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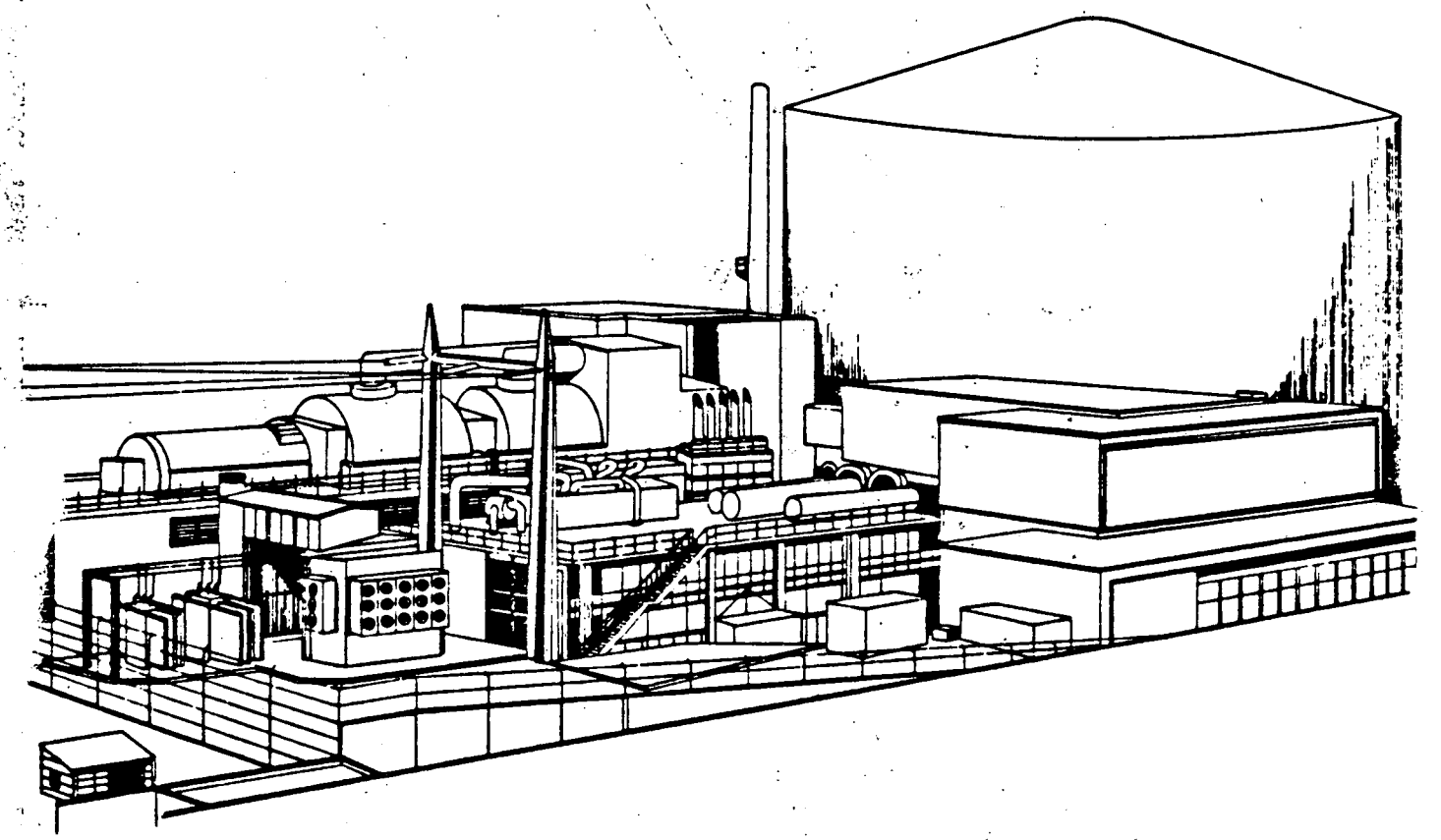
ANNUAL OPERATING REPORT
OF
SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1
For 1982

RADIOLOGICAL ENVIRONMENTAL MONITORING EVALUATION



Southern California Edison Company
San Diego Gas and Electric Company

Docket No. 50-206
License No. DPR-13

MARCH 30, 1983

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

TELEPHONE
(213) 572-1401

March 30, 1983

U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region V
1450 Maria Lane, Suite 210
Walnut Creek, California 94596-5368

Attention: Mr. R. H. Engelken, Director

Docket No. 50-206
San Onofre Unit 1

Dear Sir:

Enclosed are three copies of the radiological environmental monitoring related report entitled,

"Annual Operating Report for 1982 - Radiological Environmental Monitoring Evaluation"

This report provides detailed environmental impact analyses and data and is submitted in accordance with the requirements of San Onofre Nuclear Generating Station Provisional Operating License No. DPR-13, Appendix B, Section 5.6.1.

Please contact me if you have any questions concerning this report.

Very truly yours,

K P Baskin

Enclosures

cc: Director of Nuclear Reactor Regulation (17)
L. Miller (NRC Site Inspector)
H. T. Sipe, California Public Utilities Commission
California Regional Water Quality Control Board - San Diego Region
J. O. Ward, California Department of Health Services

ANNUAL OPERATING REPORT

SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1

FOR 1982

RADIOLOGICAL ENVIRONMENTAL MONITORING EVALUATION

Prepared by:

Southern California Edison Company

San Diego Gas and Electric Company

Docket No. 50-206

License No. DPR-13

Southern California Edison Company
P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

KENNETH P. BASKIN
VICE PRESIDENT

TELEPHONE
213 572 1401

November 1, 1983

U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region V
1450 Maria Lane, Suite 210
Walnut Creek, California 94596-5368

Attention: Mr. John B. Martin, Regional Administrator

Gentlemen:

Subject: Docket No. 50-206
San Onofre Nuclear Generating Station, Unit 1
1982 Annual Radiological Environmental Monitoring Report
and
Docket No. 50-361
San Onofre Nuclear Generating Station, Unit 2
1982 Annual Radiological Environmental Monitoring Report

Pursuant to Section 5.6.1.C. of Appendix B, Environmental Technical Specifications to Provisional License DPR-13 for San Onofre Unit 1, and to Section 5.9.1.6 of Appendix A, Technical Specifications to License NPF-10 for San Onofre Unit 2, the subject reports were submitted on March 30 and April 30, 1983, respectively. During a Quality Assurance review of the submitted document, a few errors and omissions were detected. Enclosed are errata sheets which correct those errors.

Very truly yours,

Enclosures

cc: Director of Nuclear Reactor Regulation (17)
L. Miller (NRC Unit 1 Resident Inspector)
A. E. Chaffee (NRC Unit 2 Resident Inspector)
M. T. Sipe, California Public Utilities Commission
California Regional Water Quality Control Board - San Diego Region
J. O. Ward, California Department of Health Services

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I. INTRODUCTION

During the period January 1 to December 31, 1982, an Operational Radiological Environmental Monitoring Program was conducted by San Onofre Nuclear Generating Station (SONGS). This program was designed to identify and quantify concentrations of radioactivity in various environmental media and to quantify ambient radiation levels in the environs of SONGS. Unit 1 became critical in 1968 and has been in operation until February 2, 1982. Due to seismic modification backfits, Unit 1 did not operate during the period between February 3, 1982 and December 31, 1982. Unit 2 became critical on July 26, 1982 and began ascension testing. The power level of Unit 2 did not exceed 20% of rated full thermal power.

During the operational phase, the program will monitor the operations of SONGS Units 1, 2 and 3, to fulfill the requirements of the SONGS Environmental Technical Specifications (ETS). This report presents the results of thermoluminescent dosimetry and radiochemical analyses of environmental samples collected during 1982.

A large number of analyses were performed on different environmental samples during the period covered by this report. Samples of air particulates, air iodine, drinking water, sediment, beach sand, kelp, fish, crustaceans, ocean water, local crops, soil, and jackrabbit were collected and analyzed. Thermoluminescent dosimeters (TLD) were used to measure the external radiation levels. A variety of radionuclides, both naturally-occurring and man-made, were detected in the above samples. Results at indicator stations compared favorably to control stations. It was concluded that the radiological characteristics of the environment around SONGS were not affected by the operation of SONGS Units 1 during 1982.

A. The Program

In the operational phase of the Radiological Environmental Monitoring Program (REMP), the program was conducted in accordance with Section 3.2 of the SONGS (ETS). Radioanalytical data were also analyzed to detect the presence and trends of any radioactivity in environmental samples. Correlation of liquid and gaseous effluent activity levels was made with the environmental activity levels in order to study the station impact, if any, on the environment.

B. Objectives

The objectives of the operational REMP are:

1. To fulfill the obligation for radiological surveillance required by SONGS ETS.

2. To determine whether any significant increase occurs in the concentration of radionuclides in critical pathways.

3. To detect any change in ambient gamma radiation levels.

4. To verify that SONGS operations have no detrimental effects on the health and safety of the public or on the environment.

C. Sample Collection

In order to meet the stated requirements (objectives), an appropriate operational REMP was developed for SONGS. Samples of various media were selected to obtain data for the evaluation of the radiation dose to man and other organisms. The selection of sample types was based on established critical pathways for the transfer of radionuclides through the environment to man, experience gained during the preoperational phase, and evaluation of the data during the operational phase. Sampling locations were determined from site meteorology, local demography, and land uses (land use census).

Sampling locations were divided into two classes - indicator and control. Indicator stations are those which are expected to manifest station effects, if any exist; control samples are collected at locations which are believed to be unaffected by station operations. Fluctuations in the levels of radionuclides and direct radiation at indicator stations are evaluated with respect to analogous fluctuations at control stations, which are unaffected by the station operations. Indicator- and control-station data are also evaluated relative to preoperational data whenever possible.

D. Sample Analysis

The environmental samples are collected at different locations around SONGS and then submitted to a contracted radiological laboratory Environmental Analysis Laboratory Corporation (EAL) located in Richmond, California.

The analytical methods utilized in this program which are described in EAL procedures manual may be obtained from EAL Corporation.

A portion of Radiological Environmental Monitoring Program is also devoted to quality control, including process quality control, instrument quality control, inter-laboratory cross-check analysis, and comprehensive data review. Results of the EPA inter-laboratory comparison program appear in Appendix D. Within the data tables (Appendix H), an approximate 95% ($\pm 2\sigma$) confidence interval is supplied for those data points above the lower limit of detection (LLD). These intervals represent the range of values into which,

95% of analytical results would fall. Results of each type of sample are grouped according to the analysis performed. Means, ranges, and standard deviations are calculated using standard statistical methods in the format specified in Regulatory Guide 4.8 (Appendix A). Sample type and sampling location are listed in Appendix B. These tables have been obtained from the SONGS Unit 2 Offsite Dose Calculation Manual (ODCM). Appendix C lists all the radionuclides whose activities exceed twice the activity of the background level, i.e., the control locations. For TLD results, any value greater than 1.25 times the control location will be cited. In instances when the control location reported value is less than LLD, indicator values will be cited whenever reported activity exceeds twice the control location LLD. These LLD values can be obtained from Appendix A. Correlation of effluent release with environmental concentration of specific radionuclides is also made in order to evaluate the release impact of the plant operation on the environment (Appendix F). Appendix E indicates the comparison between different locations (control and indicator) and also compares the operational data with preoperational, whenever possible. Appendix H lists data obtained for each individual sample (raw data).

II. RESULTS AND DISCUSSION

The radioanalytical results of the 1982 REMP samples are divided into categories based on exposure pathways such as airborne, direct radiation, water, aquatic, and ingestion. For comparison of the environmental concentrations with the reporting levels, Unit 2 reporting level values of the ETS have been used since these values are more conservative than the Unit 1 ETS reporting levels.

A. Assessment of Radiological Impact of Plant Operation on the Environment

1. Airborne Radioiodine

Iodine in air was sampled by adsorption on charcoal catridges. The weekly samples collected on charcoal air filters showed no detectable iodine. All results for I-131 were below the LLD. The LLD was 0.04 pCi/m^3 of air collected on the charcoal filter. A total of 312 charcoal filters were analyzed. It is concluded that the radioiodine release at the station has no impact on this medium.

2. Airborne Particulates Activity

Airborne particulate samples were collected on co-polymer fiber filters (acropor type AN-800) with an air sampler. A total of 312 filters were analyzed throughout 1982. Air sample volumes were measured with calibrated dry-gas meters corrected to (20^oC) and standard pressure. The air particulate filters were collected on a weekly basis for gross beta analysis at five sampling indicator locations and one control station (Huntington Beach).

Weekly gross beta analyses showed concentrations ranging from 0.003 to 0.063 pCi/m^3 for all indicator locations. The gross beta activity averaged 0.020 pCi/m^3. The lower limit of detection was 0.001 pCi/m^3 (Appendix A).

No significant change in gross beta activity occurred as seen in Figure 1, although there was some significant fluctuation throughout the year. As is seen in Figures 1 and 2, the gross beta activity in San Clemente had a peak in March (0.12 pCi/m^3). This activity may be attributable to the environmental or seasonal factors and is not plant related since other indicator stations do not show any unusual levels. Measured gross beta activity between the other indicator (Figures 2, 3, 4, 5, and 6) and the control locations (Figure 7), showed no major differences, thus indicating no contribution from the plant release. Gamma spectral analysis of quarterly composite samples showed the

presence of cosmogenic Be-7 with a range of 0.034 to 0.188 pCi/m^3. Cesium-137 on air filter composites was not detected at any locations (LLD = 0.001 pCi/m^3). The Sr-89 and Sr-90 analyses were also performed on the composited samples. No significant activity was noted so the plant effect is minimal.

Weekly filters were composited quarterly and were analyzed for gross alpha, Sr-89, and Sr-90. A Ge(Li) scan was also performed on composites for specific gamma emitters. The range of gross alpha activity in all locations was 0.0010 to 0.0045 pCi/m^3 with an average standard deviation of 0.0002 pCi/m^3. The average gross alpha activity of all the indicator locations was 0.0025 pCi/m^3 where in Huntington Beach Control location it was 0.0024 pCi/m^3, not significantly different. Therefore, it is concluded that this activity is not plant related and may be due to other environmental factors.

3. Direct Radiation

Gamma exposure measurements were made quarterly and annually at 59 locations. Dosimeters were located at a number of onsite locations as well as at outer locations. Each packet contained four dosimeters for a total of 1180 analyses. For the monthly analyses, calcium sulphate ($CaSO_4$) TLD were used where for the annual analysis, lithium fluoride (LiF) dosimeters were used. All TLD results presented in this report have been normalized to a standard month to eliminate the apparent difference caused by variations in exposure period. A comparison of the direct radiation data for 1981 shows the same average monthly dose as 1982 for both indicator and control stations. The data for 1982 exhibit no significant difference between the offsite and onsite locations, thus indicating no offsite effects from plant operations. The control station in Huntington Beach averaged 27.9 millirem over four quarters while the visitor center and the south southwest boundary averaged 22.7 and 23.2 millirem respectively. Annual TLD's measured an average of 109.4 millirem in the Huntington Beach control location.

4. Drinking Water

Monthly drinking water samples were collected at a local reservoir, a local well, and at a control station (Huntington Beach). Gross alpha and gross beta analyses were performed on both the solids and filtrate. Drinking water samples were composited quarterly and the composited solids and filtrate were again analyzed for gross alpha and gross beta activities. The composite filtrate was also analyzed for tritium. No samples were found to contain strontium or gamma

emitters equal to its action levels (action levels in Appendix H). The control location in Huntington Beach was consistently 20 to 25% lower than the local stations. This difference is attributable to the variations in the levels of naturally-occurring potassium-40, a beta emitter. The gamma spectral analysis did not show the presence of any specific radionuclides. Most of the gross beta activity in the water samples was found in the filtrate (mostly K-40). In general, the activity concentrations in the filtrate were an order of magnitude higher than the activity in the suspended solids. The gross beta activity of the filtrate and the solids were averaged for each locatin over 12 months and are as below:

	Gross Beta Activity			
	Filtrate (pCi/l)		Solids (pCi/l)	
Location	Mean ± 1	Range	Mean ± 1	Range
Tri-cities Municipal Reservoir	14.5 ± 4.2	8 - 21	1.1 ± 0.4	0.6 - 2.0
San Clemente Well	13.1 ± 3.4	10 - 19	0.8 ± 0.3	0.6 - 1.5
Huntington Beach (Control)	9.6 ± 4.2	5 - 21	1.0 ± 0.3	0.6 - 1.4

Statistical analysis of the above data indicates no significant difference between the control and indicator stations. Comparison of the 1982 data with the previous four year's data (1978-1981) did not reveal any statistically-significant differences except normal seasonal variations.

The gross alpha activity of the drinking water filtrate and solids were less than LLD (3 pCi/l for the filtrate and 0.2 pCi/l for solids) except in two locations. Tri-Cities Municipal Reservoir was reported to have a gross alpha activity of 0.4 ± 0.1 pCi/l in solids and a sample from the Huntington Beach control station that had a gross alpha activity of 3 ± 1 pCi/l in the filtrate. These values are within the range of 2.0 to 6.0 pCi/l over the 4-year period (1978-1981). This positive activity was observed in 5 samples out of 48 total.

No detectable concentrations of tritium were observed in any of the samples except one sample from Tri-Cities Municipal Water Reservoir, where the tritium activity of the filtrate was 200 pCi/l in the month of June 1982. This tritium activity is 100 times smaller than ETS value (reporting level - 20,000 pCi/l) for tritium in drinking water, and does not exceed the twice LLD of the control location (100 pCi/l). No other samples contained tritium activity in excess of the LLD for tritium (100 pCi/l). No radionuclides were detected by gamma spectral analysis in any of the samples analyzed. Iodine-131 was not observed in any of the water samples and its lower limit of detection was 2 pCi/l. It is concluded that the plant had no negative impact on the drinking water in the environment.

5. Ocean Water

Ocean water was collected monthly at three locations directly over Units 1, and 2/3 outfall and at one control station. Gross beta analysis was performed on the bimonthly samples and tritium analysis was performed on quarterly-composite samples. All samples analyzed showed no detectable level of cesium-137 or tritium. Monthly gamma spectral analysis did not detect the presence of any specific radionuclides except naturally-occurring potassium-40. The range of gross beta activity (mostly K-40) in ocean water was from 640 to 1010 pCi/l. The LLD for both Cs-134 and Cs-137 was 6 pCi/l.

Quarterly composites did not show any detectable tritium and its lower limit of detection was 100 pCi/l. It should be mentioned that ocean water samples for the month of April 1982 were not collected and therefore no results were available.

6. Shoreline Sediment (Beach Sand)

Beach sand samples were collected semi-annually at four locations and gamma spectral analysis was performed. The analysis showed the presence of naturally-occurring radionuclides in the uranium (4n + 2) and thorium (4n) decay series. No man-made radionuclides were observed. The gamma spectral analysis showed the presence of naturally-occurring K-40 in the range of 13 to 20 pCi/g dry-weight basis and radium-226 in the range of 0.14 to 1.27 pCi/g dry. Gamma spectral analyses idenfied no other detectable radionuclides. No contribution from the plant was observed in this medium.

7. Ocean Bottom Sediment

Ocean bottom sediment was collected semi-annually at five locations, including one control station. Gamma spectral analysis was performed on all samples. The presence of small quantities of cobalt-60 and cesium-137 were detected. The highest measured value for Co-60 was 0.58 nCi/kg dry at Unit 1 outfall (up coast) in the month of June 1982. In December, the Co-60 activities were 0.13 nCi/kg dry at Unit 1 outfall (up coast) and 0.15 nCi/kg dry at Unit 1 outfall (down coast) respectively.

The highest Co-60 activity is approximately 20 times less than the reporting level and the highest Cs-137 activity is lower than the reporting level. The potassium-40 activity measured by gamma spectrometry ranged from 14-17 nCi/kg dry weight. Natural radium-226 and thorium-228 were also found in the sediment with maximum activities of 0.67 and 0.66 nCi/kg dry weight. In conclusion, the station impact is considered minimal.