

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos.: 50-206/92-01, 50-361/92-01, 50-362/92-01

License Nos.: DPR-13, NPF-10, NPF-15

Licensee: Southern California Edison Company (SCE)  
Irvine, California 92718

Facility Name: San Onofre Nuclear Generating Station (SONGS) Units 1,2, and 3

Inspection at: SONGS Site, San Diego County, California

Inspection Conducted: January 6-10, 1992

Inspector: G.P. Yuhes 1/31/92  
H. D. Chaney, Senior Radiation Date Signed  
Specialist

Approved by: G.P. Yuhes 1/31/92  
G. P. Yuhes, Chief, Reactor Date Signed  
Radiological Protection Branch

Inspection Summary:

Areas Inspected: Routine unannounced inspection of the licensee's radiation protection (RP) program involving: licensee actions on previous inspection findings, external and internal dosimetry, radioactive liquid and gaseous effluent releases, process and effluent monitor calibrations, RP instrument calibration program and facilities, ALARA planning associated with the upcoming Unit 3 Cycle 6 (U3C6) outage and the ALARA performance attained during the U2C6 outage, ALARA goals for 1992, and contract RP technician training. NRC Inspection Procedures 83750, 84750, 83724, 83727, 83728, and 92701 were used.

Results: The licensee continues to conduct a progressive RP program. The licensee's accomplishments in the areas of self assessment and surveillances, radiological work planning (ALARA program), resolution of technical issues, and human resource development are notable. The licensee's RP programs are effective in meeting the licensee's and the NRC's safety objectives. The licensee has evaluated their problems associated with the monitoring of airborne radioactivity and has implemented a long term evaluation and development program to correct airborne radioactivity monitoring inconsistencies. One violation concerning the failure to post a radiation area in accordance with licensee procedures was identified (see discussion in paragraph 6.0 of this report). No deviations were identified during this inspection.

## DETAILS

### 1. Persons Contacted:

#### SCE Personnel:

- \*H. Morgan, Vice President and Site Manager
- \*T. Adler, HP Supervisor, Units 2 and 3
- \*S. Allen, Dosimetry Supervisor
- \*C. Bailey, HP Engineer
- C. Bostrom, Technical Training Manager
- \*L. Bray, HP Engineer
- \*D. Brevig, Onsite Nuclear Licensing Supervisor
- \*M. Farr, Onsite Licensing Engineer
- \*J. Fee, Assistant Health Physics (HP) Manager
- \*P. Knapp, Manager Site HP
- \*R. Krieger, Station Manager
- \*T. Michatov, Instruments and Controls Supervisor
- \*S. Paranandi, QA Supervisor
- \*J. Rolph, Health Physics Instrument Supervisor
- \*A. Tally, HP Supervisor, Unit 1
- \*K. Yhip, Effluent Engineering Supervisor
- \*D. Warnock, Assistant HP Manager

#### Others:

- \*D. Solerio, NRC Resident Inspector

(\*) Denotes those individuals that were at the exit meeting held on January 10, 1992. Additional licensee personnel were contacted and present at the exit meeting but are not reflected in the above listing.

### 2. Follow-up on Previous Inspection Findings (92701)

(Closed) Follow-up Item 50-206/91-14-01: "Implementation of Dosimetry Specialist Qualification Manuals for Contractors" - This item was previously discussed in NRC Inspection Report No. 50-206/91-14 and involved an inspector's determination that very little attention was being applied to the completion of qualification manuals for contract dosimetry specialists in the radiation exposure records group. The licensee has increase its attention in this area, and approximately fifty percent of the contract dosimetry specialists have completed their modified qualification manuals. This item is closed.

(Open) Follow-up Item 50-362/90-31-02: "Intercomparison of Sr-89/90, Fe-55 and Tritium Analyses Results" - This item was previously discussed in NRC Inspection Report No. 50-362/90-31, and involved the splitting of liquid radioactive waste (LRW) samples and comparison analysis results between licensee and the NRC contract laboratory. The inspector compared the licensee's results (tritium dated August 8, 1990, and for Sr-89/90 and Fe-55 dated December 12, 1990) to the results for the same radioisotopes analyses performed by the NRC contract laboratory (U.S.

Department of Energy Radiological Environmental Sciences Laboratory (RESL), Idaho Falls, Idaho).

Both RESL and the licensee reported no detectable Sr-89/Si-90 activity, therefore no comparison was made. The Fe-55 and tritium results were both in disagreement as noted below: (values are in microCuries per milliliter)

SAMPLE	NUCLIDE	NRC VAL	NRC ERR	LIC VAL	LIC ERR	RATIO	RESULT
LRW	Fe-55	2.25E-06	7.00E-08	8.50E-07	5.50E-07	0.38	0
Tank	H-3	2.43E-01	3.00E-03	1.47E-01	-----	0.60	0
TO-57							

The licensee's values for Fe-55 and tritium are non-conservative. The licensee did not report the degree of uncertainty in the tritium results. The NRC's criteria for making determinations of agreement/disagreement are discussed in the aforementioned NRC Inspection Report associated with this item.

This item will remain open pending further NRC review of the licensee's performance in this area.

(Closed) Follow-up Item 50-206/91-31-01: "Air Sampling in the Mechanical Decontamination Facility Phase Two Building" - This item was previously discussed in NRC Inspection Report No. 50-206/91-31 and involved an inspector observation that the placement of the low volume air sampler was inconsistent with the location of airborne radioactivity generating work in the facility. The licensee had modified and relocated the air sampler to a location that would better assure that airborne radioactivity generated during the loading of non-compatible waste boxes was properly monitored. This item is closed.

(Closed) Follow-up Item 50-206/91-35-01: "Root Cause Analysis and Internal Dose Assessment" - This item was previously discussed in NRC Inspection Report No. 50-206/91-35 and concerned the licensee's follow-up and evaluation of the internal uptake of radioactive materials by approximately 32 individuals during a Unit 1 Mode 3 outage in October 1991. Twenty-eight persons had radioiodine uptakes that exceeded (by a factor of two) the projected uptakes that were based on air sampling data. The inspector held discussions with responsible HP engineers concerning the root-cause and internal dose assessments for the incident. As stated in NRC Report 91-35 only 3 individuals were found to have multiple isotopic intakes/exposures greater than 40 MPC-hrs (40, 43, and 53 MPC-hrs). Radioiodine was identified as the major contributor in the uptakes. The licensee's findings accurately identify the cause of the radioiodine uptakes and why concurrent air monitoring did not detect the excessive concentrations (iodine plateout on/in the skin of workers, the lack of a method to determine the uptake via skin absorption, the release of significant concentrations of radioiodine from plant surfaces during decontamination, and less than optimal work area airborne radioactivity monitoring during work operations). The licensee's lessons learned and corrective actions appear adequate to eliminate and/or control future exposures during similar work situations. The dose evaluations of the 3 highest exposed persons were

discussed (highest individual collective intake of 53 MPC-hrs consisted of 8.89 MPC-hrs of particulate, 15.03 MPC-hrs of tritium, and 40.94 MPC-hrs of iodine radioactivity) and evaluated by the inspector. The licensee's bioassays and dose assessments agreed with the methods recommended in NRC Regulatory Guides (RG) 8.20, "Applications for Bioassay for I-125 and I-131," and RG 8.26, "Applications for Bioassay for Fission and Activation Products." No violation of the requirements of 10 CFR Part 20.103, "Exposure of individuals to concentrations of radioactive materials in air in restricted areas," were identified. The inspector noted that during the recent Unit-1 Reactor Coolant Pump Flywheel ISI outage (November 17, 1991) similar decontaminations involving the removal of boric acid accumulations from component surfaces were performed by mechanical means only and no excessive liberation of radioiodines or other airborne aerosols from surfaces were detected. This outage was completed in 3 days without any personnel contaminations other than noble gas related ones. While the licensee's root-cause-analysis did identify shortcomings in their ability accurately evaluate airborne radioactivity and assign individuals appropriate exposures no violations of 10 CFR Part 20 regulations were noted. This item is closed.

### 3. Occupational Exposure (83750)

The licensee's occupational radiation exposure control and radiation protection program were examined to determine compliance with the requirements of the Operating License Technical Specification (TSs) 6.3.1, 6.4, 6.5.3, 6.8 of the respective Units (1, 2 & 3); and agreement with the commitments contained in Sections 12.2.3 of the Unit 1 Updated Final Safety Analysis Report (UFSAR) and Section 12.5.3.6 of the Units 2/3 UFSAR.

#### a. Audits and Appraisals

Discussions were held with the Nuclear Oversight Division Site Quality Assurance (NOD Site QA) personnel responsible for performance of surveillances and auditing of the licensee's radiation protection program. Selected RP Program assessment activities since the last inspection were reviewed. The licensee's 1992 audit and assessment plan, and the Unit 3 Cycle 6 outage surveillance plan were examined. The following Surveillance Reports were examined:

- ° SOS-188-91, Radiological Controls - Control of Airborne Radioactivity, November 16-18, 1991
- ° SOS-178-91, Unit 1 Containment Mini-purge, November 13, 1991.
- ° SCES-039-91, Units 1, 2 & 3 Chemistry and Radiochemistry Programs, December 1991.

These surveillances were of adequate detail and depth. Findings noted included: control and accountability of worker urine samples for tritium bioassay, recording of air sampler flow data, and documentation of HP data for worker termination reports. The

inspector was provided Site Performance Assessment Reports for the first 3 quarters of 1991 for review. QA activities continue to be a valuable asset to the licensee's ability to conduct a high quality RP Program.

b. Changes (83750 and 83724)

No significant organizational or facility changes have taken place since these areas were last reviewed (NRC Inspection Report No. 50-206/91-35). The licensee continues to implement a significant cross training program for HP managers and supervisors. Currently the Site HP Manager and a senior HP supervisor are attending a 13 week plant systems training program.

The licensee informed the inspector that in approximately 3 months they would be switching from the use of self-reading pocket ion chambers (standard industry equipment) to the use of a digital alarming pocket type dosimeter for tracking employee exposures between processing of the official personal dosimeter (TLD). The inspector examined the licensee's evaluation of the electronic dosimeters (Geiger-Mueller type detector). The licensee's evaluations (calibration, shock and humidity tests, and in situ comparison with the licensee's personal dosimeters-TLDs) appeared to address the concerns recently raised by the NRC in communications to licensee's concerning use of such dosimeters in areas with high humidity and excessive radiofrequency interference (NRC I&E Information Notice No. 91-60, "False Alarms of Alarm Rateometers Because of Radiofrequency Interference"). The dosimeters meet the guidance set forth in NRC RG 8.28, "Audible-Alarm Dosimeters."

c. Training and Qualification

The inspector examined the experience and qualifications of selected contracted HP technicians (HPTs). The licensee's development and conduct of training for contract HPTs in support of the Unit 3 Cycle 6 (U3C6) refueling outage were examined, also. The licensee's creation and implementation of training for the position of HP Instrument Technician was examined. Task analysis and performance based training were included in the position development process. The inspector examined position qualification requirements and position descriptions. Successful candidates for the HPI technician positions must pass a screening examination on HP and instrument theory as part of the selection criteria.

d. Internal Exposure Control (83750)

The licensee's internal dosimetry program was examined to determine its ability to meet NRC guidance and industry standards (NRC Regulatory Guide (RG) 8.32, "Criteria for Establishing a Tritium Bioassay Program," RG 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," RG 8.20, "Applications of Bioassay for I-125 and I-131," and RG 8.26, "Application of Bioassay for Fission and Activation Products," and ANSI N343-1978,

"American National Standard for Internal Dosimetry for Mixed Fission and Activation Products, respectively).

The inspector held discussions with RP staff members and examined the documentation associated with the exposure evaluations for thirty-four workers to varying concentrations of radioiodines, noble gases, tritium (HTO), and particulate airborne radioactivity in October 1991; see Follow-up item above for more details. The review included the verification that the licensee's calculated intake for the one worker with the highest collective intake, (approximately 53 MPC-h) was in agreement with results obtained by the inspector. The inspector used NRC methods and guidance in NUREG/CR-4884, "Interpretation of Bioassay Measurements," and NUREG-0938, "Information for Establishing Bioassay Measurements and Evaluations of Tritium Exposure." The licensee's intake values were based on the results obtained by whole body counting and urinalysis bioassays. The licensee's derived intake values (using the INDOS computer code) for radioiodine (major contributor) and HTO were found to be in close agreement with the inspector's results.

e. Control of RAM and Contamination, Surveys, and Monitoring

The inspector examined the radiological controls and work activities associated with cleaning out of the Unit-1 yard sump and Unit 3 Holdup Tank No. 258. Radiological survey results (area radiation, air samples, and gamma spectrometry of samples) and Radiation Exposure Permit requirements were reviewed.

f. Maintaining Occupational Exposures ALARA

(1) ALARA Results

The inspector reviewed the ALARA training provided to workers and HP engineers, examined the licensee's newly implemented Hot Spot Trending Program (S0123-VII-3.4), and the licensee's person-rem performance for 1991, and the U2C6 refueling outage. The licensee's expenditure goals for the upcoming U3C6 refueling outage and the 1992 SONGS person-rem exposure goals were also reviewed. The inspector noted that the Hot Spot Trending Program was very active and several (6-8) hot spots in various units have been removed by a coordinated effort of the Reactor Operations and HP Departments.

The licensee completed 1991 expending approximately 459 person-rem (fourth quarter pocket dosimeter data) which was significantly below their goal of 680 person-rem. The licensee felt that their 1991 goal was a realistic projection. Their 1992 goal is currently set at 466 person-rem. The U2C6 outage expended approximately 175 person-rem and lasted 95 days. The U2C6 outage goal was 239 person-rem. The licensee attributed the use of robotics in the steam generator work as a significant contributor to the dose savings.

(2) ALARA Reviews, and Planning and Preparation

The U3C6 outage planning was examined, including staffing, specialized equipment needs, and special HP work packages for jobs with the potential for high dose expenditures. The ALARA goal for this 77 day outage is 192 person-rem. The work packages are very similar to those encountered in the U2C6 outage. The inspector held discussions with an HP Engineer preparing Work Control Plan (WCP) 92-004 for the hydrostatic bearing inspection on U3 reactor coolant pumps (RCPs) during the U3C6 outage. Lessons learned during the U2C6 outage were being applied in the area of special shielding for RCP heat exchangers. The planning and WCP demonstrated a high degree of expertise and quality. This job exceeded the established goal of 6.36 person-rem during the U2C6 outage by approximately 33 percent. A post job review (documented) identified several areas (lifting of the heat exchanger, failed tools, and unexpected high doses incurred by the inspecting engineers) where improvements could be made to both control and reduce future exposures.

The following draft WCPs were examined by the inspector:

- WCP 92-001, "Primary Side Steam Generator Work"
- WCP 92-002, "Upper and Lower Cavity Decontamination"
- WCP 92-003, "ICI Cut-up and Removal"
- WCP 92-005, "Unit 3 Fuel Reconstitution"

The WCPs showed a serious commitment to implementing a high quality exposure reduction and work planning program (ALARA).

The controls in the above WCPs appeared sufficient to prevent the problems addressed in NRC I&E Information Notices No. 90-33, "Sources of Unexpected Occupational Radiation Exposures at Spent Fuel Storage Pools," No. 90-47 Unplanned Radiation Exposures to Personnel Extremities Due to Improper Handling of Potentially Highly Radioactive Sources," and No. 88-63, Supplement 2 (June 1991), "High Radiation Hazards From Irradiated Incore Detectors and Cables."

No violations or deviations were identified in this area.

4. Radioactive Waste Treatment, and Effluent and Environmental Monitoring (84750)

The inspector examined recent calibration documentation of the following process and effluent monitors:

- S023-XXV-4.16, Surveillance Requirement Liquid RW Effluent Loop 2/3-RI-7813, dated January 6, 1992.

- S023-XXV-4.23, Surveillance Requirement Channel Calibration of Turbine Plant Area Sump Radiation Monitor Loop 2/3 7821, dated January 7, 1992.

Traceability of calibration source used and instrument response comparisons between calibrations were examined and discussed with I&C personnel. Alarm and trip functions of each monitor agreed with ODCM values and requirements.

I&C personnel pointed out to the inspector some initiatives they were taking to develop better components (microprocessor cards) for their aging process and effluent monitors.

No violations or deviations were identified in this area.

#### 5. Facilities and Equipment (83727)

The inspector examined the HP Department's portable and laboratory type radiological survey instrument calibration program and facilities, to determine if they are adequate to support the radiation protection program.

The licensee's procedures for implementing the HP Instrument (HPI) program were examined. Qualifications of supervising personnel, engineers, and those performing calibrations and repairs were reviewed. Inventories of instruments and their availability were examined. The licensee had made a significant improvement over past performance in the area of instrument availability.

The inspector noted that the licensee had developed a HPI technician position for the HPI program and was currently evaluating and selecting personnel to replace contracted HPI technicians.

The inspector observed calibrations of randomly selected portable instruments and verified that procedures used were current. The HPI technician performing calibrations possessed above average experience and formal education in instrument theory. Calibration procedures were found to implement the guidance contained in industry standard ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration." The licensee utilizes commercially manufactured calibrators employing several hundred curies of cesium-137. Shielding and interlocks ensure radiation levels are kept safe and ALARA. Neutron dose rate meters have been response checked by an offsite calibration laboratory to the spectrum produced by a moderated californium 252 source. The licensee conducts frequent instrument response checks using a high energy beta source. High range (1000 R/hr) instruments are response checked weekly using cesium sources in the calibrators and daily using the high energy beta sources. The inspector noted the instruments were inventoried, stored, and labeled appropriately. The inspector noted during the review of several procedures for the operation and calibration of air samplers that there was no reference to the evaluation of the overall error associated with their calibration as recommended in NRC RG 8.25, "Calibration and Error Limits of Air Sampling Instruments for Total Volume of Air Sampled." Knowledgeable HP department personnel recalled

that the error propagation reference in the RG was performed many years earlier, but they could not find the documentation. The HPI staff perform an error evaluation following the guidance of the RG and concluded that the overall error associated with the calibration of the samplers was within the 20 percent referenced in the RG. The licensee further informed the inspector that HP procedures routinely do not reference developmental material, but such references were kept with a procedure's development history documentation. Overall, the inspector found the HPI Program was adequately staffed and conducted.

No violations or deviations were identified in this area of the inspection.

#### 6. Facility Tours

The inspector performed independent dose rate measurements of areas inside and outside of Units 1, 2 & 3. These measurements were made using a Geiger-Mueller type detector equipped instrument (Xetex Model 305B, NRC Serial No. 008332, due for calibration May 12, 1992).

The inspector noted that postings in nearly all areas (30-50) visited were conducive to alerting workers to the radiological status of areas.

On January 9, 1991, during a tour of the area adjacent to the Unit 3 reactor containment equipment hatch the inspector noted that a large container inside of a posted "Radioactive Material Area" was labeled as having a contact radiation dose rate of 30 millirem per hour (mrem/hr). The inspector determined that the container produced radiation dose rates of approximately 6.0 mrem/hr at approximately 30 centimeters (12 inches) from the surface of the container. The HP Supervisor accompanying the inspector verified the finding with his own radiation monitoring instrument. The HP Supervisor immediately had the area posted as a "Radiation Area" and requested that a detailed survey of the container be made. The status of the area prior to this finding was researched to determine how long it had existed. According to a documented radiation survey conducted at 10:00 P.M. on January 8, 1991, the area was then posted as a "Radiation Area." Therefore, the area may have existed for greater than one hour.

SONGS Unit-3 Technical Specification 6.11, states that "Procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR Part 20 and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure."

SONGS Health Physics Procedure S0123-VII-7.4, "Posting," Revision 16, dated August 20, 1991, paragraph 6.1, "Radiological Posting Requirements," and paragraph 6.1.2, "Radiation Area," states, in part, that each accessible area having radiation levels greater than or equal to 2.5 mrem/hr measured at 30 cm from the source or sources, shall be identified as a Radiation Area and shall be conspicuously posted with a sign bearing the radiation caution symbol and the words: "CAUTION RADIATION AREA"

The apparent failure to properly post an area with radiation levels in excess of 2.5 mrem/hr is an apparent violation of Technical Specification 6.11. (NOV 50-362/92-01-01)

The inspector noticed, during tours of all units, that housekeeping is receiving more emphasis and cleanliness is very high. Discussions were held with housekeepers about their knowledge of radiological postings and cleaning methods inside of potentially contaminated areas. Areas outside of the units radiologically controlled spaces do not appear to be receiving as much housekeeping emphasis. The following observations were brought to the attention of HP managers:

A 55 gallon drum (painted in radiologically symbolic colors) within a posted "Radioactive Material Area" at the Unit 2 Turbine Building High Conductivity Sumps appeared to be leaking caustic liquid (determined from the apparent corrosion and deterioration of the drum bottom) for some time (a large amount of surface area around the drum was severely stained).

- The ROSTER Building (adjacent to the south end of the Unit-3 Turbine Building) a posted "Radioactive Material Area" had an excessive amount of open radiologically symbolic bag containing protective clothing strewn about.

No deviations were identified in this area.

## 7. Exit Meeting

The inspector met with the licensee representatives denoted in Section 1, at the conclusion of the inspection on January 10, 1992. The scope and findings of the inspection were summarized. The licensee representatives did not identify as proprietary any of the materials provided to or reviewed by the inspector during the inspection. The inspector informed the licensee that the un-posted radiation area discussed in this report does not appear to be programmatic in nature and is apparently an isolated occurrence.