U. S. NUCLEAR REGULATORY COMMISSION

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	REGION V	
Report Nos. 50	-206/86-02, 50-361/86-02 and 50-362/86-02	
Docket Nos. 50	-206, 50-361 and 50-362	
License Nos. D	PR-13, NPF-10 and NPF-15	
Licensee: Sout 2244 Rose	hern California Edison Company Walnut Grove Avenue mead, California 91770	
Facility Name:	San Onofre Nuclear Generating Station -	Units 1, 2 and 3
Inspection at:	San Onofre Nuclear Generating Station	
Inspection Con	ducted: January 13-17 and February 3-7, 1	986
Inspector:	<u>GP Yuhes</u> <u>Ren</u> H. S. Morth, Senior Radiation Specialist	<u>3/6/86</u> Date Signed
	J. F. Moore, Radiation Specialist	
Approved By:	G. P. Yuhas, Chief	 Date Signed
Summary:	racificies kadiation protection Section	

Inspection on January 13-17 and February 3-7, 1986 (Report Nos. 50-206/86-02, 50-361/86-02 and 50-362/86-02)

<u>Areas Inspected</u>: Routine, unannounced inspection of licensee action on previous inspection findings, review of licensee reports, gaseous waste systems, radiological environmental monitoring, occupational exposure during extended outages, Unit 3 fuel fragment contamination, facility tours and followup on Information Notices. Inspection procedures addressed included 83729, 80721, 84724 and 65051.

Results: Of the areas inspected, no violations or deviations were identified.



REPORT DETAILS

1. Persons Contacted

- *+H. Morgan, Station Manager
- * M. Wharton, Deputy Station Manager
 - A. Abusamra, PASS Chemistry
- * J. Albers, Supervisor Unit 2/3 Health Physics (HP)
 - J. Anaya, Supervisor Unit 1 Instrumentation
- J. Beebe, Supervisor Unit 1 Radiation Monitoring Instrumentation
- * E. Bennett, Quality Assurance (QA) Engineer
- +L. Bray, HP Engineer
- D. Brevig, Senior Project Engineer
- * J. Curran, Manager QA
- R. Dickey, Supervisor Dosimetry
- * M. Freedman, Compliance Engineer
- * G. Gibson, Supervisor Compliance
- *+K. Helm, Effluent Engineer
- *+R. Jervey, QA Engineer
- +C. Kergis, Compliance Engineer
- *+P. Knapp, Manager HP
- J. Madigan, Supervisor Unit 1 HP
- +J. Mundis, Supervisor Nuclear Services
- * J. Reilly, Manager Station Technical
- *+D. Schone, Site QA Manager
- * R. Warnock, Supervisor HP Engineering
- M. White, Environmental Engineer
- +W. Zintl, Manager Compliance

* Denotes attendance at the January 17, 1986, exit interview. +Denotes attendance at the February 7, 1986, exit interview.

In addition to the individuals identified above, the inspectors met and held discussions with other members of the licensee's staff.

Licensee Action on Previous Inspection Findings (Closed) Followup (50-361/83-37-01)

Inspector identified item related to the proposed use of multiple persons to collect high activity particulate and iodine WRGM samples following an accident to control individual exposures within GDC 19 limits. Inspection Report No. 50-361/83-37 noted that the proposed use of several persons to limit exposures was to be discussed with NRR. NRR concurred with the proposed solution. Licensee procedure S0123-III-8.10-23 Rev. 3 had been revised to address manpower requirements for sample collection post accident. This matter is considered closed.

(Closed) Followup (50-361, -362/84-12-03)

Inspector identified item relating to the licensee's failure to declare an "Unusual Event" on June 2, 1984. In response the licensee issued Special Order, Number 84-13, dated May 7, 1984 Significance of Effluent



2.

<u>Monitor Alarms</u> and subsequently completed (July 11, 1984) issuance of Temporary Change Notices (TCNs) to numerous alarm response procedures to assure that they led to EPIP S023-VIII-1 <u>Recognition and Classification</u> of <u>Emergencies</u>. This matter is considered closed.

(Open) Followup (50-206/85-29-01)

Inspector identified item relating to the disposal of SNM contaminated Nuclear Assurance Corporation cask waste. The waste has not been shipped to a burial site. The licensee is corresponding with NRC concerning the disposal. This matter will be reviewed during a subsequent inspection.

(Closed) Followup (50-206, -361, -362/85-10-21)

Inspector identified item related to qualification and training of persons conducting sampling activities. Three Unit 2 LER's relating to sampling and analysis discrepancies (85-25, -26, -48) were examined. The licensee's corrective actions were verified. Chemistry technicians and plant equipment operators were interviewed. Samples to be collected during the next shift were documented and passed on to the incoming chemistry shift. Chemistry technicians had been trained in sampling techniques and sampling locations. Responsibility for sample collection was assigned to chemistry and there was no evidence to indicate that this responsibility had been redelegated to another segment of the staff. This matter is considered closed.

(Closed) Followup (50-362/82-15-03)

Inspector identified item related to adequacy of the radwaste building and compactor ventilation system. Previously addressed in Inspection Report No. 50-362/82-20 and 82-34.

Documents examined:

Letter, H. B. Ray, SCE to R. H. Engelken, NRC dated November 5, 1982, documenting commitments concerning the ventilation system;

San Onofre Commitment Register System (SOCR) entries related to Inspection Report No. 50-362/82-15 and supporting documents; and

Memorandum: Warnock to Knapp, April 8, 1985, Subject: DAW Compactor Ventilation Evaluation.

A Bechtel Power Corporation report on the Radwaste Area Ventilation System, Log BE-6344, dated October 5, 1982, addressed building negative pressure, rooms without mechanical ventilation (172) and rooms with mechanical ventilation (98). The report concluded that with doors in the proper position, seals on a number of doors and penetrations and with the addition of ventilation ducting to the two waste gas compressor rooms the HVAC system meets the FSAR described performance. During numerous tours of the radwaste building the inspector has observed that negative pressure is maintained and that negative pressure is maintained in the waste gas compressor rooms with the additional ducting which was installed. With respect to the DAW compactor the licensee's Health Physics Engineering group evaluated the compactor use and concluded that with appropriate controls (e.g. respirators required, compactor filters tested following installation, proper air flow, access control and air sampling) the compactor could be operated and exhausted to the room air. Based on observations and document review this matter is considered closed.

No violations or deviations were identified.

3. Review of Licensee Reports

The inspector reviewed Licensee Event and Special Reports related to radiation protection and chemistry matters. The review verified that reporting requirements were met, causes identified or under investigation, that corrective actions appeared appropriate and that LER forms were complete. Reports identified with an asterisk, indicate a more detailed on site review.

Docket No.	<u>50-206</u>	50-361	<u>50-362</u>
	85-07-L0	84-44-L1	85-12-L0
•	85-08-X0	85-08-X0	85-18-L0
	85-08-X2	85-23-L0	85-21-L0
	85-09-L0	85-25-L0	85-23-L0
· · · · · ·	85-10-L0	85-27-L0	85-24-L0
	*85-15-L0	85-29-L0	85-25-L0
· ·	7	85-32-L0	85-27-L0
		85-33-L0	85-28-L0
		85-36-L0	*85-31-L0
	· · · ,	85-37-L0	85-33-L0
		85-39-L1	*85-35-L0
••••••••••••••••••••••••••••••••••••••		85-43-L0	85-34-L0
	6	85-44-L0	85-37-L0
	*	85-48-L0	85-41-L1
na in the second se		85-53-L0	
		85-56-L0	•

LER 50-206/85-15-LO, reported discovery of two holes in the containment/stack line to monitors R-1211 and R-1212. The licensee temporarily patched the holes and planned to replace the sample line during the current outage. The licensee agreed to evaluate the effect of the holes, which may have existed since the sphere shield construction project (1975), on reports of effluents from Unit 1. This matter will be examined during a subsequent inspection (50-206/86-02-01).

Unit 3, LER's 85-31-LO and 85-35-LO reported FHIS and CPIS actuations respectively. Followup onsite confirmed no relationships with the fuel particle problem (see report section 7).

No violations or deviations were identified.

Unit 1 Gaseous Waste System

A. Audits and Appraisals

Records of audits performed by Quality Assurance (QA) were examined and discussed with the responsible QA engineers. Audit No. SCES-020-85, conducted March 21 to May 24, 1985, verified that procedures were in compliance with changes made to the Offsite Dose Calculation Manual (ODCM) and the Radiological Environmental Technical Specifications (RETS). The scheduled audit for 1986 had not been conducted at the time of this inspection. The review found the auditor's qualifications included four years of experience as a Health Physics technician preparing effluent release permits.

B. Changes

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Discussion with licensee representatives and a tour of the facilities disclosed that the gaseous waste system had not been changed with the following exceptions:

1. The cryogenics system had been retired in place.

2. A second computer based data reduction system was used to prepare monthly reports and verify release calculations.

C. Effluents

The inspector reviewed the Monthly Effluent Reports for the period January 1985 to December 1985. Releases were within 10 CFR 50 Appendix I guidelines and the EPA limits expressed in 40 CFR 190.

The inspector verified by manual calculations that the beta and gamma air doses from Kr-85, Xe-131m, Xe-133m and Xe-133 as reported in a Gaseous Effluent Release Permit were correct. The inspector also verified by manual calculation the maximum organ dose from I-131 using data from the July 1985 Plant Vent Stack Release Report. The licensee's use of ODCM dose conversion factors was confirmed.

The inspector discussed the gaseous effluent release process with the chemistry supervisor and a chemistry technician and verified that the proper procedure was used for sampling the waste gas decay tanks. The inspector was unable to observe the preparation of a release permit since the tanks had been emptied following the plant shutdown on November 21, 1985.

D. Air Cleaning

The Unit 1 Facility Technical Specification section 3.12 <u>Control Room Emergency Air Treatment System</u> requires that the system be maintained operable including satisfactory execution of the tests and analyses specified in Technical Specification 4.11 <u>Control Room Emergency Air Treatment System</u>. Maintenance Order 840830930, action on which was completed October 23, 1984, included necessary testing and the replacement of one leaking carbon filter. Technical Specification 4.11 requires testing once per year for standby service or after every 720 hours of system operation. The testing was initially scheduled in October 1985 however the work order had been placed on hold while the plant was in modes 5 and 6. The work was rescheduled for completion immediately prior to mode 4 operation.

No violations or deviations were identified.

5. Radiological Environmental Monitoring

The subject program was last inspected January 23-27, 1984 (Inspection Report No. 50-206/84-04, 50-361, 362/84-05). The meteorology portion of the program was addressed in Inspection Report 50-206/83-24, 50-361/84-39 and 50-362/83-38.

A. Audits and Appraisals

The audit program included both the licensee and contractor phases of the program and was conducted by both the onsite and corporate QA organizations. Reports of audits and surveillances were examined.

Audit Report No. Date	Topic
RDC-1-84 12/14/8	5 Contractor-Radiation Detection Company
LFE-1-84 7/27/85	Contractor-EAL Corp. (Analytical
	Contractor)
LFE-1-85 7/2/85	Contractor-EAL Corp. (Analytical
	Contractor)
SCES-075-85	All Tech. Spec. Units 1, 2 & 3, Land
	Use Census Contractors
SCES-088-84 12/3/84	- Units 1, 2 & 3 Tech. Spec. Report
1/30/85	Submission
SCEE-9-85 10/25/8	5 Timely Submission of Reports
SCEE-8-85 10/21-	Verify Transfer of Functions to
11/8/85	Nuclear Services Group
SCEE-6-85 10/17-	Construction-Offshore Pad Removal
11/17/8	5
SCEE-5-85 8/12-	Verify Environmental Record Retention
8/29/85	•
SCEE-4-85 6/28-	Verify Implementation of Environmental
8/5/85	Protection Plan-Unit 2/3
SCEE-3-85 4/15-	Verify Implementation Unit 1
7/17/85	Environmental Tech. Spec.
SCEE-1-85 .2/27-	Verify Implementation Unit 1
3/8/85	Environmental Monitoring Tech. Specs.

Surveillances were conducted of Westec Services Inc. marine sampling contractor (ENV-1210-84, 10/16/84) and of local crop sampling by the onsite environmental group (ENV-002-84, 8/21/84).

A small number of discrepancies were identified during the audits which resulted in the issuance of Corrective Action Requests (CARs), for which prompt and effective corrective actions were taken. The most significant and still unresolved matter concerned the licensees failure to report NPDES (National Pollution Discharge Elimination System) violations to NRC pursuant to the Unit 2/3 T.S. 6.9.3.g and Unit 1 T.S. 6.19.2.c (now 6.16.2.c as per Amendment 91). The T.S. require the licensee to provide copies of reports of violations of NPDES Permits or State certifications (pursuant to Section 401 of the Clean Water Act) to the NRC. This failure was initially identified in connection with Units 2/3 by Audit SCEE-4-85 and CAR GO-G-107 was issued. Subsequently Audit SCES-075-85 identified the failure in connection with Unit 1 and the previously issued CAR was amended to address all three Units.

At the time of the inspection the licensee had not resolved the response to the CAR. The failure to resolve the issue centers on the interpretation of the term violation. The NPDES permits issued by California Regional Water Quality Control Board order for San Onofre are:

Unit Order Nümber	. <u>Permit Number</u>
Unit 1 76-21	CA 00033
Unit.2 85-11	CA 0108073
Unit 3 85-13 ·	CA 0108181

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The Permits require the annual reporting of detailed analytical results. The licensee voluntarily submits reports on a monthly basis. Some of these reports contain values which are in excess of Permit levels but are not necessarily of such significance as to be reportable to NRC in the view of SCE's Operations and Maintenance Support (O&MS) organization. SCE's QA organization has viewed these reports as reportable to NRC since they represent violations of Permit levels.

The Permits also provide in section F.6. for oral notification and a 5 day written report of, "any noncompliance which may endanger health or the environment". In addition section F.7. requires notification, "as soon as it is known if there is reason to believe;" that certain discharges have or may occur. O&MS contends that those matters properly reportable to NRC are those described in Permit sections F.6 and F.7. No events requiring reporting under sections F.6. and F.7. have occurred. The licensee's resolution of CAR GO-G-107 will be examined during a subsequent inspection (50-206, -361, -362/86-02-02).

B. Changes

The onsite environmental monitoring representative, an Environmental Engineer, now reports administratively to the O&MS organization and technically to the supervisor of the corporate Nuclear Safety and Licensing (NS&L) group. This individual had been employed at San Onofre in this capacity since 1982 and was completing degree work for a BA in Environmental Analysis. The onsite representative was responsible for collection, packaging, shipment and record keeping of all terrestrial sampling and TLDs. All terrestrial samples were shipped by Express Mail to EAL Corporation, the analytical contractor. TLDs were shipped to Radiation Detection Company. Marine samples were collected by Westec Services Inc. formerly Lockheed Ocean Sciences Laboratory under a contract administered by NS&L. Weekly reports of samples collected, problems identified (e.g. reduced air sample volume due to pump or power failures) were sent to NS&L. The only change in sampling location since the last inspection was the San Clemente air sample location, formerly at the San Diego Gas and Electric building, which was moved to the San Clemente City Hall effective January 14, 1986. The new sample location is in the same sector at approximately the same distance from the plant. The change was required by the sale of the building at the original location.

The marine sampling program, annual census program and corporate office portion of the program will be examined during a subsequent inspection (50-206, 361 & 362/86-02-03).

C. Implementation of the Radiological Environmental Monitoring Program

The Annual Radiological Environmental Operating Reports for 1983 and 1984 were reviewed. The "Mesa-E.O.F." sampling station was observed during the weekly particulate and iodine sample change. The station also included TLD's and a pressurized ion chamber. Environmental program procedures were reviewed, specifically:

<u>Number</u> <u>Title</u>	Date
S0123-IX-1.1 Rev. 1 Environmental Sample Collection	8/26/85
S0123-IX-1.2 Rev. 1 Air Sampling	8/26/85
S0123-IX-1.4 Rev. 2 Drinking Water	8/26/85
S0123-IX-1.5 Rev. 2 Sediment from Shoreline (Beach Sand)	8/26/85
S0123-IX-1.6 Rev. 2 Local Crops	8/27/85
S0123-IX-1.8 Rev. 2 Soil Sampling	8/26/85

D. Implementation of the Meteorological Monitoring Program

The licensee contracts with Dames and Moore for monthly maintenance and quarterly calibrations of meteorological equipment and data reduction of chart and data logger (digital) records. The licensee's I&C staff changes the recorder charts every two weeks. Monthly maintenance records for the period June-December 1985 and the second and third quarterly calibrations in 1985 and the first quarterly calibration in 1986 were examined.

- No violations or deviations were identified.
- 6. Occupational Exposure During Extended Outages Unit 1
 - A. Audits and Appraisals

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No audits specifically addressing this topic area had been conducted. Two surveillances related to this topic had been conducted:

HP-007-86, <u>Bioassay</u>, <u>Verification of Iodine Protection Factor</u>, as applied to the use of the GMR Iodine respirator canister; and

HP-034-86, <u>Health Physics Surveillance</u>, visual inspection of postings, containment housekeeping, availability of supplies of booties and gloves in containment and frisker operation at the equipment hatch exit. The surveillance noted the high frisker background at that location.

B. Changes

The licensee had planned a reorganization of the operational H.P. staff to improve control of technician activities and to provide a single responsible Health Physics representative onsite at all times. Technician crews of 6-8 will be permanently assigned to a foreman. Each crew and foreman will rotate through the shift schedule. Two general foremen will be assigned one each to Units 1 and 2/3. The general foremen will assign crews on the basis of work load and job priority.

For the Unit 1 outage in order to maintain technician exposures ALARA, the job coverage had been changed from constant to zone coverage. Continuous health physics coverage requirements have been relaxed for some evolutions.

Individual technician exposure was to be administratively limited to 300 mrem/quarter. Cumulative technician exposure was to be followed by the foremen on a daily basis to provide for appropriate distribution of exposure. Crew exposures were to be evenly distributed within ± 250 mrem. Increases in the administrative limit can be approved only after justification and review by the Unit Health Physics Supervisor. This change was in response to a Health Physics Division goal to reduce exposures received by the Health Physics staff. All health physics supervisors were coordinating their efforts with the ALARA supervisor. As part of this effort the licensee had increased the use of alarming dosimeters which can be preset to alarm at various total exposures, reducing the necessity for constant coverage by technicians.

The new Health Physics building was in service replacing the old Third Point access to Unit 1. Access through Door 16 was limited to operations personnel requiring prompt access.

C. Planning and Preparation

Unit 1 health physics representatives including the assigned Unit 1 ALARA Engineer began attending planning meetings in May 1985. In September 1985, two technicians were assigned to work with the Unit 1 Maintenance Schedulers in outage planning. Thirty contract technicians, onsite for the Unit 3 outage and 23 Unit 2/3 technicians were used to augment the Unit 1 technician staff of 15 providing a total of 68 technicians for the Unit 1 outage.

The staffing increase was delayed past the start of the Unit 1 outage since the outage began a week early as a result of the water hammer event. The contract technician staff was increased to limit the number of overtime hours worked by the staff. The health physics staff was operating three shifts using three foremen and two upgraded technicians per shift. The health physics staff reported good cooperation from various work groups in prioritizing work based on technician availability.

Special training on steam generator repairs and penetration work was planned. Due to the two unit outage, only foremen received the penetration work training and few technicians received steam generator mock up training. However the crews that had done the Unit 3 steam generator work were available for Unit 1 and several contractor technicians had good steam generator work experience.

An additional breathing air compressor was provided which augmented the existing equipment. The compressors were able to support 6 manifolds which permitted supplied air work simultaneously on the three steam generators, penetrations, upender cavities in containment and in the fuel building and the north charging pump room.

Portable ventilation units were used during the steam generator work. A contamination control tent was utilized in the auxiliary building for the charging pump work.

D. External Exposure Control

Discussions with the dosimetry staff established that no changes had occurred with respect to the program for utilization of extremity and specialized dosimetry or to station administrative exposure limits. Pocket ionization chamber (PIC)/TLD comparisons were performed by the licensee. PIC's were generally found to indicate higher exposures than TLDs but most were within 25% of the TLD indicated exposure. No problems had been identified with respect to extremity exposures. Daily reports of work groups or department exposures were provided to supervisors as well as an alphabetical listing of individual exposures.

E. Internal Exposure Control

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No changes in the internal exposure control program were identified. A corporate Dosimetry Records and Archival Retrieval System (DARS) had been implemented. No concerns with respect to Unit 1 internal exposures were identified. Records of evaluations of internal exposures and bioassays and whole body counts will be examined during a subsequent inspection (50-206/86-02-05).

Control of Radioactive Materials and Contamination, Surveys and Monitoring

Portable survey instruments available for use were examined and found to be within the required calibration frequency. Frisker stations were observed and noted to be set on the appropriate range. Use of friskers by personnel exiting the Unit 1 containment, radwaste building and the controlled area at the health physics building were observed to be of appropriate duration and thoroughness. Records of surveys will be examined during a subsequent inspection (50-206/86-02-06).

6. Maintaining Occupational Exposures ALARA

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The licensee had established a station goal of less than 1000 manrem for 1986. The 1985 Unit 1 goal was 305.4 manrem. The approximate Unit 1 total exposure was 70 manrem prior to the outage and 96 manrem during the first month of the outage (December 1985), a total of approximately 170 manrem.

The Unit 2/3, 1985 goal was 767.6 manrem and the measured exposure was 605.5 manrem. Examination of the source of exposure to Unit 1 health physics personnel identified surveys as a principal contributor. As a result the frequency of routine surveys of areas not continuously occupied had been reduced. The change which, was implemented in October-November 1985, had resulted in reduced personnel exposures. No changes in connection with contamination control had been observed. The largest single contributor to exposures were the surveys associated with radiation exposure permit (REP) preparation. In cooperation with the Maintenance Department only maintenance tasks to be started within two days are submitted for REP preparation. This change from the previous practice of submitting all jobs scheduled (e.g. the January 6-12, 1986 list called for REP's for 258 jobs) was expected to result in a significant manrem reduction. Additional ALARA related topics were identified in section B. above.

The licensee had implemented an ALARA awards program providing for quarterly recognition of outstanding exposure reduction efforts. The awards are based on established guidelines and include certificates and a prize.

Significant ALARA activities noted by the inspector at Units 2/3 included:

Operation's and Management Supports development of a steam generator manway shield which provided a small opening for eddy current testing while reducing the platform exposure to approximately 100 mrem/hour. The shield also has doors which close the opening when not in use.

Robotics device "Genesis" used for ultrasonic testing and mechanical steam generator tube plugging saved an estimated 20 manrem.

Learning through experience on the Pressurizer Spray Valve work, using the same crew where possible, the Unit 2 work resulted in 75.5 manrem of exposure. The same work on Unit 3 resulted in 57.8 manrem exposure.

No violations or deviations were identified.

Unit 3 Fuel Fragment (Fuel Fleas) Contamination

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Α. Beginning on October 30, 1985, the licensee identified the existence of microscopic particulate, contamination with fuel fragments subsequently dubbed "Fuel Fleas". Following the recognition of this problem, extensive surveys were conducted of the Fuel Handling Building, Radwaste Building and all levels of the Unit 3 Containment and the reactor cavity. The particles are believed by the licensee to have apparently originated during a fuel bundle reconstitution evolution performed in the Unit 3 Fuel Handling Building.

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资源19年 1月1日年期 - 日本日本11年代1月1日日 While "Fuel Fleas" were found in other areas the principal concentrations were found in the Unit 3 Fuel Handling Building and reactor cavity. The contamination in the reactor cavity was located principally in the lower level near the upender. The major portion of this activity was flushed to the radwaste system. Some of the "Fuel Fleas" were found on modesty garments. Frisking of modesty garments at the laundry was increased to a 100% sample. The solvent and lint filters from the modesty garment dry cleaning machines were surveyed for presence of the "Fuel Fleas" with negative results. Protective clothing used in the Unit 3 Fuel Handling Building was isolated. Access to the Fuel Handling Building was denied for routine non-essential access on November 6, 1985 so that extensive radiological surveys could be conducted. After successful decontamination efforts the building was released for access. Personnel who had worked in the Fuel Handling Building following the fuel reconstitution evolutions were identified and whole body counts were performed. No indications of "Fuel Flea" constituents were found in the first 80 persons counted. Extensive review of air sample data showed no evidence of "Fuel Fleas" or their constituents. Surveys established that no "Fuel Fleas" were found more than one foot above the floor.

On November 21, 1985 access to the Fuel Handling Building was again restricted for decontamination. Access was limited to the decon crew and operator surveillance under continuous H.P. coverage.

Since protective clothing appeared to be a medium for the transfer of "Fuel Fleas" all protective clothing was withdrawn from use. Protective clothing unused since before the Unit 3 fuel reconstitution work or disposable protective clothing was used to replace the withdrawn clothing.

Licensee analysis of "Fuel Fleas" identified the presence of the following fission products: Nb-95, Zr-95, Ru-103, Ru-106, Ba-140, La-140, Ce-141 and CE-144. EAL Corporation analyzed three "Fuel Fleas" and confirmed the licensee's analysis and in addition

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identified the presence of Cs-134, 137, Pm-147, 148m, Eu-154, Y-91, Cm-242 and Pu-238.

Because of the high beta energy (500 keV vs 90 keV for "normal" contamination) exhibited by the "Fuel Fleas" a specially modified ion chamber instrument utilizing different window thicknesses was developed by the onsite H.P. Engineering group. This instrument was used to conduct extensive surveys.

As a result of the extensive surveys and the routine frisking program "Fuel Fleas" were found on protective clothing and modesty garments of several personnel. The licensee performed evaluations to assess the skin dose to exposed individuals.

The Region V staff evaluated the licensee's methodology and results of skin dose assessments for personnel exposed to the "Fuel Fleas". The licensee's evaluation included a conservative exposure scenario, comparison of the theoretically derived spent fuel spectrum, and the spectrum measured by gamma pulse height analysis by both SCE and an independent laboratory, and the final estimation of activity of the limiting radionuclides based on licensee assumptions. We find these studies, considerations and assumptions to be acceptable. The key assumption being that the "Fuel Fleas" were in direct contact with the skin.

The basis of acceptability was the comparison of the licensee's methodology of evaluation of skin dose, using Healy's model (1), against other models also acceptable to the staff. In the draft report "Dose Calculations for Contamination of the Skin Including the Computer Code Varskin," NUREG-4418, the authors introduce a computer code, Varskin, which calculates dose to the skin by a beta emitting radionuclide, from point and disc sources. They use Berger's (2) data of energy distribution around point sources in water from which they compute skin dose as a function of distance for a point or disc source (skin thickness), of any given strength and time of exposure. The model and data of Spangler and Willis (3) was also used by the staff as an alternative method (Loevingers equations (4)) for skin evaluation.

Using the data, provided to the staff by the licensee, of one of the exposed individuals, the following results were tabulated, as shown, for two of the radionuclides identified in the inventory of fission products which comprised the "Fuel Flea".

		Dose (mrad for 2.2 hr exposure)		
Isotope	uCi/cm ²	SONGS	VARSKIN	SPANGLER
91 Y	1.98×10^{-2}	405	337	330
140 Ba	8.25×10^{-4}	16	12	14

It is noted that the Healy model, used by the licensee, provides a conservative dose estimate as compared to the Varskin computer code and the Spangler model.

Based on the conservative model used by the licensee to determine the skin dose to individuals exposed to "Fuel Fleas", and the fact that the dose estimate for all the radionuclides found in the "fuel flea" provides a total dose of 1517 mrem to the exposed individual which represents 20% of permissible skin dose, the staff finds the SCE methodology for skin dose evaluation to be acceptable.

- (1) Surface Contamination Decision Levels LA-4558-MS J. W. Healy
- (2) M. J. Berger, MIRD #8, J. Nucl. Med. 1971
- (3) G. W. Spangler, C. A. Willis "Permissible Contamination Levels" Proceeding of a Symposium held at Gatlenburg, Tennessee June 1984 pg 151-158)
- (4) Describe Radioisotope Sources R. Loevinger, etal "Radiation Dosimetry" Hine and Brownell pp. 711-715.

The final licensee actions and effectiveness of the decontamination will be examined in a subsequent inspection (50-362/86-02-04)

No violations or deviations were identified.

8. <u>Tours</u>

Tours were conducted during the inspection of the protected areas of all three units, the Unit 1 containment, radwaste building, backyard, chemistry laboratory, and the health physics building. Confirmatory radiation surveys were performed with an ion chamber survey instrument, NRC-015844, due for calibration February 18, 1986. No discrepancies in posting were identified. In addition the recently completed Materials Control Building, with office space on the second floor and decontamination facilities on the first floor, and the laundry - change room facilities on .65.5-70 elev. Units 2/3 and Multipurpose Handling Facility which were under construction were toured.

No violations or deviations were identified.

9. Followup on IE Information Notices

The inspector verified receipt, review for applicability and initiation or completion of action, if required, with respect to IE Information Notices Nos. 85-42, 85-42 Rev. 1, 85-81, 85-87 and 85-92.

No violations or deviations were identified.

10. Exit Interview

The scope and findings of the inspection were discussed with the individuals denoted in report section 1. The licensee was informed that no violations or deviations were identified.

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