pollution, he said. Transmission lines may be another unfavorable aspect. "The commission is already faced with substantial complications in ratemaking procedures," Mattes said.

Arundel disagrees: "If we're going to put up billions of dollars for these plants and they're giving ahead and build them anyway, we should be the beneficiaries." He said 220,000 area residents would fall under the discount plan.



United States
Department of
Agriculture

Soil
Conservation
Service

2828 Chiles Road
Davis, CA 95616
(916) 758-2200

February 11, 1981

Mr. Frank J. Miraglia
Acting Chief, Licensing Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miraglia:

The Soil Conservation Service has reviewed the Supplement to the Draft Environmental Statement for San Onofre Nuclear Generating Station, Units 2 and 3. We find no controversial items within the realm of SCS responsibilities.

This Environmental Statement Supplement reveals no conflicts with any of the ongoing projects within our jurisdiction. No prime land will be lost to the proposed project.

We appreciate the opportunity to review and comment on this report.

Sincerely,

Francis C. H. Lum
FRANCIS C. H. LUM
State Conservationist

cc: Norman A. Berg, Chief, SCS, Washington, D.C.
Jack Smith, Area Conservationist, Escondido, CA

8102180 359



The Soil Conservation Service
is an agency of the
Department of Agriculture



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 81/80

MAR 2 1981

Mr. Frank J. Miraglia
Acting Chief
Licensing Branch No. 3
Division of Licensing
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miraglia:

We have reviewed the supplement to the draft environmental statement for San Onofre Nuclear Generating Station, Units 2 and 3, San Diego, California, and find we have no comments. The opportunity to review this document is appreciated.

Sincerely,

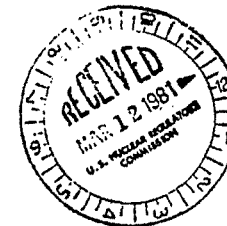
Cecil S. Hoffmann
CECIL S. HOFFMANN

Special Assistant to
Assistant Secretary

RICHARD J. WHARTON
Attorney at Law
University of San Diego
Alcala Park, California 92110

(714) 291-6480 Ext. 4376

Attorney for Intervenors



UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

SOUTHERN CALIFORNIA
EDISON COMPANY, et al.

(San Onofre Nuclear Generating
Station, Units 2 and 3)

DOCKET Nos. 50-361 OL
50-362 OL

JOINT INTERVENORS COMMENTS ON SUPPLEMEN
TO DRAFT ENVIRONMENTAL STATEMENT RELATE
TO OPERATION OF SAN ONOFRE NUCLEAR
GENERATING STATIONS, UNITS 2 and 3
(NUREG-0490)

The Supplement to Draft Environmental Statement (NUREG-0490, December, 1980), hereinafter referred to as NUREG-0490, prepared by the Office of Reactor Regulation (Staff) of the United States Nuclear Regulatory Commission (NRC) related to the operation of San Onofre Nuclear Generating Station, Units 2 and 3 (SONGS 2 and 3) has been reviewed by Intervenors in relation to the requirements imposed by the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321, et seq.), 10 C.F.R. Part 51, and 40 C.F.R. Part 1502. Intervenors comments on the proposed action and on NUREG-0490 are made pursuant to 10 C.F.R. Part 51.25 and 40 C.F.R. Part 1503.

8109130526

-1-

A-55

The purpose of NUREG-0490 was "to identify and evaluate the site-specific environmental impacts attributable to accident sequences that lead to releases of radiation and/or radioactive materials including sequences that can result in inadequate cooling of reactor fuel and to melting of the reactor core." NUREG-0490, p. vi. These accident sequences are commonly referred to as meltdowns or Class 9 accidents.

The NRC's historic first site-specific impact study of a meltdown accident at a California nuclear reaction is inadequate, incomplete and misleading. NUREG-0490 is misleading because it does not provide decision-makers with sufficiently detailed information regarding the potential environmental impacts of a meltdown at SONGS 2 and 3 to aid them in a substantive decision whether or not to proceed with granting an operating license to this federal nuclear project in light of the economic and other consequences of an accident at SONGS 2 and 3. NUREG-0490 does not encourage public participation because it does not make adequate information available to the public in non-technical language about the potential economic and environmental impacts that could affect the lives of twelve million people. NUREG-0490 appears inadequate and incomplete when compared with other independent meltdown impact analyses.

After the Three Mile Island accident, which resulted in mass evacuations and temporary relocation of many people, the California State Legislature passed a law (Senate Bill 1183, now Section 8610.5 of the Government Code), which required the State

Office of Emergency Services (OES) to prepare Emergency Response Plans for potentially severe nuclear accidents involving the release of large amounts of radiation. In order to plan for such accidents, the State required information of the potential scenarios and consequences that could result from meltdowns in California reactors. The State lead agency, OES, contracted with a conservative consulting group, Science Applications, Inc. (SAI), to study the consequences and potential scenarios of meltdowns at California reactors. SAI has conducted research for the NRC, the Department of Energy, nuclear military projects, nuclear utilities, and the nuclear industry. The SAI-OES study was released to the public in Sacramento, California on July 15, 1980. The portion of the SAI-OES study which relates to SONGS 2 and 3 was based on extensive site-specific data whereas NUREG-0490, while it purports to be based on site-specific data, considers mainly excerpted "data, methodology and assumptions" from the WASH-1400 study. The inadequacies of this approach are demonstrated by the following comparison between the SAI-OES study and NUREG-0490 consequence analyses:

The SAI-OES study indicates that the maximum consequences for a nuclear meltdown at SONGS 2 and 3 would be \$180 billion in economic cost consequences. NUREG-0490 estimates \$35 billion; SAI-OES estimates 16,000 square miles of land contaminated with radiation, NUREG-0490 estimates 3,000 square miles; SAI-OES estimates eight to ten million Southern Californians would be required to relocate and leave their homes and property for up to ten years. Four to five million of them would have to be relocated longer than ten

years, NUREG-0490 gives no estimates for the magnitude of the population affected by relocation. SAI-OES estimates that in 1975 there were 7.7 million people living within 60 miles of the San Onofre site. Within 100 miles there are approximately 12 million people. The SAI-OES study acknowledges that "Latent deaths from San Onofre can occur within 100 miles, which includes half of the population of California." Another report done for the California State Legislature, discussed below, warns that children within 100 miles downwind from the reactor would receive damage to their thyroid glands and would require surgery due to exposure to radioactive iodine gases. The SAI-OES study also estimates that \$6.6 billion in cost consequences could occur within 500 miles of San Onofre following a meltdown. Reports to the President's Council on Environmental Quality warn that areas as far away as 1,000 miles or more could be affected, and that up to 125,000 square miles of land could suffer some contamination or crop or milk interdiction. The possibility exists that Southern California could be permanently contaminated after a meltdown at SONGS 2 and 3. This is not surprising when we look at other accident scenarios and compare their estimates.

One NRC analysis of reactor accidents, WASH-740, estimated that an area the size of Pennsylvania could be permanently contaminated by a meltdown at a reactor significantly smaller than either Unit 2 or 3 at San Onofre. Another report, the Rasmussen report, WASH-1400, estimated that 3,000 square miles of land would be contaminated, but assumed that effective

evacuations would take place out to 30 miles downwind from the reactor accident. NUREG-0490, estimates the maximum consequences of a San Onofre meltdown to be \$35 billion in costs for mitigating actions (evacuations, relocations, land interdiction, emergency response by local, county, state and federal teams), 1 million people would receive more than 25 rems, there would be 130,000 acute fatalities, and 300,000 latent cancers in the population within 50 miles who would be exposed to 30 to 40 billion person rems released during the accident.

The consequences of nuclear power plant core melt accidents have also been estimated at the request of the California State Legislature and the President's Council on Environmental Quality by Dr. Jan Beyea and Dr. Frank von Hippel, nuclear physicists with the Princeton University's Program on Nuclear Policy Alternatives of the Center for Energy and Environmental Studies. Dr. Beyea noted in his analysis that a meltdown with a release of radioactive gases from a large reactor could involve "health effects and possible land use restrictions have been considered out to distances of 1,000 miles and for periods of decades after the release." He estimates that up to 175,000 square miles of land could be under some form of interdiction or restricted use following the meltdown. He explains this by saying "The number of health effects and the . . . land contamination can range so high because a substantial fraction of the released radioactivity can be carried for hundreds of miles downwind

before being removed from the atmosphere by deposition on the ground. Dr. Beyea told the President's Council on Environmental Quality (CEQ) that "early fatalities could occur up to 30 miles downwind" of a reactor meltdown. Dr. Frank von Hippel testified before the California State Legislature after Three Mile Island that "the thyroid could receive a radiation dose tens to hundreds of times higher than the rest of the body. Exposed children more than a hundred miles downwind would suffer thyroid damage which would require surgery years later." (emphasis added)

NUREG-0490 did not reference the SAI-OES study, in spite of the fact that the Atomic Safety and Licensing Board (ASLB) and the NRC Staff were made aware of the report by intervenors during July and August of 1980, six months before NUREG-0490 was issued.

The SAI-OES study is a conservative report in that it calculates its predictions and models based on site-specific data. NUREG-0490 is not conservative and is inadequate because it is not sufficiently based on site-specific data. The SAI-OES report used extensive site-specific data regarding the nearby population centers and the various weather conditions in Southern California. That report identified several site-specific unique features which should have warranted a different conclusion from the NRC Staff than "there are no special or unique features about the San Onofre site and environs that would warrant special or additional engineered safety features for the San Onofre plants." Joint intervenors conclude there are special and unique features that exist at the San Onofre site which are listed as follows:

(1) The three reactors at San Onofre are uniquely located near the intersection of two major Fault Zones, the Cristianitos and the Newport-Inglewood. Prior to 1980, the NRC believed there was no structural relationship between the two Fault Zones. However, in 1980, federal and state marine geologists discovered a new zone of faults which they named "Cristianitos Zone of Deformation" which project directly beneath the three reactors. Thus, the possibility of damage to the reactors during earthquakes is higher now because of the possibility of surface rupture directly under the reactors. This was not factored into the Rasmussen Report, WASH-1400, the Lewis Report, SAI-OES or NUREG-0490. NUREG-0490 does not even mention geologic-seismic site-specific events as a significantly possible factor in the probabilistic risk assessment.

(2) The San Onofre site is uniquely located on the Pacific plate, near the Plate Tectonic Boundary Fault, the San Andreas. San Onofre is moving north in relation to the North American Plate. These reactors are uniquely migrating north on a geologic time scale. Plate Tectonics were not understood when the San Onofre site was originally chosen in 1962. It was not until 1969 that the plate tectonics theories were accepted.

(3) The San Onofre site has the unique feature of being sited close to San Onofre Unit 1. If Unit 1 had a meltdown, it would severely affect operations of Units 2 and 3, resulting in various consequences, none of which were considered in NUREG-0490. The older reactor at the site, San Onofre Unit 1,

was identified by the SAI-OES analysis as having the highest probability of a meltdown of any reactor in California for two primary reasons. "The first reason is that the Unit One auxiliary feedwater system depends on operators to align and initiate the system. Potential failures due to human factors make the system less reliable than automated systems. The second reason relates the long term recirculation mode of emergency core coolant, which requires at least one of two pumps located in the containment. In the event of a pump failure, repairs cannot be made because the pump is inside the containment and would be isolated during an accident." NUREG-0490 does not consider the proximity of SONGS 2 and 3 to Unit 1 to be a unique or special feature.

(4) San Onofre Unit 1 has been shutdown for approximately one year due to leaky corroded steam generator tubes. The NRC issued a report in 1976 (NUREG-0900-5, Report to Congress on Abnormal Occurrences) which explained that "The failure of a number of steam generator tubes as a result of the pressure transients during a loss of coolant accident could render the emergency core cooling system ineffective." The Unit 1 was not designed for the magnitude of ground motions that Units 2 and 3 were. An earthquake could conceivably only damage Unit 1, because of its structurally weak steam generator tubes, but that could result in a LOCA (loss of coolant accident) and a meltdown, which would affect the two other reactors and the environment.

(5) The San Onofre reactors are special and unique in that the reactor core of Unit 2 was installed backwards, necessi-

tating total rewiring of the control room and other systems.

(6) The San Onofre site is unique also in that San Onofre Unit 2 was constructed above earthquake faults that were not discovered until 1974 during construction excavations.

(7) SONGS 2 and 3 are underlain by dewatering cavities that developed during construction. Intervenor believe this also is a special of unique feature at SONGS 2 and 3 which must be considered.

(8) The Southern California region, including San Onofre, frequently has weather inversions. During these inversions, air pollutants, including accidentally leaked radioactive gases, can be trapped beneath the inversion layer, where they can only mix and travel horizontally. Thus, a meltdown at SONGS 2 and 3 could affect the nine to ten million people who live in the air basins that share the same East Pacific high pressure zone inversion layers. Although NUREG-0490 admits that "accident consequences are very much dependent on the weather conditions existing at the time . . ." they do not specifically consider the unique Southern California high pressure inversion layers which are a predominant characteristic of the San Onofre site.

(9) The San Onofre reactors are uniquely located on a Southern California beach state park that stretches for many miles, but which is inaccessible and inescapable except by driving past the reactors on the old-highway, now running parallel to Interstate-5. On a typical summer day, 25,000 persons drive close to the reactors on a narrow and curving road. These beach-goers could be trapped during a meltdown, especially if

an earthquake occurred at the same time or caused it.

(10) Another unique or special feature of San Onofre is its proximity to roads used by thousands of uncontrolled travelers per day which presents a unique possibility for sabotage accidents that could lead to releases of radioactivity.

(11) The San Onofre site is special and unique in that one-half of the population of the State of California lives within 100 miles of the site.

(12) It is a unique feature of SONGS 2 and 3 to be the largest reactors ever considered for operating licenses:

(13) The San Onofre site is unique in that it is sited within contamination distance of a major portion of the nation's fresh produce farms, especially in the winter months.

(14) The San Onofre site is also unique in that it could cause international economic and environmental impacts by contamination of a significant part of Baja California's agricultural resources.

After the Kemeny Commission and the Rogovin Report were issued on Three Mile Island, the Council on Environmental Quality wrote a letter to the Nuclear Regulatory Commissioners on March 20, 1980. The letter released the results of the CEQ review and criticized the NRC's lack of compliance with NEPA laws in the EIS analyses of potential accidents at reactors. The CEQ stated that the NRC's EIS discussions of "potential accidents and their environmental impacts was found to be largely perfunctory, remarkably standardized, and uninformative to the public." The CEQ also advised the NRC that "site specific treatment of data

should be substituted for "'boilerplate' assessment of accident initiating events and potential impacts, and EIS's should be comprehensible to non-technical members of the public..."

Intervenors comment upon the fact that NUREG-0490 contains 29 pages of text with about 8 pages of site-specific information which is selective and slanted. NEPA requires detailed statements of aspects of proposed action significantly affecting the quality of the human environment and Intervenors feel NUREG-0490 is inadequate in that it is "largely perfunctory, remarkably standardized and uninformative to the public."

NUREG-0490 is also inadequate in that it failed to consider earthquake induced core melt accidents. While the Reactor Safety Study (RSS), WASH-1400, concluded that the probability of core melt accidents in nuclear power plants from seismic events was insignificant compared to core melt probabilities from other accidents, recent assessment of the potential for earthquake induced core melt accidents suggests that the probability of such events may be significant when compared to core melt accidents from other causes considered by RSS. Intervenors contend that the seismic design basis for SONGS 2 and 3 is inadequate and, therefore, consider it prudent to evaluate the potential for seismic-induced core melt accidents at SONGS 2 and 3 to establish if they may be significant factors. The purpose of NUREG-0490 was to identify and evaluate site-specific environmental impacts. It does not evaluate the potential for seismic-induced core melt accidents and, therefore its probabilistic assessment of risk at SONGS 2 and 3 is inadequate.

NUREG-0490 is further inadequate and particularly misleading in its assessment of health effects avoidance (Section 7.1.1.4). NUREG-0490 did not mention thyroid blocking in its assessment of health effects avoidance, relying only on restriction of contaminated property and foodstuffs. Dr. Frank von Hippel in his testimony before the California State Legislature states:

The thyroid can be protected against absorbing radioiodine, however, if before the cloud arrives you take about one thousand times your ordinary daily iodine intake in the form of potassium iodide (the form of iodine present in iodized salt). This will saturate the thyroid with ordinary iodide and reduce its ability to absorb the radioactive iodide when it arrives. This strategy was recommended in the American Physical Society's reactor safety study four years ago. The Food and Drug Administration approved potassium iodide for emergency thyroid 'blocking'. . . I would recommend that California do two things with regard to this thyroid protection strategy:

- 1) Develop a stockpile of potassium iodide in the appropriate dosage in either sealed foil wrapped pills or liquid solution. This would not be costly. Based on a 1972 study for the Defense Civil Preparedness Study, it appears that enough pills for the entire nation could be produced for a few million dollars.
- 2) The more difficult part of the job would be to develop an effective distribution system. If one waited until a cloud of radioiodine had been released before distributing the blocking chemical and informing the public of its use, one might well be too late. (A week after the beginning of the crisis at Three Mile Island, the Pennsylvania state government refused to distribute the chemical to the population within 10 miles of the site - despite the joint recommendation to do so from the Surgeon General, the Food and Drug Commissioner, and the Director of the National Institutes of Health who thought that sufficient warning time might not be available to protect this population

in case a release occurred. On the other hand, if people were given potassium iodide to keep in their medicine cabinets along with aspirin, it is likely that many would lose track of it pretty quickly. Perhaps it should be attached by the local utility to household electricity meters and its presence announced in case of need. The best strategy is obviously a problem well worth a study. California could break some important ground here."

Section 7.1.1.4. is particularly misleading in its statement that "radiation hazards in the environment tend to disappear by the natural process of radioactive decay (but) can continue for a relatively long period of time -- months, years or even decades." (emphasis added) This misleading statement fails to note that some radioactive wastes from nuclear accidents such as radioactive Strontium and Cesium can enter the food chain and remain a hazard for 1,000 years or more. Other isotopes remain a hazard for 1 million years or more.

NUREG-0490, Section 7.1.3. entitled Mitigation of Accident Consequences is inadequate in that it fails to note that consequences could be reduced by retrofitting SONGS 2 and 3 with filtered venting systems to prevent accidental releases of radioactive gases.

NUREG-0490, Section 10 is misleading, inadequate and incomplete. The Section contains three sentences with regard to its conclusions and Re-Evaluated Benefit-Cost Balance. This section should be expanded because the environmental risks of a Class 9 accident involve the entire region of Southern California, Northern Baja California, Mexico, and parts of Arizona. These regions could be permanently contaminated with radiation following a core melt at SONGS 2 and 3. The risks involve the

value of all real and personal property, both public and private in those regions. The risks involve fatalities, latent cancer deaths and genetic damage. The risks involve compensation to victims in the event of such accidents. Section 10 of NUREG-0490 concludes that the environmental risks of Class 9 - core-melt accidents - "does not change the results of the cost-benefit balance contained in the Draft Environmental Statement (Section 10)."

CONCLUSION

NUREG-0490 concludes "that there are no special or unique features about the San Onofre site and environs that would warrant special or additional engineered safety features for the San Onofre plants." Intervenor conclude there are unique characteristics at SONGS 2 and 3 that warrant additional engineered safety features especially in light of the unique earthquake hazard which could cause a core-melt accident and common-cause failure of essential safety systems at SONGS 2 and 3. A future earthquake near the San Onofre site could be the common cause for failure of the cooling systems of all three reactors on the San Onofre site and all three of the spent fuel pools simultaneously. This would be the worst case accident that should be analyzed by the NRC and this analysis should be a part of a revised NUREG-0490.

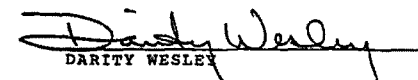
CERTIFICATE OF SERVICE

I hereby certify that the JOINT INTERVENORS COMMENTS ON SUPPLEMENT TO DRAFT ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SAN ONOFRE NUCLEAR GENERATING STATIONS, UNITS 2 AND 3 (NUREG-0490) have been served on the following by deposit in the United States mail, first class, postage prepaid, this 9th day of March, 1981:

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Director, Division of
Licensing

Executed on March 9, 1981 at San Diego, California.


DARITY WESLEY

Union of
**CONCERNED
SCIENTISTS**

9 March 1981

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Director, Division of Licensing

Dear People:

Re: Supplement to the Draft Environmental Statement
(NUREG-0490) related to the operation of San Onofre
Nuclear Generating Station, Units 2 and 3

Herewith are some brief comments on the above Supplement, in response to your invitation.

We are pleased that the NRC has finally published a document providing a hint of the consequences of severe accidents at the San Onofre Station. We consider, however, that this Supplement does not satisfy the intent of the Commission's Statement of Interim Policy of 13 June 1980 (Federal Register, 45, 40101). Nor does this Supplement provide the public with information sufficient to make a reasoned assessment of the risks of severe accidents at this plant.

You will recall that the Commission's Statement of Interim Policy followed a letter of 20 March 1980 from the Chairman of the Council on Environmental Quality (CEQ) to the Chairman of the NRC. Included in this letter was the statement:

"The results of our review of impact statements prepared by the NRC for nuclear power reactors are very disturbing. The discussion in these statements of potential accidents and their environmental impacts was found to be largely perfunctory, remarkably standardized, and uninformative to the public."

This Supplement must be substantially revised and improved before it overcomes these CEQ criticisms. For guidance during this process of revision and improvement, the NRC staff should consult the report "NRC's Environmental Analysis of Nuclear Accidents: Is It Adequate?", prepared for CEQ by the Environmental Law Institute (ELI) in February 1980. A copy of this



Office of Nuclear Reactor Regulation
9 March 1981
Page 2.

report was provided to the NRC with the CEQ Chairman's letter.

Part 5 of the ELI report recommends that the NRC should continue, with some substantial improvements, its previous practice of studying a selection of accident scenarios. The ELI report recommends that this selection should be expanded to include "Class 9" accidents. Section 7 (Environmental Impact of Postulated Accidents) of the San Onofre Draft Environmental Statement (dated November 1978) exemplifies this previous practice; it estimates radiation doses for a number of selected accidents in Classes 1 through 8. This Supplement, however, merges nine release categories, weighted by assumed probabilities. The results of this analysis are confusing for the public; one might suspect that this is by intention.

Each accident scenario should be considered alone. For each scenario, the NRC should provide a clear account of:

- (i) the nature of the postulated accident
- (ii) the estimated nature of the radioactive release
- (iii) the estimated nature of the environmental consequences of that release.

The Commission's Statement of Interim Policy directs:

" . . . approximately equal attention shall be given to the probability of occurrence of releases and to the probability of occurrence of the environmental consequences of those releases."

This Supplement does not satisfy the intent of that directive. It merges these two probabilities although they are of quite different natures. One might suspect that this approach is selected in order to persuade the public that severe consequences have extremely low probabilities. This form of analysis and presentation does not fulfill the NRC's obligation to accurately inform the public.

As the NRC staff should well know, probabilities in nuclear accident analysis fall into two distinct categories:

- (i) probability of occurrence of release
This category of probability concerns engineering estimates. These are very difficult to make since there is a limited statistical base and much of the uncertainty relates to human behaviour.

Office of Nuclear Reactor Regulation
9 March 1981
Page 3.

(ii) probability of occurrence of environmental consequences, given a particular release

This category of probability concerns factors such as wind speed and direction. These factors can be estimated from a good statistical base.

The NRC staff should revise this Supplement so as to exhibit their estimates of these probabilities separately, within each accident scenario studied.

The Commission's Statement of Interim Policy also directs:

" . . . consequences shall be characterized in terms of potential radiological exposures to individuals, to population groups, and, where applicable, to biota."

This Supplement does not fulfill the intent of that directive. It provides very limited information on the geographical variation of potential exposure. More seriously, it provides essentially no information on the significance of exposure for different population groups. As the NRC staff should well know, certain population groups (especially children and fetuses) are at greater risk for a given release.

The importance of revising this Supplement, so as to accurately inform the public, can be illustrated by two estimates which can be gleaned from the supplement itself:

(i) probability of occurrence of the "PWR2" core melt accident

This release is one of the most severe accidents considered in the Reactor Safety Study (WASH-1400) and this Supplement. Table 7.1.4-2 of the Supplement estimates its probability as 7×10^{-6} per reactor-year. Section 7.1.4.2 concedes that this estimate could be low by a factor of 100. One thus finds (assuming a reactor life of 30 years) that this Supplement admits that a "PWR2" accident could have a 4% probability of occurrence during the life of San Onofre Units 2 and 3.

(ii) potential for serious health effects

Table 7.1.4-4 of this Supplement admits that a severe accident at San Onofre could lead to 130,000 acute fatalities, 300,000 subsequent fatal cancers, and 600,000 genetic effects.

Office of Nuclear Reactor Regulation
9 March 1981
Page 4.

In the light of the grave hazard shown by these estimates, the NRC has a clear duty to provide the public with more complete information than is contained in this Supplement.

Thank you for your attention.

Sincerely,



Gordon Thompson, Ph.D.
Staff Scientist

GT:VN

A-64



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca 94105



Project # DS-NRC-K06002-CA

Frank J. Miraglia, Acting Chief
Licensing Branch No. 3
Division of Licensing
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miraglia:

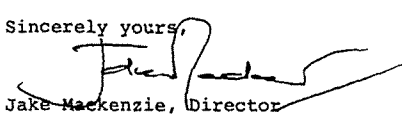
The Environmental Protection Agency (EPA) has received and reviewed the Draft Supplement (DS) to the Draft Environmental Impact Statement (DEIS) for the project titled SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3.

In our previous reviews of environmental documents dealing with Light Water Reactors (LWR) EPA has consistently emphasized the need for a thorough evaluation of the environmental impacts from different LWR accident scenarios to include Class 9 accidents. The discussion of the environmental and societal impacts of a core melt down accident included in the Supplement to the Draft Environmental Impact Statement for the San Onofre Nuclear Generating Station, Units 2 and 3 is a step forward in this respect and, as a result, EPA applauds the Nuclear Regulatory Commission's (NRC) decision to prepare this Supplement.

The assessment of environmental impacts for severe accidents at the plant uses methodologies originally developed in the Reactor Safety Study (WASH-1460) and the Liquid Pathway Generic Study (NUREG-0440). Because these two studies will be the cornerstones for similar assessments for other nuclear power plants environmental statements, we would refer NRC to EPA's original technical comments on these studies. These comments can be found in "Reactor Safety Study (WASH-1400): A Review of the Final Report" and a letter from EPA's Office of Federal Activities to NRC dated February 8, 1977.

Our specific comments on the San Onofre Supplemental DEIS and generic comments are attached. The EPA appreciates the opportunity to comment on this Draft Supplement. Should the NRC choose to revise other sections of the EIS, EPA would like to review these documents. If you have any questions regarding our comments, please contact Susan Sakaki, EIS Review Coordinator, at (415)556-7858.

Sincerely yours,


Jake Mackenzie, Director
Surveillance and Analysis Division

Attachment

A-65

8103230423

EPA Technical Comments on the Supplement to the Draft Environmental Statement Related to the Operation of the San Onofre Generating Station Units 2 and 3 (NUREG-0490)

General Comments

The Final EIS for San Onofre Units 2 and 3 is dated March 1973. This statement contains a Section 7, titled "Environmental Impact of Postulated Accidents." It is not clear if the Supplement is to replace the original information or if the Supplement is supplemental. If this information is supplemental then we would suggest that the original Section 7 be revised to agree with the supplemental statements and data.

It would also be hoped that any previous information and conclusions would be revised if it is impacted by events occurring since 1973 or by a change in Commission consideration. For instance the supplement refers to the original Section 5.5 and further mentions 10 CFR Part 20 and 10 CFR Part 50. However, the supplement does not make any mention of the Commission's implementation of 40 CFR 190 for normal operation.

Specific Comments

Table 7.1.4-4

This table should correspond on a one-to-one basis with the release categories (PWR 1-9) in Table 7.1.4-2. It is also not readily apparent how the PWR 1-9 compares to the original Table 7.1.

Design Basis Accidents

In the discussion of accident risk and impact assessment of Design Basis Accidents (DBAs), Section 7.1.4.1, we do not understand the intent of the comparison of the results in Table 7.1.4-1 to the Reactor Site Criteria of 10 CFR 100. First, the infrequent accidents listed in Table 7.1.4-1 do not meet the requirements of 10 CFR 100 for purposes of site analysis. Footnotes to 10 CFR 100 state:

(1)...calculations should be based upon a major accident, hypothesized for the purposes of site analysis...that would result in potential hazards not exceeded by those from any accident considered credible, and

(2)...this 25 rem whole body value and the 300 rem thyroid value have been set forth as reference values, which can be used in the evaluation of reactor sites

with respect to potential reactor accidents of exceedingly low probability of occurrence, and low risk of public exposure to radiation.

Secondly, by the description of infrequent accidents in the supplement ("events that might occur once during the lifetime of the plant"), these accidents have an annual probability of occurrences on the order of 10^{-2} , are considered credible, and are not of exceedingly low probability of occurrence. Reference to 10 CFR 100 and its implementation provide a misleading inference that, since the results shown in Table 7.1.4-1 are within the dose values of 10 CFR 100, the risk of those infrequent accidents is small and therefore acceptable. Also, the radiation doses listed in Table 7.1.4-1 are calculated using a conservative model approach which is relevant to safety evaluations and not consistent with the realistic approach to the assessment of environmental risks of normal operation and severe core melt accidents.

The discussion of impacts of infrequent accidents and limiting faults, in both the original DES and the Supplement, addresses probabilities of occurrence qualitatively. Yet, in the discussion of the more severe core melt accidents the probabilities of occurrence are quantified (Table 7.1.4-2). For consistency in the presentation of all environmental risks, the probabilities of occurrence of infrequent accidents and limiting faults DBA's should also be provided.

It is not clear whether the risks listed in Table 7.1.4-5, Annual Average Values of Environmental Risks Due to Accidents, include those from infrequent accidents and limiting faults (Table 7.1.4-2), postulated accidents (Table 7.2 of the original DES), and accidents leading to the PWR 1-9 release categories (Table 7.1.4-2). The risks should include all those from moderate frequency accidents, infrequent accidents, limiting faults and severe core melt accidents. Although the risk of the infrequent accidents and limiting faults is "judged to be extremely small" and appear to be overshadowed by the risk from core melt accidents, they should be fully presented. The risks from the more probable yet lower consequence accidents may indeed be significant to the individual risk and should be listed in the Supplement. It would also be beneficial to extend Figures 7.1.4-3, 7.1.4-5, and 7.1.4-7 to include the higher probability accidents.

It would be helpful to provide a summary table of the annual average value of environmental risks from operation of all the reactors at the San Onofre site. The risks

should include all those from normal operations, moderate frequency accidents, infrequent accidents, limiting faults and severe core melt accidents. Both societal and individual risks should be presented.

7.1.1.3 Health Effects

The statement that a dose greater than about 25 rem is necessary before any physiological effects to an individual are clinically detectable should be reviewed. Information contained in a World Health Organization technical report No. 123 would seem to indicate that physiological changes can occur at exposures as low as 10 rem.

7.1.3.3 Emergency Preparedness

It is unclear what is the basis of the statement, "Emergency preparedness plans including protective action measures for the San Onofre facility and environs are in an advanced, but not yet fully completed stage." The plans (seven) are at this date undergoing informal review by the Region IX Regional Assistance Committee (RAC). Thus, there has been no request for formal review, there has been no drill schedule established and there has been no full scale exercise. We do not concur in the Commission's statement that these plans are in an advanced stage.

Table 7.1.4-5

It is not clear from the information presented regarding risk and protective action that protective actions can be taken to reduce exposures by 10-20 times or in fact to prevent exposures determined by the State of California to be unacceptable considering the following:

1. The emergency preparedness plans and protective action measures for the San Onofre facility are not yet complete.
2. The State of California does not use the EPA's Protective Action Guides (PAG's).

In view of the above, we feel the statements made are premature.

Figure 7.1.4-8

This figure, "Relative Directional Risk to Individuals," might be a useful risk analysis. However, as presented, the figure is illegible and lacking in background information. It should be presented more clearly, with an

accompanying table or coding explaining the significance of the numbers.

Decommissioning

The cost of reactor decommissioning and replacement power costs are as large as the costs from the Three Mile Island accident. It would seem that these costs could significantly change the cost-benefit information originally provided in Section 13. Future EIS's or Supplements to EIS's should include an evaluation of these costs.

Suite 524, Security Pacific Plaza
1200 Third Avenue
San Diego, California 92101
(714) 238-5300

A-58

Dear Mr. Scaletti:

On March 16, 1981, the Board of Directors of the San Diego Association of Governments (SANDAG) adopted a resolution supporting the operation of San Onofre Nuclear Power Plant Units 2 and 3 and requested the Nuclear Regulatory Commission to grant an operating license for these units subject to federal regulations regarding the safety of nuclear power plant operations and emergency planning for nuclear power plant accidents. This resolution and the supporting staff report are attached.

Please call me or have your staff call Steve Sachs of my staff if you have any questions about the Board of Directors action.

Sincerely

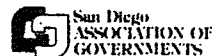
for RICHARD J. HUFF

Executive Director

RJH/SS/sc

Attachments

cc: Patricia Fleming, SDG&E
Fred Massey, SCE



No. 81-36

RESOLUTION SUPPORTING THE OPERATION
OF SAN ONOFRE NUCLEAR POWER PLANT
UNITS 2 AND 3
SUBJECT TO FEDERAL REGULATIONS REGARDING THE
SAFETY OF NUCLEAR POWER PLANT OPERATIONS AND
EMERGENCY PLANNING FOR NUCLEAR PLANT ACCIDENTS

WHEREAS, the Energy 2000 Task Force, appointed by Mayor Wilson of the City of San Diego, presented the conclusions and recommendations of its report to the SANDAG Board of Directors on February 23, 1981; and

WHEREAS, one of the recommendations of the Energy 2000 Task Force is to support the completion and operation of San Onofre Plants 2 and 3; and

WHEREAS, San Onofre Units 2 and 3, if completed and operated on schedule, will supply approximately half of the additional electricity needs forecast for the San Diego region between now and 1995; and

WHEREAS, the Nuclear Regulatory Commission will begin licensing hearings for San Onofre Units 2 and 3 in June 1981; and

WHEREAS, federal regulations concerning nuclear power plant safety and emergency response planning will have to be met in order for a license to be granted; NOW THEREFORE

BE IT RESOLVED that the Board of Directors supports the operation of San Onofre Nuclear Power Plant Units 2 and 3 and requests the Nuclear Regulatory Commission to grant an operating license for these units subject to federal regulations regarding the safety of nuclear power plant operations and emergency planning for nuclear plant accidents.

PASSED AND ADOPTED this 16th day of March 1981.

ATTEST:

~~SECRETARY~~

CHAIRMAN

San Diego Association of Governments
BOARD OF DIRECTORS

DATE: March 16, 1981

AGENDA REPORT No.:

R-95

SAN DIEGO ASSOCIATION OF GOVERNMENTS

RESOLUTION NO. 81-36 DATE CONSIDERED: 3/16/81

AGENCY	YES	NO	ABSENT	ABSTAIN
CARLSBAD	X			
CHULA VISTA	X			
CORONADO	X			
DEL MAR		X		
EL CAJON	X			
IMPERIAL BEACH	X			
LA MESA	X			
LEMON GROVE	X			
NATIONAL CITY	X			
OCEANSIDE	X			
SAN DIEGO	X			
SAN MARCOS	X			
SANTEE	X			
VISTA	X			
TOTALS	13	1		

I certify from personal observation and count that the above results are an accurate record of the SANDAG Board of Directors vote and action.

Betty Black

CONSIDERATION OF SUPPORT FOR OPERATION OF
SAN ONOFRE NUCLEAR POWER PLANT UNITS 2 AND 3

Introduction

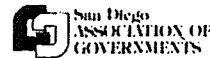
The Board requested this report as the basis for considering a resolution to support the operation of San Onofre Nuclear Power Plant Units 2 and 3. Three important points the Board should consider before taking a position are:

- The risks to health and life of both present and future generations and the costs of reducing these risks associated with almost all aspects of the nuclear fuel cycle, are extremely controversial. There is little scientific or technical consensus on the severity of the risks and the effectiveness or cost of strategies to reduce these risks.
- San Onofre Units 2 and 3 would provide 440 MW of electric power to the San Diego region - almost one-half of the additional power requirements forecast to be needed between now and 1995 for the SDG&E Service Area by SDG&E and the California Energy Commission. These forecasts include the effects of existing conservation and alternative energy source programs which will reduce electricity demand. Potential additional electricity supplies and conservation and alternative energy sources which could result in a balance between demand and supply over the next 10 to 20 years without San Onofre Units 2 and 3 have been identified (see attachment for a partial list) but are not yet committed. In some cases, these sources may be infeasible or unavailable.
- The construction of San Onofre Units 2 and 3 is nearing completion. About one-half of the total \$3.4 billion project construction cost has been expended. The plant is currently undergoing U.S. Nuclear Regulatory Commission review in order to obtain an operating license.

It is my

RECOMMENDATION

that the Board of Directors support the operation of San Onofre Nuclear Power Plants 2 and 3 and request the Nuclear Regulatory Commission to grant an operating license for these units subject to Federal regulations regarding the safety of nuclear power plant operations and emergency planning for nuclear plant accidents.



RESOLUTION

No. 81-36

Discussion


San Onofre Units 2 and 3 are scheduled to have a total capacity of 2,200 megawatts (MW) of electricity. SDG&E is a 20% partner in the plant. It is therefore entitled to 440 MW of the electricity generated. The other 1,760 MW is scheduled to be used by Southern California Edison Company (76%) and Municipal Utilities serving the Cities of Anaheim and Riverside (total of 4%).

The Nuclear Regulatory Commission (NRC) is the federal agency responsible for issuing nuclear power plant operating licenses. The NRC will hold hearings on the license applications for San Onofre Units 2 and 3 starting in June 1981.

There are many environmental and economic issues related to the operation of San Onofre Units 2 and 3 which include:

- Cost and reliability of nuclear power
- Risk of accidents from transport of uranium, spent nuclear fuel and operation of the plants.
- Cost of decommissioning the plants.
- Ability of the plants to withstand earthquakes.
- Hazards, cost and technical feasibility of long-term storage of radioactive wastes.
- Scope and adequacy of emergency plans to reduce radiation exposure in the event of an accident.

At the licensing hearings in June, it appears that the most controversial issues will be the ability of the plants to withstand earthquakes and the adequacy of emergency planning in case of an accident that could impact surrounding areas. The Plant must meet federal standards in both of these areas before a license will be issued.


RICHARD J. HUFF
Executive Director

RESOLUTION SUPPORTING THE OPERATION OF SAN ONOFRE NUCLEAR POWER PLANT UNITS 2 AND 3 SUBJECT TO FEDERAL REGULATIONS REGARDING THE SAFETY OF NUCLEAR POWER PLANT OPERATIONS AND EMERGENCY PLANNING FOR NUCLEAR PLANT ACCIDENTS

WHEREAS, the Energy 2000 Task Force, appointed by Mayor Wilson of the City of San Diego, presented the conclusions and recommendations of its report to the SANDAG Board of Directors on February 23, 1981; and

WHEREAS, one of the recommendations of the Energy 2000 Task Force is to support the completion and operation of San Onofre Plants 2 and 3; and

WHEREAS, San Onofre Units 2 and 3, if completed and operated on schedule, will supply approximately half of the additional electricity needs forecast for the San Diego region between now and 1995; and

WHEREAS, the Nuclear Regulatory Commission will begin licensing hearings for San Onofre Units 2 and 3 in June 1981; and

WHEREAS, federal regulations concerning nuclear power plant safety and emergency response planning will have to be met in order for a license to be granted; NOW THEREFORE

BE IT RESOLVED that the Board of Directors supports the operation of San Onofre Nuclear Power Plant Units 2 and 3 and requests the Nuclear Regulatory Commission to grant an operating license for these units subject to federal regulations regarding the safety of nuclear power plant operations and emergency planning for nuclear plant accidents.

PASSED AND ADOPTED this 16th day of March 1981.

ATTEST:

SECRETARY

CHAIRMAN

MEMBER AGENCIES: Cities of Carlsbad, Chula Vista, Coronado, Del Mar, Escondido, Imperial Beach, La Mesa, Lemon Grove, National City, Oceanside, San Diego, San Marcos, Santee and Vista/Ex-officio Member, California Department of Transportation/Honorary Member, Tijuana, B. C. A.

ATTACHMENT
(From Energy 2000 Task Force Report)

Potential Supply Alternatives
For the SDG&E Service Area*
1980-2000

San Onofre 2 and 3	440 MW (nuclear)
Arizona (renewed contract)	400 MW (imported)
New Mexico (renewed contract)	150 MW (imported)
Washington (renewed contract)	100 MW (imported)
Mexico (purchase)	300 MW (imported)
Geothermal	800 MW (geothermal)
Blythe site	1,000 MW (coal gasification)
Hydroelectric	34 MW (hydroelectric)
Cogeneration	100 MW (cogeneration)
Wind	30 MW (wind)
TOTAL	3,354 MW

SOURCE:

San Diego Gas and Electric Company, September 1979

*Some of these sources may be infeasible or unavailable. For example, Arizona Public Service Company would have to agree to a renewed contract for 400 MW of imported power from Arizona; the feasibility of 1000 megawatts from a coal gasification plant at Blythe has not been proved.

Southern California Edison Company

P O BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD CALIFORNIA 91770

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

March 24, 1981

TELEPHONE
(213) 972-1401

Director, Office of Nuclear Reactor Regulation
Attention: Darrel G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

References: Realistic Estimates of the Consequences of Nuclear Accidents,
M. Levenson and F. Rahn, EPRI, November, 1980.

This letter provides Southern California Edison Company's comments to the Supplement to Draft Environmental Statement related to the operation of San Onofre Nuclear Generating Station Units 2 and 3 NUREG-0490. In our review of this document we have found two points which we feel are in need of further clarification prior to the issuance of a Final Environmental Statement.

1. The following statement contained in Section 7.1.4.3,

"The 200-rem whole-body dose figure corresponds approximately to a threshold value for which hospitalization would be indicated for the treatment of radiation injury. The 25-rem whole-body (which has been identified earlier as the lower limit for a clinically observable physiological effect) and 300-rem thyroid figures correspond to the Commission's guideline values for reactor siting in 10 CFR Part 100."

requires clarification, to prevent the statement from being misconstrued to state that San Onofre does not meet the Commission siting guidelines of 10 CFR 100.

In order to clearly differentiate between the Class 9 accident and the design basis accidents used in the Commission siting criteria, specific clarification is needed. The traditional Design Basis Accidents (DBA's) are hypothetical and conservative scenarios, evaluated in accordance with regulations and other regulatory guidance which define the required assumptions and methodology. In contrast, the Class 9 accident scenario is defined with no consideration of mitigation by engineered safety features, assumes highly conservative and consequence maximizing behavior of natural mitigation processes. Since the Class 9 accident uses much more conservative, unrealistic, assumptions, it is not considered in the evaluation of reactor siting.

D

8103300332

A-71

D. G. Eisenhut

-2-

2. Although uncertainties in probability calculations are discussed in Sections 7.1.4.2 and 7.1.4.7 of the Supplement, the uncertainties in the source terms, and hence the consequences of the accident, are not discussed in either Section 7.1.4.3 or 7.1.4.7. These radiation source terms have been shown to be conservative by experiments performed at Rockwell, Karlsruhe, Oak Ridge National Laboratory, General Electric (Aircraft Nuclear Propulsion Department), Bettis National Laboratory, Hanford National Laboratory, and tests performed in the Idaho Reactor Test Site. The results of these tests and experiments, summarized in a paper by M. Levenson and F. Rahn of the Electric Power Research Institute, indicate that natural processes are operating which prevent the release of radioactive nuclides from molten nuclear reactor fuel (Reference 1). Dr. Chauncey Starr, former President of the Electric Power Research Institute advised the Commission, at the Commission's November 18, 1980 meeting in Washington, D.C., that,

"The important issue is that the initial review of this subject appears to indicate that under any conceivable realistic circumstance, the real source term is likely to result in risk to the public that is less by factors of 10 to 100 than that which was previously estimated."

Using Dr. Starr's estimate of a realistic maximum release into the atmosphere would lower the consequences (acute fatalities and cancer deaths) from a Class 9 accident by 1 to 2 orders of magnitude.

The Final Environmental Statement for San Onofre Units 2 and 3 should be accurate, concise, and not leave room for misinterpretation. Where applicable, all sources of error, and the relative magnitude of error, should be indicated. We hope that these comments will help to make the FES for SONGS 2 and 3 such a document.

Very truly yours,

K P Bush

A-72

APPENDIX B
NEPA POPULATION DOSE ASSESSMENT

Appendix B

NEPA POPULATION DOSE ASSESSMENT

Population dose commitments are calculated for all individuals living within 80 km (50 miles) of the facility employing the same models used for individual doses (see Regulatory Guide 1.109, in preparation). In addition, population doses associated with the export of food crops produced within the 80-km region and the atmospheric and hydrospheric transport of the more mobile effluent species such as noble gases, tritium, and carbon-14 have been considered.

B.1 NOBLE GAS EFFLUENTS

For locations within 80 km of the reactor facility, exposures to these effluents are calculated using the atmospheric dispersion models in Regulatory Guide 1.111 and the dose models described in Section 5.5 and Regulatory Guide 1.109. Beyond 80 km and until the effluent reaches the northeastern corner of the United States, it is assumed that all of the noble gases are dispersed uniformly in the lowest 1000 m (3280 ft) of the atmosphere. Decay in transit was also considered. Beyond this point, noble gases having a half-life greater than one year (e.g., Kr-85) were assumed to mix completely in the troposphere of the world with no removal mechanisms operating.

Transfer of tropospheric air between the northern and southern hemispheres, although inhibited by wind patterns in the equatorial region, is considered to yield a hemisphere average tropospheric residence time of about two years with respect to hemispheric mixing. Since this time constant is quite short with respect to the expected mid-point of plant life (15 years), mixing in both hemispheres can be assumed for evaluations over the life of the nuclear facility. This additional population dose commitment to the U.S. population was also evaluated.

B.2 IODINES AND PARTICULATES RELEASED TO THE ATMOSPHERE

Effluent nuclides in this category deposit onto the ground as the effluent moves downwind, which continuously reduces the concentration remaining in the plume. Within 80 km of the facility, the deposition model in Regulatory Guide 1.111 was used in conjunction with the dose models in Regulatory Guide 1.109. Site-specific data concerning production, transport, and consumption of foods within 80 km of the reactor were used. Beyond 80 km, the deposition model was extended until no effluent remained in the plume. Excess food not consumed within the 80-km distance was accounted for, and additional food production and consumption representative of the eastern half of the country was assumed. Doses obtained in this manner were then assumed to be received by the number of individuals living within the direction sector and distance described above. The population density in this sector is taken to be representative of the eastern United States, which is about 410 persons per km² (160 persons per mi²). (This approach is conservative for San Onofre because population densities in the western United States are considerably lower than those in the eastern portion.)

B.3 CARBON-14 AND TRITIUM RELEASED TO THE ATMOSPHERE

Carbon-14 and tritium were assumed to disperse without deposition in the same manner as krypton-85 over land. However, they do interact with an atmospheric residence time of 4 to 6 years with the oceans being the major sink. From this, the equilibrium ratio of the carbon-14 to natural carbon in the atmosphere was determined. This same ratio was then assumed to exist in man so that carbon-14 to natural carbon in the atmosphere was determined. This same ratio was then assumed to exist in man so that the dose received by the entire population of the United States could be estimated. Tritium was assumed to mix uniformly in the world's hydrosphere, which was assumed to include all the water in the atmosphere and in the upper 70 m (230 ft) of the oceans. With the model, the equilibrium ratio of tritium to hydrogen in the environment can be calculated. The same ratio was assumed to exist in man, and was used to calculate the population dose, in the same manner as with carbon-14.

B.4 LIQUID EFFLUENTS

Concentrations of effluents in the receiving water within 80 km of the facility were calculated in the same manner as described above for the Appendix I calculations. No depletion of the nuclides present in the receiving water by deposition on the bottom of the Pacific Ocean was assumed. It was also assumed that aquatic biota concentrate radioactivity in the same manner as was assumed for the Appendix I

evaluation. However, food consumption values appropriate for the average individual, rather than for the maximum, were used. It was assumed that all of the sport and commercial fish and shellfish caught within the 80-km area were eaten by the U.S. population.

Beyond 80 km, it was assumed that all of the liquid effluent nuclides except tritium have deposited on the sediments so they make no further contribution to population exposures. The tritium was assumed to mix uniformly in the world's hydrosphere and to result in an exposure to the U.S. population in the same manner as discussed for tritium in gaseous effluents.

APPENDIX C

EXPLANATION AND REFERENCES FOR BENEFIT-COST SUMMARY

Appendix C

EXPLANATION AND REFERENCES FOR BENEFIT-COST SUMMARY

C.1 ECONOMIC IMPACT OF STATION OPERATION

C.1.1 Direct benefits

C.1.1.1 Energy

2114 MWe x 1000 kW/MW x 365 days x 24 hr/day x capacity factor (0.5 or 0.7). This product ranges from 9.3×10^9 kWhr/year (0.5 capacity factor) to 13.0×10^9 kWhr/year (0.7 capacity factor).

C.1.1.2 Reduced regional oil consumption

Section 8.3.1 shows that the applicants primarily have oil/gas fired units, which would have to be operated to a greater extent if SONGS 2 & 3 are not operated. The additional fuel oil consumption (assuming a 50% capacity factor for the nuclear units) is calculated as follows:

$$\frac{9.3 \times 10^9 \text{ kWhr} \cdot 9,000 \text{ Btu/kWhr} \cdot 1 \text{ bbl oil}}{6.29 \times 10^6 \text{ Btu}} = 13.2 \times 10^6 \text{ bbl oil.}$$

C.1.2 Economic costs

C.1.2.1 Fuel

From Sect. 8.3.1, the staff's estimate of fuel cost is \$10.8 per megawatt-hour in 1983. Assuming a 60% capacity factor or 11.1×10^6 MWhr/yr gives the value in Table 10.1.

C.1.2.2 Operating and maintenance

Using the staff's OMCST computer code, operating and maintenance costs are estimated to be 4.05 mills/kWhr at 60% capacity, which multiplied by 11.1×10^9 kWhr/year gives the values in Table 10.1.

Decommissioning: Based on estimates given in Sect. 9.4, the cost of decommissioning each unit will be \$66.7 million in 1978 dollars or \$85.4 million in 1980 dollars at the end of the useful life of the plant. If this value is discounted from 2013 to 1983, then annualized over a 30-year life assuming a real interest and discount rate of 4.76%, and then multiplied by 2 units, the value in Table 10.1 is obtained.

APPENDIX D
CULTURAL RESOURCES

