

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-206/88-06, 50-361/88-06 and 50-362/88-06

Docket Nos. 50-206, 50-361 and 50-362

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

Licensee: Southern California Edison Company  
2244 Walnut Grove Avenue  
Rosemead, California 91770

Facility Name: San Onofre Nuclear Generating Station - Units 1, 2 and 3

Inspection at: San Onofre Nuclear Generating Station

Inspector:

J. E. Russell  
J. E. Russell, Radiation Specialist

3-24-88  
Date Signed

Approved by:

G. P. Yuhas  
G. P. Yuhas, Chief  
Facilities Radiological Protection Section

3/24/88  
Date Signed

Summary:

Inspection during the period of February 29 through March 4, 1988, (Report Nos. 50-206/88-06, 50-361/88-06 and 50-362/88-06)

Areas Inspected:

Routine unannounced inspection of Units 1, 2 and 3 - maintaining exposures ALARA and Unit 1 - occupational exposure during outages, including tours of licensee facilities. Inspection procedures 30703, 83724, 83725, 83728, 83729, and 92701 were addressed.

Results:

In the areas inspected, the licensee's programs appeared adequate to accomplish their safety objectives. However, weakness was exhibited in the area of control of radioactive material as detailed below. One violation was identified involving the posting of a high radiation area (paragraph 3). One unresolved item was identified involving the detection of hot particles by the licensee's wholebody counting system (paragraph 4).

## DETAILS

### 1. Persons Contacted

#### Licensee Personnel

C. McCarthy, Vice President and Site Manager  
H. Morgan, Station Manager  
P. Knapp, Health Physics (HP) Manager  
M. Wharton, Assistant Technical Manager  
R. Warnock, Assistant HP Manager  
M. Short, Nuclear Training Manager  
J. Scott, HP Supervisor  
S. Jones, Quality Assurance (QA) Engineer  
C. Couser, Compliance Engineer

#### NRC Personnel

J. Tatum, Resident Inspector

All of the above noted individuals were present at the exit interview on March 4, 1988. In addition to the individuals identified, the inspector met and held discussions with other members of the licensee's staff.

### 2. Audits and Training

The inspector reviewed SCE QA Audit Reports SCES-18-87 and SCES-52-87 and QA Surveillance Reports as follows:

HP-239-87	HP-328-87	HP-474-87
HP-267-87	HP-387-87	HP-484-87
HP-309-87	HP-415-87	NR-277-87
HP-312-87	HP-455-87	NR-422-87

These audits and surveillances covered areas of external and internal exposure control, control of radioactive material and ALARA for the period of 1987 to present. Corrective Action Requests were issued to the HP organization as a result of these audits and surveillances for failure to implement portions of the survey program, internal exposure control program, ALARA program, Radiological Infraction Notice program, and fuel fragment control program. Numerous Problem Review Reports were also issued to document minor discrepancies.

The inspector reviewed the current Hot Particle Detection and Control lesson plan and student handout, a 20 hour course given to all SCE and contract HP technicians as a part of their qualification.

The inspector interviewed several operational HP and RMC technicians during plant tours to ascertain their knowledge of health physics and plant procedures in general and the hot particle program in particular. All appeared well informed and cognizant of their duties and responsibilities.

The licensee seemed to be maintaining their previous level of performance in this area and their program appeared fully capable of accomplishing its safety objectives. No violations or deviations were identified.

3. External Exposure Control

The inspector interviewed the Unit 1 HP supervisor, HP foremen, various HP technicians and Dosimetry personnel. The inspector reviewed records including select Radiation Exposure Permits (REPs), area and job specific surveys, airborne radioactivity surveys, daily Radiation Exposure Monitoring Summary (REMS) Reports, External Dosimetry Investigations and dose evaluations. Records reviewed covered the period of the inspection, except for the dosimetry investigations and dose evaluations which covered the period of August 1987 to present. No exposures in excess of 10 CFR 20.101, Radiation dose standards for individuals in restricted areas, limits were noted.

The inspector observed work in the Unit 1 containment and protected area and noted personnel in the various areas were wearing personal dosimetry. Workers interviewed were generally aware of the requirements of the REPs under which they were working, their personal exposure totals and limits and the need to perform work such that radiation exposures are as low as reasonably achievable (ALARA), with the exceptions noted in paragraph 5 below.

Radiation and high radiation areas in the various areas toured were posted in accordance with 10 CFR 20.203, Caution signs, labels, signals and controls, and licensee HP procedure S0123-VII-7.4, Posting and Access Control, with the exception of a catwalk behind Steam Generator (SG) A.

During a tour on March 1, the inspector noted that a diagonal catwalk on the 31' elevation, at the foot of the stair from the 42' elevation, had accessible radiation levels in excess of 100 mrem/hr as measured with an Eberline model R0-2, serial number 4042, calibrated on 2-16-88 and due for calibration on 5-16-88. The inspector measured approximately 160 mrem/hr at thigh height at the end of the catwalk and approximately 200 mrem/hr at 2 feet off the end. There was no end railing on the end of the catwalk; access was directly available on SG supports to a work area directly behind the SG, between it and the reactor cavity shield wall; and a yellow plastic bag of feedwater line insulation was stored in that area which indicated that workers had been in the area and had probably accessed the area by way of the unposted catwalk.

After this matter was brought to the licensee's attention, a survey was performed on the catwalk on March 2 which indicated 100 mrem/hr at knee height in the middle of the last section of catwalk. The area was expeditiously reposted as a high radiation area and the HP Manager issued a memo on March 3 to alert all operational HP personnel to the event. It was noted during a tour on March 3 that the catwalk in question had been reposted as a high radiation area and that the posting and labeling within the unit 1 containment in general was fully adequate.

The unit 1 HP supervisor informed the inspector that the catwalk and other areas around SG A had previously been posted at the foot of the stair from the 42' elevation but that the posting had been inappropriately moved in, omitting the entry point to the catwalk, when the SG had been drained and the area had been reposted on February 29. He also stated that this had occurred in spite of having a technician assigned specifically to assure postings were adequate.

Technical Specification (TS) 6.12, High Radiation Area, reads in part:

"In lieu of the "control device" or "alarm signal" required by paragraph 20.203(c)(2) of 10 CFR 20, each high radiation area in which the intensity of radiation is greater than 100 mrem/hr but less than 1000 mrem/hr shall be barricaded and conspicuously posted as a high radiation area and entrance thereto shall be controlled by requiring issuance of a Radiation Exposure Permit (REP)...."

The failure to post the catwalk is an apparent violation of TS 6.12 (50-206/88-06-01).

During a review of dose evaluations, the inspector noted a dose evaluation for an event on January 27, 1988, involving a pipefitter at unit 3 who was found to have a hot particle of approximately 274  $\mu\text{Ci}$  on his right hand. The dose to 1  $\text{cm}^2$  of the skin of the worker's right hand for a residence time of 30s was estimated to be 3.782 rem and this dose had been added to the worker's record on February 2.

During an interview of the HP engineer who had performed the evaluation, the engineer stated that no time and motion study had been performed to determine the residence time of the particle on the worker's hand and that the engineer had not interviewed either the worker or the HP technician involved in the event. The engineer stated that he had obtained the 30s duration from the Personnel Contamination/Injury Report (PCIR) which stated, "...Removing filters from the cavity dewatering filtration system, job took appx. 30 seconds of hands on work for pulling filters out of canister, Health Physics immediately surveyed worker, found particle, and removed glove...."

The inspector noted to the engineer and, subsequently, to the HP Manager that notwithstanding the estimate of 30s for job duration, which had not been confirmed with the involved HP technician, the dose evaluation did not appear sufficient to assure that the potential residence time of the particle on the worker's glove was no more than 30s.

The HP Manager stated at the exit meeting that the investigation of this event was not adequate and was not performed in the manner in which he wants to do business. He also provided the inspector with a statement from the involved HP technician documenting the technician's estimate that the total time from the initiation of filter removal to the time at which the particle was found and removed from the worker's hand was no longer than 30s. The Assistant HP Manager also stated after the exit meeting that he would assure a time and motion study was performed to verify the estimate of the exposure time. Subsequent to the inspection, the inspector received a copy of a memorandum documenting that a time and

motion study had been performed and that an average residence time of 29s had been determined for the event. Based on the results of the time and motion study and the HP Manager's commitment to more circumspect reviews of contamination events, the inspector had no further questions on this matter.

The licensee seemed to be maintaining their previous level of performance in this area and their program appeared adequate to accomplish its safety objectives. One violation was identified in this area which appeared to be an isolated occurrence.

#### 4. Internal Exposure Control

The inspector held discussions with various Dosimetry personnel and technicians, and other licensee personnel. The inspector reviewed airborne radioactivity surveys, the placement of air sampling equipment, REPs, the current REMS report, whole-body counts and internal deposition calculations. These documents were reviewed for the period of the inspection. The inspector also reviewed the currently implemented versions of the following procedures:

- S0123-VII-4.2 Internal Dosimetry Program
- S0123-VII-4.2.1 Operation of the Analytical Whole Body Counting System
- S0123-VII-4.2.1.2 Operation of Quicky Model III Whole Body Counter

No overexposures to airborne radioactive material were noted and the HP supervisor indicated that there had been no exposures to greater than 40 MPC-hr in any week during the outage.

Program implementation appeared to be in compliance with the requirements of 10 CFR 20.103, Exposure of individuals to concentrations of radioactive materials in air in restricted areas, with the following exception regarding the detection of Ce/Pr-144 by the SCE wholebody counting systems.

An unresolved item was previously identified (50-362/87-12-01) regarding the ability of the licensee's wholebody counting systems to detect Ru/Rh-106 and Ce/Pr-144 to comply with the 40 MPC-hr investigation level of 20.103. The item was subsequently closed when the licensee took action to reconfigure the system software to allow the detection of the isotopes of concern and to reevaluate the counts of those individuals most likely to have been exposed to irradiated fuel particles (IFPs).

The inspector noted that, although Ru/Rh-106 is now included in the standard matrix for use in the analytic and quicky counters, Ce/Pr-144 is contained only in the "Flea Matrix." S0123-VII-4.2.1 and 4.2.1.2 allow the use of the Flea Matrix only when approved by the Dosimetry Supervisor or HP engineer and provide no specific guidance on its use other than what can be inferred from general guidance on the resolution of spectral anomalies identified in assigned regions, specifically the Compton where Ce/Pr-144 would be evinced.

When the responsible Dosimetry supervisor was asked how many times the Flea matrix had been used in the last six months, he stated that it had been used about 10 times when the matrix itself was under development and 2 or 3 times since then. The supervisor also stated that there had been more than 3800 counts during that period.

The inspector noted to the Dosimetry supervisor and involved HP engineer that Ce/Pr-144 are isotopes of primary concern in older fuel fragments which have been identified at all three units; that ANSI N343-1978, American National Standard for Internal Dosimetry for Mixed Fission and Activation Products, specifically indicates these isotopes are more likely to represent sources of internal exposure and that S0123-VII-4.2 specifically cites these isotopes in regard to the 40 MPC-hr investigation level.

The inspector was informed at the exit meeting that a determination would be made to assess the minimum particle activity of Ce/Pr-144 which would be detectable using the standard matrices and that the referenced procedures would be reviewed to determine whether revisions were necessary to provide specific criteria for implementation of the Flea Matrix. The inspector also requested that hard copies of wholebody counts currently on file in the dosimetry office be maintained for further review by the inspector during the next inspection. The assistant HP manager stated that they would be maintained.

The inspector considered the implementation of the licensee's wholebody counting procedures for detection of Ce/Pr-144 at the 40 MPC-hr investigation level to require further investigation. The assistant HP manager stated at the exit interview that he believed that SCE was currently in compliance with the regulations as regards detection of Ce/Pr-144. This matter is unresolved (50-362/87-12-01).

An unresolved item is a matter about which more information is required to ascertain whether it is an acceptable item, a deviation, or a violation.

The licensee seemed to be maintaining their previous level of performance in this area and their program appeared adequate to accomplish its safety objectives. One unresolved item was identified and requires further evaluation to determine whether the licensee's wholebody counting system provides adequate criteria for identifying Ce/Pr-144 intakes.

## 5. Control of Radioactive Materials

The inspector interviewed the unit HP supervisor, the Nuclear Fuel Services Group supervisor, select HP and Radioactive Material Control (RMC) technicians and personnel and various plant workers. The PCIR log and select PCIRs and associated dose evaluations from August 1987 to present were reviewed as well as select Maintenance Orders, REPs, the unit containment log and contamination surveys current to the outage.

The inspector also observed, during several tours, work-in-progress in the unit 1 containment and protected area including SG eddy current

testing, sludge lancing, and bolt hole repair; reactor coolant pump repairs; waste packing and various minor valve and electrical repairs.

During a tour of containment on March 1 while observing work on SG A, the inspector observed that the barrier rope separating the Zone 1 area on the 14' elevation from the Zone 2 area on the 5' and lower elevations was down and that the attached Zone 2 sign was not directly visible to personnel traversing the catwalk. It was also noted that maintenance workers, assisting during sludge lancing equipment changeout on SG A, crossed the boundary several times to obtain equipment being stored in the lower, Zone 2, area without donning and doffing protective clothing as required by S0123-VII-7.12, Fuel Fragment Exposure and Contamination Control, and the job specific REP in that they failed to remove their second set of rubber gloves when they exited the Zone 2 area and without replacing the barrier rope and sign. When questioned, the workers were aware that the lower area was a Zone 2 area. The barrier remained down until a HP technician covering work on SG A noticed the barrier was down and replace it thus making the sign visible.

S0123-VII-7.12 states in part:

"...6.3.3 Zone 2

".1 In addition to the requirements in Ref. 2.1.4 (S0123-VII-7.4, Posting and Access Control) the area shall be posted as a 'Zone 2' area.

".2 Protective clothing for entering Zone 2 consists of additional:

".2.1 Booties and gloves..."

During the same tour, the inspector also observed work on the RCP A motor on the 42' elevation of the unit 1 containment and noted maintenance workers traversing the boundary between a contaminated work area and a highly contaminated work area without donning and doffing protective clothing and equipment in accordance with the requirements of REP 70192, RCP "A" Motor Work. Instruction 1, Section VI, of the REP states, "Protective clothing is required in contaminated areas only. An extra set of protective clothing, (paper or cloth), and a faceshield is required while working on the motor." The motor was in the posted highly contaminated area and being worked at the time of the inspector's observations and the sign on the barrier to the area stated "Special REP required for entry."

S0123-VII-9.9, Radiation Exposure Permit Program, states in part:

"...6.3.2 All personnel covered by the REP must follow the requirements specified in the REP...."

TS 6.11, Radiation Protection Program, reads:

"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."

The licensee's performance in this area appeared to be adequate to accomplish its safety objectives. No violations or deviations were identified in this area but attention appeared to be warranted to assure maintenance personnel obey posted and procedural health physics requirements.

6. ALARA

The inspector interviewed select members of the ALARA engineering group to determine their involvement in the outage in particular and the current state of program implementation in general. Select ALARA Pre-Job Exposure Estimates (Form 57s), ALARA Pre-Job Checklists (Form 58s), ALARA Job Review Records (Form 59s), and Temporary Shielding Authorizations (Form 260s) were reviewed for the period of the outage. The following current procedures were also reviewed:

S0123-VII-3	ALARA Job Review
S0123-VII-3.2	Temporary Shielding Installation
S0123-VII-3.3	Methods for Establishing ALARA Goals
S0123-VII-3.5	ALARA Program

Outage exposure goals by job and by work group were reviewed as well as the exposures expended to date. The issuance of weekly, monthly and quarterly exposure reports were also reviewed. The institution of hot particle controls after the opening of the unit 1 SGs was reviewed. An outage exposure goal of 180 person-rem has been established for unit 1. Categories of collective exposure were appropriately under their respective exposure goals at the time of the inspection but HP technician exposures were increasing rapidly.

The record reviews revealed that the above noted procedures were being followed and plant and contractor personnel interviewed during tours appeared cognizant of the need to minimize exposure and observe ALARA requirements.

The licensee seemed to be maintaining their previous level of performance in this area and their program appeared fully capable of accomplishing its safety objectives. No violations or deviations were identified.

7. Exit Interview

The inspector met with the licensee representatives, denoted in paragraph 1, at the conclusion of the inspection on March 4, 1988. The scope and findings of the inspection were summarized. During the interview, the HP Manager reviewed the action that had been taken to assure that high radiation areas are properly posted and also stated that he had taken

steps to eliminate the removable type of radiological boundary and institute the sole use of secured boundary ropes. No corrective action was offered to alleviate the problem of personnel disregard of posted and procedural HP requirements.