U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos.: 50-206/93-32, 50-361/93-32, 50-362/93-32

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

Licensee: Southern California Edison Company (SCE)
Irvine Operations Center
23 Parker Street
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: November 1-5, 1993

Inspector: _____ 11/18/93
L.C. Carson II, Radiation Specialist — Date Signed

Approved by: _____ 11/22/93
J.H. Reese, Chief — Date Signed
Facilities Radiological Protection Branch

Inspection Summary:

Areas Inspected: This routine announced inspection covered the licensee's Unit 3 Cycle 7 (U3C7) refueling outage radiation protection activities. Inspection procedures 83729, 83750, 86750, and 92701 were used.

Results: The licensee's radiation protection activities during the first half of the U3C7 outage were adequate for meeting safety objectives. The licensee's approach to integrate plant operations into the U3C7 outage schedule for radiation source reduction was a strength. No violations or deviations were identified.

DETAILS

1. Persons Contacted

SCE Personnel

*D. Warnock, Assistant Health Physics (HP Manager)
*J. Fee, Assistant HP Manager (Acting Manager Site HP)
*S. Schoefield, Supervisor of HP Engineering
M. Lewis, Supervisor HP/Radioactive Material Control (RMC)
*J. Barrow, HP General Foreman
*E. Gatto, HP Training Administrator
T. Adler, HP Supervisor Units 2/3
*T. Cooper, HP Engineer
*T. Ushino, HP Engineer
*R. Wood, ALARA Supervisor
*H. Wood, Quality Assurance Engineer
*S. Sewell, Dosimetry Supervisor
*G. Gibson, On-site Nuclear Licensing
*D. Axline, On-site Nuclear Licensing
*M. Farr, On-site Licensing Engineer

(*) Denotes those individuals who were at the exit meeting on November 5, 1993. Additional licensee personnel were contacted and present at the exit meeting, but are not reflected in the above listing.

2. Occupational Exposure and Occupational Exposure During Extended Outages (83729 and 83750)

The inspector evaluated this program area by interviewing cognizant personnel, reviewing procedures and records, and observing work in progress. Additionally, the inspector conducted tours of the Unit 3 Containment Building, Auxiliary Building, and Radioactive Waste Building. Reviews of audits, surveillances, and observations of radiation protection activities such as ALARA [As Low As Reasonably Achievable], personnel contaminations, and labeling and posting were conducted by the inspector.

a. Audits and Surveillances

Discussions were held with quality assurance (QA) personnel responsible for performing audits and surveillances of the licensee's radiation protection program. The inspector reviewed the following QA documents:

* Audit Report SCES-318-93
* SONGS Surveillance (SOS) 100-93
* SOS 126-93
* SOS 185-93
* SOS 243-93
* SOS 252-93

* SOS 256-93
* SOS 258-93
* SOS 260-93
* Problem Review Report (PRR) 010-93
* PRR 012-93
* PRR 022-93

The QA audit report contained many performance based observations of the Health Physics Division activities. The audit identified minor deficiencies associated with record keeping and procedural guidance. The deficiencies, which were determined to be isolated instances, were dispositioned as field corrected errors. The inspector noted that the audit, surveillance and problem reports had been thorough and comprehensive, and corrective actions were appropriately being addressed. No violations or deviations were identified.

b. Maintaining Occupational Exposures ALARA

The inspector examined radiation protection and ALARA planning for the Unit-3 Cycle-7 (U3C7) refueling outage to determine if the licensee was consistent with NRC Regulatory Guide (RG) 8.8 "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be As Low As Reasonably Achievable," and RG 8.10 "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable." Discussions were held with SONGS health physics (HP) supervision on exposure goals, personnel training, work scope, and plant design changes. U3C7 outage preparation was in progress at the time of this inspection.

(1) ALARA Goals

The U3C7 outage ALARA exposure goal was 412 person-rem. Each work group established its own exposure goal. The U3C7 exposure goal was high because of emergent work identified at the end of the U2C7 outage, particularly, the Steam Generator feed rings repair (70 person-rem), and the replacement of four Reactor Coolant Pumps (RCPs) Heat Exchangers (38 person-rem). As of November 4, 1993, the collective personnel exposure for the Unit 3 outage was approximately 220 person-rem.

The U3C7 jobs with the highest exposure potential were as follows:

* Low Pressure Safety Injection (LPSI)
* Maintenance & Surveillance Work
* Refueling Floor Activities

* Reactor Vessel and other In-Service Inspection (ISI)
* Reactor Coolant System & Pumps
* Personnel Tours, Inspection & Support
* Motor Operated Valve (MOV) work
* Steam Generator (SG) work

U3C7 ALARA Pre-Job Reviews examined by the inspector were performed in accordance with licensee procedures. The inspector reviewed the details of U3C7 Health Physics Work Control Plans (HPWCPs) for the Steam Generator feed ring repair work. The inspector noted that in 1990 the licensee performed SG feed ring work for the first time and expended 81 person-rem in Unit-3 and 65 person-rem in Unit-2. In the recent U2C7 outage the ALARA goal was 70 person-rem with only 55 person-rem being expended. For this U3C7 outage the ALARA goal was set at 39 person-rem. ALARA engineering utilized inflatable bladders that allowed the use of water shielding of dose rates inside the SGs tube bundle. This process reduced dose rates by a factor of four, and reduced the time spent to install shielding by four shifts.

The LPSI cross-tie work was completed with 21 person-rem exposure, and the ALARA goal was 20 person-rem.

The inspector had no concerns with the licensee's ALARA goal, planning and preparation for the U3C7 outage. The inspector concluded that the licensee's ALARA program was meeting its safety objectives during the U3C7 refueling outage. No violations or deviations were identified.

(2) Worker Awareness of ALARA Goals and Practices

The inspector observed and interviewed various workers during tours of the Unit 3 containment. Personnel interviewed were knowledgeable of work area dose rates and ALARA practices. Workers were observed moving to low dose rate areas to perform work and hold conversations. The inspector noted that the licensee used lead shielding and remote surveillance equipment (i.e., cameras) to maintain personnel exposures ALARA. Additionally, the licensee placed television monitors in locations such as the cafeteria and radiological control points to inform workers of updated ALARA group radiation exposure and outage work.

c. ALARA/HP Engineering Surveys, Contamination Controls, and Control of Radioactive Material

(1) Source Term Reduction

The inspector examined the results of the reactor coolant system (RCS) chemical decontamination (Chem-Decon), and contamination controls in Units 2 and 3.

(a) Chemical Decontamination

The inspector held discussions with the ALARA engineering supervisors about the U2C7 and U3C7 RCS Chem-Decon. Hydrogen peroxide was the chemical used for dissolving cobalt-58 CRUD activity in the Units 2 and 3 RCS. Preliminary estimates showed that the U3C7 removed 900 Curies (Ci) of radioactivity from the RCS, which was comparable to the 922 Ci removed in U3C6. During the recent U2C7 Chem-Decon 410 Ci of radioactivity was removed from the RCS. The peak concentration of cobalt-58 during the U3C7, U3C6, and U2C7 Chem-Decon was 1.66 micro(μ)Ci/cubic centimeter (cc), 1.85μCi/cc, and 0.58μCi/cc, respectively.

The licensee planned to further analyze U2C7 and U3C7 Chem-Decon data to provide ALARA engineering with long term and short term radiation field reduction results. The inspector had no further concerns in this area.

(b) Radiation Protection and Survey During the Hydrogen Peroxide Injection

The hydrogen peroxide injection was performed to lower dose rates of reactor systems during the U3C7 outage. HP's efforts to control personnel exposures and track dose rates during the hydrogen peroxide injection were reviewed by the inspector. HP operations established the following controls:

* Areas normally posted as Radiation Areas were posted as High Radiation Areas, and some areas that were not normally posted were posted as Radiation Areas.

* Operations was required to notify HP

when the plant was in the shutdown cooling (SDC) mode, which was the mode of operation used during the hydrogen peroxide injection.

* HP surveys in affected areas were performed each shift for a seven day period.

HP engineering installed five radiation detectors along SDC system piping to measure and record dose rate changes at 15 minute intervals during the hydrogen peroxide injection. November 11 - 13, 1993, dose rates in the Containment Building on the 17 feet level were 252 to 917 millirem/hour (mr/hr). In the Safety Equipment Building on the 15 feet level dose rates were 134 to 790 mr/hr.

The inspector concluded that the licensee satisfactorily performed radiation surveys, posted radiation areas, and controlled access during the hydrogen peroxide injection and SDC operations.

(c) Integrated ALARA Controls

The inspector reviewed additional controls the licensees used to reduce airborne radioactivity and radiation fields. HP/ALARA engineering supervision revealed that the outage management scheduled specific activities for operations, HP, chemistry and maintenance to perform to decrease radioactivity during plant shutdown operations. Three such ALARA measures were:

* Running the containment filtration particulate/iodine ventilation system

* Running the RCS letdown purification ion exchanger system at maximum flowrate for extended period.

* Running the RCS pumps at full flowrate for extend period to reduce the likelihood resuspended and stagnant areas of cobalt 58.

The inspector concluded that licensee management's integrated approach to controlling radiological

sources during shutdown operations was an ALARA program strength.

(2) Personnel Contamination: Internal and External

(a) Personnel Contamination Prevention

The inspector observed personnel working in contaminated areas and performing contamination surveys using "Friskers" and installed personnel monitors (IPM-8s). The licensee's Personal Contamination Incidents Reports, Noble Gas/Contamination, and Material Release Logbooks were reviewed by the inspector. The Logbooks were satisfactorily maintained, and no concerns were identified. During tours in the Containment Building the inspector noted effective contamination control practices around hot particle control zones, and particularly around the reactor coolant pumps and steam generators.

The inspector reviewed the licensee's personnel contamination events for the Unit 3 refueling outage. As of November 4, 1993, the licensee had initiated 240 personnel contamination reports. The licensee noted that the increase in personnel contaminations were due to the following:

* Installation of very sensitive personnel contamination monitors (IPM-8s)

* Low administrative procedure threshold for reporting personnel contaminations

* Decreased use of respirators

* Elevated contamination levels in the Unit 3 reactor systems because of the RCS decontamination process.

(b) The inspector reviewed the records that indicated the number of respirators issued during this U3C7 outage. Three weeks into the U3C7 outage the Health Physics Department had issued 113 respirators to workers compared to the 490 respirators issued by the third week in the U2C7 outage. Over 1500 respirators were issued during the nine weeks of the U2C7 outage, however, licensee

personnel reported that only 700 respirators actually were used.

(c) The inspector reviewed the personnel contamination data base, and found that the licensee had initiated 40 contamination reports associated with facial contaminations. The licensee indicated that measures had been taken to limit the number of facial contaminations. The inspector also noted that several facial contaminations had occurred during work inside the containment. Discussions with licensee personnel revealed that workers performed more work without wearing respirators. However, none of the 20 personnel facial contaminations that required whole body counts, detected internal radioactivity near the licensee's 10% maximum permissible body burden (MMPB) action limit.

Base on the above observations, the inspector concluded that the licensee's internal and external contamination controls were adequate.

d. Tours and Outage-Related Radiological Controls

The inspector conducted tours of the Unit-3 Containment Building, Auxiliary Building, and Radioactive Waste Building to observe the performance of outage-related controls. Additionally, the inspector reviewed licensee records and procedures associated with radiation and contamination surveys. Observations were made regarding posting & labeling, personnel contamination, and specific job controls.

(1) Posting & Labeling

The inspector performed independent radiation measurements at Units 1,2 and 3 using a licensee RO-2 ion chamber beta-gamma survey instrument and NRC Model RO-2, Serial No. 15843, due for calibration December 11, 1993

(a) The inspector toured the 17'6" elevation of the Unit 3 containment and noted that accessible area insides the biological shield were posted as required. The inspector measured radiation levels near Reactor Coolant Pumps (RCP) P-001 and P-004, and steam generators E-088 and E-089.

(b) Touring the Unit 3 containment, the inspector

found bags of radioactive materials appropriately labeled with radiation and contamination survey information.

(c) During tours of the Radioactive Waste Building, the inspector noted that the Zone III high contamination postings were adequate. The inspector toured the radwaste storage areas, and noted packaged radwaste containers were positioned to minimize area dose rates.

The inspector concluded that radiation postings were conspicuous and alerted workers to the area radiological conditions.

e. External and Internal Exposure Control

The inspector observed radiological work controls inside the Unit 3 Containment Building and Safety Equipment Building for the following jobs:

* Reactor Coolant Pumps
* Steam Generator
* Low/High Pressure Safety Injection Pumps
* Radiography

HPs maintained adequate control over workers, performed radiation surveys, and collected contamination smears and air samples. Additionally, the licensee used equipment such as video cameras, remote radiation survey meters, and portable continuous air monitors to augment routine HP coverage. Based on the inspector's observations of work in the reactor cavity area, it was concluded that external and internal exposure control practices were adequate.

The licensee's programs for controlling radiation exposure appeared adequate in meeting the licensee's safety objectives. No violations or deviations were identified.

5. Solid Radwaste Management and Transportation of Radioactive Materials (86750)

a. Transfer from Storage of Highly Radioactive Material

The inspector observed licensee solid radioactive waste (SRW) transfer operations conducted at the Multi-Purpose Handling Facility (MPHF). The MPHF is a building where the licensee stores low/high specific radioactive waste (L/HSAW). This observation involved the transfer of a stored high integrity container (HIC)

to a Type A shipping cask (NUPAC 14/210H), which was being prepared for the licensee's first SRW shipment to the burial site in Barnwell, South Carolina.

The HIC contained HSAW resin that was transferred from Unit-1 to the MPHF in May 1993. The dose rates on this HIC were 70 Rem/hour (R/hr) contact and 5 R/hr at one meter. The HIC was stored in the HSAW cell located in the MPHF. The inspector observed licensee radioactive material controllers (RMC) testing MPHF HSAW remote controls, cranes and hoisting equipment in accordance with procedure SO123-VII-8.2.6, "Prerequisite Checklist," prior to moving the 70 R/hr HIC. A tailboard meeting was held between the RMC and HP general foremen, two HPs, three RMCs, and a quality control engineer to establish radiation protection controls.

The inspector observed that the transfer of the 70 R/hr HIC to the cask occurred without any radiation protection concerns. The maximum dose rate on the surface of the cask was 20 mr/hr after the HIC was placed inside.

The inspector concluded that this aspect of the licensee's SRW storage and transfer program was adequate. No violations or deviations were identified.

6. Exit Meeting

The inspector met with the licensee representatives denoted in Section 1 at the conclusion of the inspection on November 5, 1993. The scope and findings of the inspection were summarized. No violations or deviations were identified. At the conclusion of the meeting, the licensee did not identify as proprietary any material provided to or examined by the inspector.