

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos.: 50-206/93-03, 50-361/93-03, 50-362/93-03

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: January 25-29, 1993

Inspector: *L.C. Carson II* for 2/12/93  
L.C. Carson II, Reactor Radiation Specialist Date Signed

Approved by: *J.H. Reese* for 2/12/93  
J.H. Reese, Chief Date Signed  
Facilities Radiological Protection Branch

Inspection Summary:

Areas Inspected: Routine inspection of the licensee's radiation protection program, during the transshipment of 49 Unit 1 spent fuel bundles to the Unit 3 spent fuel pool. Inspection procedures 83729, 86721, and 86740 were used.

Results: The licensee's spent fuel transshipment activities were effective in meeting the program's radiological safety objectives. Transshipment planning, preparation, and personnel training were strengths. The incorporation of health physics (HP) survey steps in the transshipment procedures strengthened radiological controls. No violations or deviations were identified.

## DETAILS

### 1. Persons Contacted

#### SCE Personnel

- \*R. Krieger, Station Manager
- \*P. Knapp, Manager, Site Health Physics (HP)
- \*M. Short, Manager, Site Technical Services
- \*D. Warnock, Assistant HP Manager
- \*J. Fee, Assistant HP Manager
- \*R. Rosenblum, Manager, Nuclear Regulatory Affairs
- \*S. Panarandi, Quality Assurance (QA) Supervisor
- \*M. Lewis, Supervisor HP/Radioactive Material Control (RMC)
- \*S. Enright, HP/RMC Lead
- \*D. Brooks, RMC General Foreman
- \*T. Adler, HP Supervisor
- \*A. Tally, HP Supervisor
- \*E. Gatto, HP Technical Assistant
- \*R. Corbett, HP Planning Supervisor
- \*R. Wood, ALARA Supervisor
- \*C. LaPorte, Refueling Group Supervisor
- \*S. Allen, Dosimetry Supervisor
- \*R. Ash-Everest, Site Technical Engineer
- \*E. Bennett, QA Engineer
- \*D. Wilcockson, On-site Nuclear Licensing
- \*J. Jamerson, Lead On-site Licensing Engineer
- \*M. Farr, On-site Licensing Engineer

#### Others

- \*D. Solario, NRC Resident Inspector
- \*F. Gee, NRC Inspector
- \*G. Johnston, NRC Examiner

(\* Denotes those individuals who were at the exit meeting held on January 29, 1993. Additional licensee personnel were contacted and present at the exit meeting but are not reflected in the above listing.

### 2. Transportation and Inspection of Transportation Activities (86721 and 86740)

#### a. Transshipment Overview

Unit 1 was permanently shutdown, and preparing for decommissioning. Unit 1 had to transfer the fuel in the reactor vessel to the spent fuel pool (SFP), after transferring 49 spent fuel bundles from the Unit 1 SFP to the Unit 3 SFP. This spent fuel transfer operation was also known as "Transshipment." The licensee used the Irradiated Fuel (IF-300) Transportation System to transfer the spent fuel. Because the IF-300 cask held seven spent fuel bundles, seven transshipments between Units 1 and 3 were necessary to complete the operation. During this inspection, the inspector reviewed transshipment planning, IF-300 cask receipt, and observed transshipment operations.

b. IF-300 Certificate of Compliance

The inspector reviewed the licensee's IF-300 cask Certificate of Compliance (CoC) and other cask registration documents. An NRC letter dated January 15, 1992, identified the licensee as a registered user of the IF-300 cask (CoC No. 9001 under the provisions of 10 CFR 71.12 and 49 CFR 173.471), and granted authority to use the IF-300 cask for shipment of radioactive materials.

The IF-300 cask CoC No. 9001 required the following:

- \* spent fuel bundle burn-up rate not to exceed 35,000 megawatt-days/megawatt thermal units (MWD/MTU);
- \* minimum cooling time of at least 120 days for each spent fuel bundle;
- \* maximum decay heat per transshipment of 40,000 Btu/hr; and
- \* no single spent fuel bundle exceeding 5,725 Btu/hr.

The licensee provided the inspector a report, dated May 4, 1992, detailing Unit-1's spent fuel analysis, which included decay heat and burn-up rates. The inspector noted that all of the 49 spent fuel bundles selected for the transshipment were within the CoC limits. The inspector had no concerns in this area.

c. Maintenance & HP Receipt and Inspection of the IF-300

The inspector examined maintenance procedure S0123-I-3.4, "Receipt, Inspection and Shipment of the IF-300 Shipping Cask," which provided personnel (health physics, quality control (QC), maintenance, refueling engineering, and the IF-300 contractor) with detailed instructions for receiving and inspecting the IF-300 cask. The procedure was completed as required up to the point of preparing the cask for offsite shipment. The inspector reviewed cask maintenance and inspection document records. The inspector had no concerns in this area.

The inspector examined HP radiation and contamination survey data taken during the receipt of the IF-300 cask. HP completed signoff steps in S0123-I-3.4, and survey requirements in accordance with 10 CFR 20.205 and HP procedure S0123-VII-8.2.10, "Receipt of Radioactive Material." The inspector had no concerns with this aspect of HP programs.

d. Transshipment Training

The inspector reviewed the transshipment training schedule and course plan dated November 3, 1992. The refueling engineers trained personnel involved in the transshipment operation as follows:

- \* A 20-hour transshipment course for supervisors and lead personnel, which included reviewing the transshipment procedures.

- \* A one day course for all non-supervisory transshipment personnel.
- \* Personnel viewed a video and slides of transshipment activities.
- \* Personnel participated in "Dry Runs" from January 11-22, 1993.

"Tailboard" briefings were conducted in accordance with the transshipment procedure and HP Work Control Plan (HPWCP) No. 93-002 by the Refueling Supervisor, ALARA, and the lead HP.

The inspector reviewed a list of trained and qualified transshipment personnel dated January 22, 1993, including supervisors, QC, maintenance crafts, crane operators, radioactive material control (RMC) personnel, and HP technicians, which was maintained in the field copy of Procedure S0123-I-3.5, "Transshipment of Spent Fuel Using the IF-300."

The inspector had no concerns with the licensee's training program.

e. Transshipment Procedure Implementation

The inspector examined the transshipment procedure (S0123-I-3.5), and noted the following:

- \* The transshipment operation was a quality assurance (QA) program, 10 CFR 50, Appendix B activity.
- \* The procedure incorporated many QC witness and holdpoints.
- \* The procedure incorporated several HP radiation survey points.
- \* The Refueling Supervisor was the lead responsible person for directing and implementing the procedure.

The inspector noted that many lessons learned from the previous 1989 transshipment operation had been incorporated into the current transshipment procedures. The inspector concluded that the transshipment procedure, as approved, was well-written and technically adequate.

During the 1993 transshipment operation, the inspector observed the implementation of the following subsections of Procedure S0123-I-3.5:

- \* 6.9, "Loading the Irradiated Fuel - Unit 1"
- \* 6.10, "Installing the Cask Closure Head - Unit 1"
- \* 6.11, "Returning the Cask to the Washdown Area - Unit 1"
- \* 6.17, "Decontaminating the Cask - Unit 1"
- \* 6.21, "Moving the Cask to Unit 2 or 3"
- \* 6.22, "Attaching the Yoke to the Crane and the Cask - Unit 2/3"
- \* 6.23, "Upending the Cask and Lifting it Off the Skid - Unit 2/3"
- \* 6.24, "Moving the Cask to the Cask Washdown Area - Unit 2/3"
- \* 6.27, "Unloading Irradiated Fuel - Unit 2/3"

Generally, the licensee performed the transshipment operation in

accordance with S0123-I-3.5, and without deviation. However, during the performance of the transshipment procedure, Subsection 6.10, Step 27, the Refueling Supervisor and the lead HP agreed to deviate from the intent of the procedure. The Refueling Supervisor wanted the lead HP to sign the approval to proceed without performing surveys until Subsection 6.11, Step 12. Subsection 6.10, Step 27 required in part that:

"Health Physics shall perform a radiation survey of the parting plane of the cask while the cask is underwater . . . Obtain HP approval to proceed."

The inspector asked the HP and Refueling Supervisor why such a deviation from the original intent of the procedure would not be considered a non-compliance, requiring a formal procedure change. The HP and Refueling Supervisor, subsequently, decided not to deviate from the intent of procedure at that time. The licensee initiated a procedure change in accordance with S0123-VI-1.0.1, "Documents - Temporary Change Notices (TCNs) Preparation, Review, Approval, Incorporation and Distribution," for the remaining transshipment operation.

Licensee management did not concur with the inspector that the deviation would have been in non-compliance with the transshipment procedure, because Subsection 6.0.3 stated that:

The transshipment procedure must be followed in procedural compliance, and may be implemented in whole or in part depending on the sequence of events subject to the following exceptions:

Some sections/subsections of the procedures may be performed concurrently or out of sequence.

The responsible Refueling Supervisor shall approve performance of sections/subsections out of sequence prior to performance of the work.

The inspector considered the licensee's position, and reviewed other licensee procedural conduct guidance. The inspector found that the licensee's program did not address strict procedural adherence regarding HP survey holdpoints in plant procedures. Licensee management explained that this matter would be further evaluated, and they understood the implications of appearing to not implement the transshipment operation in accordance with the intent of an approved 10 CFR 50, Appendix B, QA program procedure.

The licensee was fully capable of meeting its safety objectives during the 1993 transshipment operations. No violations or deviations were identified in this area.

### 3. Occupational Exposure During Extended Outages (83729)

The inspector reviewed the ALARA and HP staff's exposure goals, planning,

and preparation for the transshipment operation. The inspector observed the performance of HPs during the transshipment operation.

a. ALARA External Exposure Controls, Goals and Planning

The ALARA pre-job review for the transshipment operation estimated total exposure to workers was 9.25 person-rem, distributed as follows:

- \* Cask closure head torquing & de-torquing, and cask decontamination: 6.0 person-rem
- \* SFP area work, and cask fuel loading & unloading: 2.0 person-rem
- \* Transporting the spent fuel cask: 0.75 person-rem
- \* Miscellaneous work: 0.5 person-rem

Discussions were held with licensee ALARA personnel regarding the exposure estimate, and ALARA precautions taken. The basis of the exposure estimate was the 1989 transshipment operation and lessons learned. The inspector reviewed the person-rem exposure data from the 1989 transshipment. HP and ALARA learned from the 1989 data that most of the exposure was attributed to an area of the IF-300 shipping cask known as the parting plane. The parting plane was the gap area between the cask closure head and cask where radiation could stream, and cause additional exposures. The inspector noted, during the 1993 transshipment, the contact dose rates at the cask parting plane were as high as 0.8 rem/hour, and 0.2 rem/hour at 30 centimeters. The ALARA group designed a shield ring made of stainless steel and lead to fit over the parting plane area. The shield ring had reduced potential exposures as evidenced by the ALARA group's exposure tracking data for the transshipment operation.

The cumulative exposures through two transshipment loads were 1.8 person-rem. The inspector projected from ALARA data that the 1993 transshipment operation could result in total exposures of 6.0 person-rem. The inspector mentioned to ALARA and HP that the 9.25 person-rem goal seemed to be an overestimation by at least 2.0 person-rem. The licensee did acknowledge the inspector's observation, but explained that they had taken a conservative approach to the estimate.

The inspector concluded that ALARA's cask shield ring was helping to produce the lower doses, and the licensee's ALARA planning was adequate to meet its safety objectives. The inspector had no concerns with the ALARA program.

b. Audits and Appraisals (83729 and 86740)

Quality Assurance (QA) personnel responsible for surveillances of HP activities gave the inspector a detailed transshipment and Unit-1 outage QA plan that was dated January 15, 1993. The QA plan was adequate and covered many important aspects of the transshipment operation, and the Unit-1 extended outage condition. The inspector observed two QA engineers

performing surveillances during the transshipment. The inspector had no concerns with QA's involvement during the transshipment operation.

c. Worker and HP Awareness of Radiological Controls

Transshipment workers and HPs were generally knowledgeable of the requirements of the Radiation Exposure Permits (REPs) for their task. HPs and workers exercised appropriate measures to control personnel contamination and exposures. The inspector observed HPs and workers who were signed on transshipment REPs. The inspector paid particular attention to worker and HP information that was on REP No. 627, and noted the following:

- \* REP No. 627, Section I, Radiological Controls: The pre-job survey for neutron radiation indicated N/A [Not Applicable]; however, Section IV, "Dosimetry," required workers to wear neutron dosimetry. Additionally, a transshipment cask survey performed on January 23, 1993, indicated neutron radiation dose rates of 0.012 rem/hour. The licensee corrected the discrepancy, subsequent to the inspector's finding.
- \* REP No. 627, Section II, "ALARA Review," estimated the person-rem exposure for the transshipment job to be 9.25 person rem; however, projected personnel exposure data suggested that the REP No. 627 estimate should be 4.5 person-rem. The inspector found workers who thought that the 9.25 person-rem estimate represented the projected exposure for that REP. The licensee stated that they would consider making the REP ALARA estimate more specific to the task being performed.
- \* REP No. 627, Section II, "ALARA Review," stated, in the recommendation section, that a "Tailboard is required by all personnel." The inspector noted that such a requirement seemed out of place, and it seemed more appropriate that such a requirement on the REP belonged in Section VI, "Special Instructions."
- \* REP No. 627, Section VI, "Special Instruction," Instruction 1(A) stated in part that "This REP did not allow work on items with a contact dose greater than 0.6 rem/hour." The inspector noted that part of the transshipment cask measured 0.8 rem/hour before the shield ring was in place, but personnel worked on the cask when a contact dose was excess of the literal allowance set on the REP. The licensee explained that the REP statement needed clarification. The licensee deleted Special Instruction 1(A), and added REP No. 627, Special Instruction 10 to read as follows:

"Work on items with contact dose rates greater than 0.6 rem/hour may be performed with the approval of the HP general foreman or higher. Also, dose tracking cards will be used."

The licensee satisfactorily showed the inspector the technical intent of the original requirement, and that workers did not directly come in

contact with the cask parting plane where the 0.8 rem/hour dose rate streamed from. Additionally, the inspector observed a tailboard meeting where HPs clearly warned workers about the radiation hazard at the parting plane. The inspector noted that one HP did question the intent of the original instruction regarding the use of finger ring dosimetry when working at the cask parting plane.

The inspector concluded that worker and HP awareness of the REPs was adequate; however, licensee REP format could have been arranged more clearly. HP management concurred with the inspector's concerns about REP No. 627, and stated that REPs under the new 10 CFR 20 program would be more user friendly. The inspector had no further concerns in this area.

d. Surveys, Contamination Controls, and Control of Radioactive Material

The inspector observed the licensee's transshipment activities regarding the control of radioactive materials. Of particular interest were the licensee's contamination control efforts and radiation monitoring efforts during spent fuel pool (SFP) operations and IF-300 cask decontaminations. The inspector found that HP and radioactive material controls (RMC) generally performed their duties in accordance with the transshipment HPWCP No. 93-002.

Contamination Control

Contamination control standards for the 1993 transshipment were based on the 1989 transshipment lessons learned. For this transshipment operation the licensee had the IF-300 cask electro-polished and decontaminated before the vendor shipped it. During the cask receipt process the licensee thoroughly documented the cask radiation data. Each time the IF-300 cask was removed from the Units 1 and 3 SFP the cask was decontaminated at the cask washdown area. HPWCP 93-002 prohibited the transfer of the cask between Unit 1 and 3 if contamination levels exceeded 150,000 disintegrations/minute/100 centimeters squared (dpm/100 cmsq). The cask was transferred with a corderro cover that could not exceed 1000 dpm/100 cmsq. The inspector examined contamination survey data from Transshipments 1 & 2 and noted that the highest cask contamination level (after decontamination efforts) was 20,000 dpm/100 cmsq.

HP established hot particle control zones (Zone IIIs) around the SFPs and cask washdown areas. Lesser contamination control zones were established (Zones I & II), however, all contamination control zones required periodic surveys and decontaminations. The inspector observed that HPs complied with the area survey and decontamination frequencies.

The inspector noted that the SFPs water levels were lowered about five feet to support not contaminating parts of the Fuel Handling Building (FHB) crane. However, in Unit 3 the SFP level in combination with the effects of a recent SFP cooling system modification caused increased contamination levels in the FHB. Because of the SFP water level, the FHB ventilation could not adequately exhaust radioactive contaminants through the SFP vent ducts. This problem was resolved by operations, engineering,



chemistry, and HP collectively deciding to decrease the SFP pump flowrate to reduce the SFP turbulence that was causing the contamination problem.

The licensee's contamination control efforts were more than adequate to meet their safety objectives.

#### Radiation Field Monitoring

The inspector specifically monitored the depth of radiological controls that were in place to warn workers if a spent fuel bundle was lifted out of the SFP too high, or if the cask closure head was loose. HPWCP 93-002 and the transshipment procedure required radiation monitoring during SFP operations. The inspector verified the following:

- \* Underwater surveys were taken, and HP hold points were in place if dose rates exceeded 0.5 rem/hour.
- \* Self-alarming dosimeters were required to be worn, specifically, by workers who might remove SFP objects with dose rates in excess of 0.1 rem/hour. The dosimeters were set to alarm at 0.04 rem/hour.
- \* An HP technician was on the refueling bridge taking radiation surveys on a continuous basis.
- \* HP installed a portable radiation monitor on the refueling bridge, which was set to give an alert signal at 0.01 rem/hour, and alarm at 0.05 rem/hour.
- \* The FHB and SFP area radiation monitors were verified operational on a shiftly basis.

The inspector concluded that the licensee's actions to prevent inadvertent exposures were more than adequate. The inspector had no concerns in this area.

#### e. Facility Tours

The inspector performed independent radiation measurements during transshipment operations. These measurements were taken with an NRC ion chamber survey instrument (Serial No. 22906, calibration due April 7, 1993). The inspector noted that radiation postings were conspicuous and alerted workers to the area radiological conditions. The inspector toured radwaste storage areas, and noted that packaged radwaste containers were positioned to minimize area dose rates.

The licensee continued to demonstrate prudent radiological controls in performing most aspects of the transshipment operation. The inspector concluded that the licensee was fully capable of meeting its safety objectives during the transshipment operation. No violations or deviations were identified.

4. Exit Meeting

The inspector met with the licensee representatives denoted in Section 1 at the conclusion of the inspection on January 29, 1993. The scope and findings of the inspection were summarized. No violations or deviations were identified.