UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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ARLINGTON, TEXAS 76011-8064

June 29, 2001

Richard Ferreira, Assistant General Manager
Energy Supply and Chief Engineer
Sacramento Municipal Utility District
6201 'S' Street
Sacramento, California 95852

SUBJECT: NRC INSPECTION REPORT FOR INSPECTIONS 50-312/2001-03; 72-11/2001-01 AND 50-312/2001-04; 72-11/2001-02

Dear Mr. Ferreira:

On March 12-15 and April 2-3, 2001, the NRC conducted a team inspection at your Rancho Seco nuclear reactor facility to evaluate the pre-operational test activities for the Independent Spent Fuel Storage Installation (ISFSI). On April 3-13 and 19, 2001, the NRC conducted an inspection of the loading of the first canister into the ISFSI and on June 12-14, 2001, an inspection conducted of decommissioning activities included follow-up of issues identified during the previous ISFSI inspections. An onsite exit was conducted with your staff on March 15, 2001, to review the results of the pre-operational inspection and a telephonic exit was conducted on April 25, 2001, to review the results of the inspection of the loading of your first canister with spent fuel. On June 14, 2001, an onsite exit was conducted concerning the follow-up inspection items and on June 25, 2001, a telephonic exit was conducted concerning the unresolved item identified in this report. The enclosed report presents the scope and results of these inspections.

This inspection report includes the results of the inspections conducted by the NRC at your Rancho Seco facility concerning your dry cask storage program. The first inspection, conducted during March and April 2001, evaluated the pre-operational activities required by your ISFSI Final Safety Analysis Report (FSAR) to demonstrate the adequacy of procedures, equipment and training necessary to safely move spent fuel from the spent fuel pool into dry cask storage at your ISFSI. This inspection was conducted by a team of NRC inspectors that reviewed key areas of your ISFSI operations. As a result of this inspection, the NRC found your facility and equipment to be adequate and your staff to be trained and qualified to begin fuel movement activities.

The second inspection, conducted during April 2001, observed the actual loading of the first canister with spent fuel, transfer of the canister to the ISFSI and insertion of the canister into a horizontal storage module. Loading of the first canister into the ISFSI was successfully completed on April 19, 2001. During the loading of the first canister, an unexpected problem occurred with the seal between the canister and the transfer cask while in the spent fuel pool. This resulted in your decision to unload the canister and make modifications to the transfer cask. The canister was successfully reloaded and placed in the ISFSI. Throughout the effort to load the first canister, your staff, and in particular, your management team at the Rancho Seco facility, demonstrated a cautious and questioning attitude to the handling of the spent fuel. This attitude was particularly noteworthy when the decision was made to unload the spent fuel to examine the transfer cask and canister when the seal failed. This decision resulted in a modification to the transfer cask, which improved how the canister fit into the transfer cask and reduced the risk of the seal becoming dislodged during future canister loadings. Overall, both the pre-operational test and the loading of the first canister demonstrated the capabilities and safety conscious attitude of your staff. This attitude to proceed slowly and stop work at any time a staff member questioned an activity was identified by the NRC inspection team as a strength related to the dry cask storage project at Rancho Seco.

An inspection was conducted the week of June 12-14, 2001, as part of the core inspection program for the dismantlement activities underway. During this inspection, issues identified during the previous ISFSI inspections, related to your safety evaluation program and neutron dosimetry program, were further reviewed. Based on the results of the pre-operational inspection and the follow-up inspection, the NRC identified an unresolved item, discussed in Section 6.0 of the attached report, related to shifting of the walls in the fuel storage building. It was not apparent from documentation reviewed during the inspections that an appropriate basis had been established to conclude that a change to the facility, as identified in your licensing basis documents, had not occurred. We request that you provide a documented basis for your determination that the shifting of the walls was not a change to the facility as described in your licensing basis document, and in particular, Section 5.0 of the DSAR.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/NRC/ADAMS/index.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

***/RA/***

Dwight D. Chamberlain, Director
Division of Nuclear Materials Safety

Docket Nos.: 50-312; 72-11
License Nos.: DPR-54; SNM-2510

Enclosure:
NRC Inspection Report 50-312/2001-03;72-11/2001-01
and 50-312/2001-04;72011/2001-02

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**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

| | |
|---|---|
| Docket Nos.: | 50-312;72-11 |
| License Nos.: | DPR-54; SNM-2510 |
| Inspection Nos.: | Pre-Operational Test: 50-312/2001-03; 72-11/2001-01<br>Loading of First Canister: 50-312/2001-04; 72-11/2001-02 |
| Licensee: | Sacramento Municipal Utility District |
| Facility: | Rancho Seco Nuclear Generating Station |
| Location: | 14440 Twin Cities Road<br>Herald, California |
| Dates: | Pre-Operational Test: March 12-15 and April 2-3, 2001<br>Loading of First Canister: April 3-13 and April 19, 2001<br>Follow-up Inspection: June 12-14, 2001 |
| Inspectors: | J. V. Everett, Team Leader, Region IV<br>R. S. Carr, Health Physicist, Region IV<br>E. M. Garcia, Health Physicist, Region IV<br>C. A. Clark, Reactor Inspector, Region IV<br>D. W. Schaefer, Physical Security Inspector, Region IV<br>J. J. Blake, Senior Reactor Inspector, Region II<br>J. B. Hickman, Project Manager, Project Directorate IV, NRR<br>R. R. Temps, Safety Inspector, Spent Fuel Project Office, NMSS<br>M. J. Shah, Structural Engineer, Spent Fuel Project Office, NMSS<br>A. D. Rayland, Physical Protection Specialist, Fuel Cycle Safety and Safeguards Division, NMSS<br>L. Donovan, Inspector-in-Training, RIV |
| Approved By: | D. Blair Spitzberg, Ph. D., Chief<br>Fuel Cycle and Decommissioning Branch |
| Attachment: | Supplemental Information |
| ADAMS Entry : | IR 05000312-2001-03;2001-04/072000011-2001-01;2001-02; on 03/12-6/14/2001; Sacramento Municipal Utility District; Rancho Seco Nuclear Generating Station. Safety Evaluation. |

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## EXECUTIVE SUMMARY

Rancho Seco Nuclear Generating Station
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Report 50-312/2001-04; 72-11/2001-02

On April 17, 1995, the NRC observed the concrete placement activities for the Independent Spent Fuel Storage Installation (ISFSI) pad near the Rancho Seco reactor facility. This was the first of several inspections conducted over a 6-year period to verify the adequacy of the programs, procedures, personnel, facilities and equipment that would eventually be used by Rancho Seco to begin the process of moving spent reactor fuel from the spent fuel pool to dry cask storage. The effort to establish an ISFSI at the Rancho Seco site had experienced numerous delays during this time period, most of which were beyond the control of the licensee. Throughout the process of working toward the goal of establishing a dry cask storage facility, the staff and management at Rancho Seco continued to place safety and quality above pressures to push the schedule ahead. This was evident as an NRC inspection team of 11 inspectors observed the pre-operational test activities conducted during March 2001 and 2 NRC inspectors observed the actual loading of spent fuel into the first canister in April 2001.

The licensee had developed an extensive program and procedures for the ISFSI operations. This program had incorporated lessons learned from other utilities that had loaded spent fuel into their ISFSI. Appropriate precautions and contingency provisions were incorporated throughout the procedures to ensure workers were aware of potential problem areas and were provided guidance on acceptable compensatory actions. Training had been effectively implemented. Numerous discussions with workers indicated a clear understanding of the procedures, possible problems that could be encountered and the regulatory and safety basis for the requirements and limitations in the procedures. The licensee had contracted with several consulting organizations to provide specialized expertise in areas such as welding, health physics and spent fuel retrieval. In addition, the fuel team was augmented with personnel from Southern California Edison Company on loan to Rancho Seco to assist in the fuel movement activities. This provided the licensee with highly qualified personnel who were an asset to the operation as well as providing the Southern California Edison Company personnel with an opportunity for hands on experience in preparation for their future dry cask storage activities.

Over the next year, the licensee will proceed to load the remaining 20 canisters. Based on the activities observed during this inspection, the licensee has demonstrated the capability to safely perform this work. Special recognition is given to the licensee’s management team for their cautions and safety conscious attitude in directing activities. Decisions made by management during the loading of the first canister established a questioning atmosphere that was exhibited by the workers as unexpected events occurred. Workers were willing to bring issues to management’s attention and were encouraged to proceed forward only when they felt that issues had been properly resolved and work could continue safely.

This report is divided into 19 topical areas. The following provides the conclusions presented in this inspection report for each of the areas reviewed.

Pre-Operational Test Program

- Pre-operational testing requirements identified in the final safety analysis report (FSAR) were successfully demonstrated by the licensee. Based on activities observed during the pre-operational test, the licensee demonstrated the adequacy of procedures, training, and equipment to initiate loading of spent fuel into the ISFSI (Section 1).

Loading of the First Canister

- The loading of the first canister with spent fuel was halted when the seal in the gap between the canister and transfer cask dislodged allowing spent fuel pool water into the gap. The spent fuel was unloaded and an evaluation of the problem resulted in a modification to the transfer cask to prevent recurrence (Section 2).

- Loading activities were resumed with no significant problems encountered. The welding, vacuum drying, transportation of the canister to the ISFSI and insertion into the horizontal storage module were successfully completed on April 19, 2001 (Section 2).

Fuel Verification

- The licensee had developed a procedural process and a worksheet to document placement of the spent fuel assemblies into the canisters. The worksheet included data for the various parameters described in Table 2.1, "Spent Fuel Limits," of Technical Specification 2.1 to facilitate verification that the selected fuel was in compliance with the technical specification limits (Section 3).

- The fuel loading worksheet for the spent fuel originally planned for the first canister was reviewed. The spent fuel characteristics were in compliance with the technical specifications. Decay heat for the canister was calculated as 8.774 Kw (Section 3).

- As a result of the problem with the seal during the initial loading of the canister, the decision was made to remove the spent fuel and conduct a visual examination. To proceed with loading activities, the spent fuel planned for the second canister was designated for loading into the first canister. A review of the worksheet data for this spent fuel found the fuel characteristics to be in compliance with the technical specifications. Decay heat for the canister was calculated as 9.005 Kw (Section 3).

Procedures and Technical Specification Compliance

- Procedures for controlling dry cask storage activities, including activities in the fuel storage building, during transport to the ISFSI and during insertion of the canister into the horizontal storage module were found to be detailed and complete with adequate precautions and warnings. Technical specification and FSAR requirements had been incorporated into appropriate portions of the procedures (Section 4).

- Adequate procedures had been developed for the retrieval of a canister from the ISFSI and removal of spent fuel from the canister. The procedures were detailed and included necessary precautions. Requirements to sample and analyze the gases in the canister prior to reflooding were included (Section 4).

- During loading of the first canister, workers consistently demonstrated compliance with procedural requirements. Procedural checklists were completed and required quality controls were implemented. Operations were conducted safely and in compliance with the license during the loading of the first canister (Section 4).

Spent Fuel Pool

- Spent fuel pool water level, temperature, and chemistry had been maintained within required limits and adequate procedures were established to ensure monitoring of these limits on the required frequencies (Section 5).

- Procedures for fuel handling operations were reviewed and found to be adequate, including provisions for movement of spent fuel assemblies to a canister. The licensee had considered the possibility of a stuck fuel assembly during canister loading. To minimize the risk of this, verification of the dimensions of the sleeves inside the canister was conducted as part of the canister acceptance program. Contact had been made with the fuel vendor concerning acceptable actions to free a stuck fuel assembly (Section 5).

Safety Reviews

- The licensee's program to review design changes, facility modifications, procedure changes, tests and experiments in accordance with 10 CFR Parts 50, 71 and 72 had been combined into one program. This program was current for the requirements at the time of the pre-operational test and was revised to implement the new 10 CFR Parts 50 and 72 requirements that became effective April 5, 2001 (Section 6).

- Selected safety screenings and evaluations were reviewed to verify compliance with the requirements of 10 CFR 50.59 and 10 CFR 72.48. A safety screening completed by the licensee relating to shifting of the east and west walls in the fuel storage building had been determined to not require a safety evaluation. It was not apparent from documentation reviewed during the inspections that the licensee had an appropriate basis to determine that no change had been made to the facility as described in the licensing basis documents. This issue will be tracked as an Unresolved Item pending receipt and review of further information from the licensee to support their conclusion (Section 6).

- Training records were reviewed for individuals listed as qualified to perform safety evaluations. Training was found to be adequate and individuals interviewed were knowledgeable in the requirements for conducting safety evaluations (Section 6).

Health Physics

- The licensee's radiation protection program used for site decommissioning and dismantlement activities was applied to the work activities associated with the dry cask storage project. The program had been effectively implemented in the areas required by 10 CFR Part 20 (Section 7).

- The licensee had performed an ALARA evaluation of activities and had established provisions in procedures to ensure adequate health physics monitoring and controls were established (Section 7).

- Personnel dosimetry, including neutron badges and survey instrumentation, were used on the project and were calibrated (Section 7).

- Radiation protection personnel assigned to the project were properly trained and qualified. Personnel were aware of the radiological controls to be implemented for the dry cask storage project and were observed by the NRC inspection team on numerous occasions conducting the required radiological surveys and implementing proper radiation controls (Section 7).

- Numerous commitments and requirements had been incorporated into the ISFSI technical specifications and FSAR. A review of selected requirements found good correlation between the requirement and instructions provided in the procedure used for loading the first canister into the ISFSI (Section 7).

Training Program

- The dry cask storage training program had been reviewed during a previous inspection and was confirmed during this inspection as being current and effectively implemented. Training records were being maintained. Workers demonstrated a good knowledge of technical specifications and an understanding of procedural requirements indicating that training had been successfully implemented (Section 8).

Quality Assurance Program

- The licensee was implementing a quality assurance program for the dry cask storage activities utilizing the same program implemented for the site decommissioning effort. Audits and surveillances of vendors and contractors that provided equipment for the ISFSI were being performed. The scope of the audits and surveillance activities was considered appropriate (Section 9).

Procurement Controls and 10 CFR Part 21

- An acceptable program had been established and implemented by the licensee to control the procurement of equipment, materials and services to ensure that acceptable quality requirements were applied (Section 10).

- The licensee had established satisfactory procedures for reporting defects and noncompliances in accordance with 10 CFR Part 21 (Section 10).

Fire Protection

- The licensee had developed an acceptable program for controlling flammable liquids at the ISFSI to comply with technical specification requirements and to keep flammable liquids below the level analyzed in the FSAR for the worst case fire scenario. Security maintained a list of vehicles allowed into the ISFSI. Personnel questioned during the pre-operational test activities were aware of the limits for flammable liquids (Section 11).

- Support from two local fire organizations had been arranged to support fire fighting activities at the ISFSI. Both organizations were contacted by the NRC and confirmed their preparedness to provide support to the licensee (Section 11).

Emergency Planning

- The licensee had adequately implemented provisions for responding to an emergency at the ISFSI. This included an emergency plan, emergency procedures, training, drill/exercise program and arrangements with offsite support organizations (Section 12).

- Memoranda of Understanding or contracts had been established with offsite support organizations that would provide response during an emergency at the ISFSI. Contact with the two fire departments that would provide fire and ambulance services confirmed the availability of the support (Section 12).

- Site wide exercises conducted in 1999 and 2000 were based on emergency scenarios related to dry cask loading activities. These exercises were successfully conducted and helped prepare site personnel for unexpected incidents that could occur during cask loading activities (Section12).

Heavy Loads

- The licensee adequately demonstrated that heavy loads could be safely moved from the fuel storage building to the ISFSI by moving a simulated cask loaded with dummy fuel assemblies. The safe load path was verified as adequate and the analysis performed by the licensee to evaluate the effect on structures if a heavy load was dropped was found to be acceptable (Section 13).

Welding/Non-Destructive Testing/Vacuum Drying

- The creation of a dedicated team for the purpose of developing and implementing the canister seal welding and testing program was a commendable step by the licensee. Procedures governing the overall scope of the job were highly detailed. Observation of the welding and nondestructive testing on the mock-up canister verified the skills of the welding and nondestructive examination team. Work practices, such as making trial welds and cuts on full scale mock-ups prior to making a lid weld were an effective method to further ensure quality work. The welding and testing team members were knowledgeable and able to produce quality welds (Section 14).

- Welding performed on the first canister was successfully completed using the automatic welding process. Nondestructive testing of the welds included visual inspections, dye penetrant testing and helium leak testing. Welds were found to be of high quality. Hydrogen monitoring of the canister gap under the lid during welding did not indicate the presence of hydrogen (Section 14).

- The licensee had obtained a cutting machine to remove the welded lids from a canister, should this be necessary. The cutting machine had been used to remove lids on mock-ups to verify operation of the equipment (Section 14).

Security

- The licensee was currently implementing both a Part 50 security program and a Part 72 ISFSI security program, with overlap between the two programs. The Part 50 security program was required while spent fuel was in the spent fuel pool. As the spent fuel is moved to the ISFSI, a transition from the Part 50 security program to the ISFSI security program will occur (Section 15).

- The ISFSI Physical Protection Plan, Amendment 0, was approved by the NRC with the issuance of ISFSI License SNM-2510 on June 30, 2000. The licensee had made no changes to the ISFSI physical protection plan since NRC approval. The licensee had established an acceptable management process for approving and processing future changes to the ISFSI physical protection plan and procedures (Section 15).

- An effective protected area barrier, isolation zones, and detection system were established that would provide delay and detection of individuals attempting unauthorized entry into the ISFSI protected area. The licensee planned to install a closed circuit television (CCTV) camera system for continuous surveillance of the ISFSI protected area perimeter. Adequate compensatory actions were identified for the interim period between the initial movement of spent fuel to the ISFSI and installation of the CCTV camera system (Section 15).

- Provisions were established to implement a thorough program for searching personnel, packages, and vehicles prior to entering the ISFSI protected area. These provisions were implemented and remained in effect prior to initial storage of spent fuel at the ISFSI (Section 15).

- Onsite security response force capabilities were determined to be acceptable. Provisions had been made with a local law enforcement agency for offsite response support during a security threat (Section 15).

- Training of ISFSI security personnel had been conducted in accordance with the ISFSI training and qualification plan and procedures. ISFSI staff personnel demonstrated good knowledge of the procedural requirements for the tasks they performed (Section 15).

Notifications

- The reporting requirements, as contained in the licensee's procedures, were found to be consistent with the regulations in 10 CFR Part 72, 10 CFR Part 20 and 10 CFR Part 50 (Section 16).

Records/Documentation

- The licensee had established a records filing system for the ISFSI and associated components. The licensee demonstrated the ability to retrieve selected records (Section 17).

- The licensee had requested an exemption from the requirement of 10CFR72.72(d) to maintain duplicate sets of spent fuel and high level radioactive waste records. This request was approved by the NRC on March 15, 2001 (Section 17).

Special Topics: Coatings

- The licensee had performed a special test on the coating used on the canister to verify the compatibility of the coating with the borated spent fuel pool water. The test, conducted by an independent laboratory, found that the coating did not generate hydrogen or create water clarity problems while the canister was in the spent fuel pool. While dissolution of the coating from the spacer disks was noted during the test, the amount lost was determined to be relatively insignificant (Section 18).

- During the loading of the first canister with spent fuel, no indication of interaction problems between the coating and the spent fuel pool water were observed (Section 18).

Special Topics: Station Blackout

- The licensee had developed a plan for responding to a station blackout during dry cask loading activities. This included contacting the offsite power dispatcher prior to fuel movement activities to ensure grid reliability. As a backup, a diesel generator was available to operate the gantry crane to avoid a situation of a loaded cask being suspended in air due to a loss of offsite power (Section 19).

## Report Details

Summary of Facility Status

The NRC issued Special Nuclear Materials License # SNM-2510 to the Sacramento Municipal Utility District (SMUD) on June 30, 2000, for an Independent Spent Fuel Storage Installation (ISFSI) to be located near the Rancho Seco nuclear power plant. The Rancho Seco nuclear power plant was shut down in 1989 and the site is currently being decommissioned. The ISFSI is licensed under the site specific provisions of 10 CFR Part 72, utilizing the TransNuclear West NUHOMS horizontal storage system and an MP-187 transportation cask. The ISFSI will store the 493 spent fuel assemblies from the Rancho Seco reactor in 21 stainless steel canisters which will be placed in individual concrete horizontal storage modules at the ISFSI. The licensee purchased twenty-two horizontal storage modules, which provides for one spare The spent fuel assemblies have been in wet storage in the reactor's spent fuel pool since the facility was shut down. Description of the ISFSI and the design basis for the facility are provided in the ISFSI Final Safety Analysis Report (FSAR), Revision 0, dated November 21, 2000, as revised on April 4, 2001.

In 1996, the licensee conducted an examination of all spent fuel assemblies to assess the condition of the fuel cladding. Of the 493 spent fuel assemblies, 10 were classified as containing damaged fuel. The damaged fuel assemblies consisted of fuel rods with cladding defects that required storage in a special failed fuel canister. Of the 21 canisters purchased by the licensee, 1 was specially designed for storage of the failed fuel. The failed fuel canister can hold 13 spent fuel assemblies as compared to the other 20 canisters, which can hold 24 fuel assemblies each. The licensee had received their first canister from the fabricator. The second canister was delivered during June 2001.

### 1 PREOPERATIONAL TEST PROGRAM (36801, 60854)

1.1 Inspection Scope

Section 9.2 of the ISFSI FSAR, Volume 1, required the licensee to conduct pre-operational tests to verify that procedures, training and equipment were adequate prior to placing spent fuel into the ISFSI. This NRC inspection evaluated the licensee's pre-operational test activities. Demonstrations of the adequacy of procedures, equipment and training by the licensee was assessed to determine if sufficiently comprehensive pre-operational tests had been completed to satisfy the requirements of the FSAR and to adequately prepare the licensee to begin actual fuel load activities.

1.2 Observations and Findings

The licensee had developed a number of procedures to support the dry cask storage program. Procedure DFC-001, "ISFSI Loading," Revision 2, was the primary procedure for loading the spent fuel into the ISFSI. The licensee had also developed special test procedures to describe the sequence of activities for the pre-operational test and to relate the test activities to the appropriate sections of procedure DFC-001. This was necessary since some of the activities described in DFC-001 would be simulated during the pre-operational test and some activities would be demonstrated out of sequence. Procedures STP-1345a, “Dry Fueling Casking Procedures-Dry Evolutions,” Revision 2, STP-1345b, “Dry Fuel Casking Procedures-Wet Evolutions,” Revision 1, and STP 1345c, “Dry Fuel Casking Procedures-Cask Only Wet Evolutions,” Revision 1, were used for the pre-operational test in conjunction with procedure DFC-001.

The licensee had obtained all equipment required for ISFSI operations. This included welding equipment, testing equipment, vacuum drying equipment, the transfer yoke, transfer trailer, storage modules, and other associated equipment. The ISFSI security program had not been fully implemented; however, acceptable equivalent provisions were in place under the Part 50 security program. One spent fuel storage canister had been received from the fabricator. The second canister was delivered on June 12, 2001. The roof temperature readout system, required by FSAR Section 5.4.1, was confirmed as being installed and operational.

The licensee had conducted numerous practice exercises over the past year with equipment and components to test procedures and verify the adequacy of personnel training. As part of this testing process, the licensee was required by Section 9.2 of the FSAR to demonstrate certain key activities and elements of the ISFSI program. The licensee conducted the pre-operational test demonstrating these key activities in two phases. Both phases were observed by the NRC. The first phase was conducted during March 12-15, 2001, and included the following activities:

- load a canister into a transfer cask,
- demonstrate lowering the canister and transfer cask, loaded with dummy fuel assemblies, onto the transfer trailer and transport the canister to the ISFSI,
- insert the canister into a horizontal storage module,
- move the transfer trailer away from the horizontal storage module, then realign the transfer trailer to the horizontal storage module and remove the canister,
- weld the lid on a truncated canister,
- demonstrate the techniques to be used for the non-destructive testing of the weld,
- demonstrate connection of the vacuum drying equipment to the canister and discuss the proper operations of the equipment,
- demonstrate the capability to cut open a sealed canister, and
- discuss the process to remove spent fuel from a defective canister.

To demonstrate the ability to open a canister in order to remove the spent fuel, a video tape was provided by the licensee demonstrating the process to be used for cutting open a canister. The licensee had established a contract with a vendor that specialized in this type of work and had extensive industry experience. The video tape showed the cutting open of a truncated canister at the Rancho Seco site that had been used during welding practice sessions. The tri-tool cutting process used by the vendor was very effective in cutting the lid off the canister and had been observed at other ISFSI sites by the NRC inspection team leader.

Pre-job briefings were conducted prior to implementing procedures and work activities. The pre-job briefings were comprehensive and included good discussions concerning acceptance criteria, safe work practices, evacuation alarms, responsibilities and radiological controls. Workers performed tasks as if actual canisters were being moved. Consultants were used by the licensee to provide independent observations and recommendations during the work processes. These individuals brought knowledge and experience from other ISFSI projects at operating nuclear plants and were familiar with industry problems that had occurred over the recent years with NRC licensed dry cask storage projects. Their presence provided a valuable resource and an additional level of confidence to the workers that activities were being conducted correctly and safely.

The second phase of the pre-operational test was conducted April 2 and 3, 2001, and involved the placement of the canister and transfer cask into the spent fuel pool. Procedure DFC-001 had been revised and issued as Revision 3. This revision incorporated lessons learned and improvements identified during the first phase of the pre-operational test. The canister was successfully moved into the spent fuel pool and loaded with a dummy fuel assembly. The dummy fuel assembly was inserted into several locations in the canister to verify fuel bridge operations. The shield plug was placed in the canister to verify proper fit and the ability to maneuver the lid underwater.

Modifications and improvements to the work operations and procedures were identified by the licensee during the work activities to be incorporated into the final program. Additional information was added to pre-job briefings related to lessons learned while conducting the pre-operational test. Adequate provisions for health physics controls, heavy loads, quality assurance, security, pre-job briefings, safe work practices, stop work conditions and documentation of activities were demonstrated.

### 1.3 Conclusion

Pre-operational testing requirements identified in the FSAR were successfully demonstrated by the licensee. Based on activities observed during the pre-operational test, the licensee demonstrated the adequacy of procedures, training, and equipment to initiate loading of spent fuel into the ISFSI.

## 2 LOADING OF THE FIRST CANISTER (60855)

### 2.1 Inspection Scope

Upon completion of the pre-operational test program, the licensee proceeded directly into fuel loading activities. The observation of fuel loading activities was a performance based inspection focusing on conduct of work activities, safety practices, documentation of activities completed and the safe handling of spent fuel. Those areas reviewed during the pre-operational test program that were determined to be risk significant, such as spent fuel movement, heavy loads, radiological controls, welding, vacuum drying and non-destructive testing were the primary focus of this inspection effort.

2.2 Observations and Findings

On April 3, 2001, the licensee completed the pre-operational test required by the FSAR. Briefings were held by the staff to review lessons learned, radiation work permit requirements and changes to procedure DFC-001. The licensee then proceeded into the movement of spent fuel. Since the canister and transfer cask were already in the spent fuel pool from the activities associated with the final stages of the pre-operational test, spent fuel movement activities were able to start immediately. At 5:30 p.m. on April 3, 2001, movement of the first spent fuel assembly to the canister was initiated. Loading of all 24 spent fuel assemblies into the canister took 13 ½ hours.

During initial fuel movement activities, the spent fuel pool temperature was 65°F. Water level was 38.6 feet and the boron level was 1155 parts/million (ppm). Technical Specification D3.1.1 of the Part 50 license (DPR-54) for Rancho Seco requires the water level of the spent fuel pool to be at least 37 feet during fuel handling activities. Technical Specification D3.2 of License DPR-54 requires the spent fuel pool temperature to be maintained below 140°F. The licensee maintains boron levels above 700 ppm, however, there are no technical specification limit requirements for boron levels in the spent fuel pool. The spent fuel pool racks contain Boraflex to maintain criticality control.

A fuel movement schedule had been developed by the licensee in procedure RSAP-0238 “Control and Accountability of Special Nuclear Material (ISFSI),” which included Attachment 2, “DSC Fuel Movement and Loading Schedule,” A fuel movement and loading schedule had been developed for each canister listing the spent fuel assembly to be moved, its location in the spent fuel pool racks and the location in the canister where it was to be placed. The fuel movement and loading schedule was initialed by a certified fuel handler as each spent fuel assembly was moved to the canister. Procedure RSAP-0238, Attachment 3, “DSC Loading Verification Form,” provided a form to document an independent verification of the spent fuel assemblies after placement in the canister.

To confirm that the spent fuel assembly was fully inserted into the canister and had not become stuck, the licensee had calculated a value for the reading on the tape measure that provided a relative reading related to the grapple location on the fuel handling machine. The tape reading was calculated based on a number of inputs, each with associated errors. A tape reading of 11' 3½" ±½" was calculated as being the correct reading to represent full insertion. However, the spent fuel assemblies being loaded were reading 11' 4 ⅜" to 11' 4⅝". An inconsistency between the expected tape reading and the spent fuel assembly position had also been noticed on the dummy assembly loaded during the pre-operational test. The licensee had determined that the dummy assembly had seated all the way into the canister and that the tape reading had been miscalculated. A previous error had been found in the calculations for the tape reading and the associated errors that could be introduced in the calculations based on assumptions used could result in further errors. Since the dummy fuel assembly reading had been off, and now the spent fuel assemblies being placed in the canister were consistently off, it was assumed that the calculated tape reading was in error. A difference between the tape reading and the value measured for a spent fuel assembly would indicate that the assembly was bowed or deformed and had not fully inserted. This was not the case since there was no indication of sticking of the spent fuel assemblies during insertion and the assemblies were consistently off by approximately the same value of ⅜" to ⅝" beyond the upper value of the calculated tape reading.

After the canister was fully loaded, an independent management representative performed the final verification of the proper loading of the canister. This final inspection was being video taped as a record of the loading. During the final stages of the verification process, the seal between the canister and the transfer cask became dislodged and air bubbles escaped from between the gap. A loud thud was heard and a rippling effect occurred on the surface of the spent fuel pool. The initial assessment was that the heat of the spent fuel assemblies now loaded in the canister had heated the demineralized water and the small amount of air in the gap between the canister and the transfer cask, causing an over-pressurization which resulted in the seal dislodging. However, the thud that had been heard was a mystery. The seal had been placed between the transfer cask and the canister prior to placement in the spent fuel pool to prevent spent fuel pool water from contaminating the outside surfaces of the canister. This would minimize the potential for contamination being introduced into the ISFSI when the canister was placed into the horizontal storage module.

Because of the uncertainty regarding what happened, the plant manager made a decision to unload the canister, remove the transfer cask and canister from the spent fuel pool and conduct a visual examination. During removal of the spent fuel, the tape reading was found to indicate the fuel was approximately ⅜" lower than when it had been inserted. The visual examination of the bottom of the canister found scratches on the weld associated with the key. The key was a piece of metal welded on the bottom of the canister that fit into a slot, called a key way, on the bottom of the transfer cask to align the canister in a certain orientation in the transfer cask. The scratches on the ⅜" welds associated with the key indicated that the key had not fully inserted into the key way of the transfer cask, resulting in the canister not fully resting on the bottom of the transfer cask. Once the fuel was loaded into the canister, the added weight eventually caused the canister to drop the rest of the way into the transfer cask, resulting in a thud and causing a hydrostatic pressure in the gap between the canister and the transfer cask that caused the seal to dislodge. The corrective action was to bevel the key way to prevent the welds on the key from catching on the edge of the key way and not allowing the canister to fully settle to the bottom of the transfer cask. Management also decided to perform a full visual examination of the spent fuel that had been in the canister when the drop occurred to re-verify the condition of the fuel. To continue the fuel loading process, the fuel planned for loading in canister #2 was designated for loading in canister #1.

The questioning attitude concerning the dislodging of the seal and the willingness to stop work and investigate the situation to fully understand what had happened was an example of the cautious attitude that was demonstrated throughout the pre-operational test and during the loading of the first canister. This questioning attitude and the willingness of management to stop work to address safety issues and concerns identified by the staff during work operations was a strength noted by the NRC inspection team.

The loading of the canister with the spent fuel planned for canister #2 was initiated on April 10, 2001, and completed that same day. Fuel loading took approximately 8 hours. Loading was performed using the approved fuel movement and loading schedule from RSAP-0238. An independent verifier mapped the location and documented each spent fuel assembly. For the first canister loaded, the independent verifier was an individual from the quality assurance organization. Then an additional independent verification by senior management was performed. For the first canister, the manager, radiation protection performed the independent senior management verification. Upon recording the location of the spent fuel assemblies in the canister on separate RSAP-0238, Attachment 3 forms, the two independent verifiers compared their respective data to confirm the correct spent fuel assemblies had been placed in the correct locations in the canister. The independent verification also included the video taping of the location of the spent fuel in the canister as an additional record. All fuel movements were conducted under the direction of a certified fuel handler and were in compliance with the commitments made in FSAR, Section 10.2.5.2 for controlling spent fuel activities related to using a written loading plan, verifying placement of the spent fuel assemblies in the canister and video taping the location of the spent fuel assemblies.

The transfer cask was removed from the spent fuel pool, vacuum dried and welded during the next several days. The canister was moved to the ISFSI and inserted into the horizontal storage module on April 19, 2001. No significant issues or problems occurred with the welding, vacuum drying, transportation or insertion of the canister into the horizontal storage module. During loading of the canister, spent fuel pool water level was 38' 9" and pool temperature was 64°F. Technical specification limits were ≥37' and ≤140°F, respectively.

2.3 Conclusion

The loading of the first canister with spent fuel was halted when the seal in the gap between the canister and transfer cask dislodged allowing spent fuel pool water into the gap. The spent fuel was unloaded and an evaluation of the problem resulted in a modification to the transfer cask to prevent recurrence.

Loading activities were resumed with no significant problems encountered. The welding, vacuum drying, transportation of the canister to the ISFSI and insertion into the horizontal storage module were successfully completed on April 19, 2001

## 3 FUEL VERIFICATION (60854, 60855)

### 3.1 Inspection Scope

The licensee's program for verifying that the correct spent fuel assemblies had been selected and placed in the canister was reviewed.

### 3.2 Observations and Findings

Technical Specification 2.1 of the ISFSI license SNM-2510 established the parameters for the spent fuel planned for storage in the ISFSI. This included requirements for decay heat, cooling time, burn-up and type of fuel.

Table 2.1 "Spent Fuel Limits," of Technical Specification 2.1, required that the fuel cool at least 7 years before placement in the ISFSI. Since the reactor was shut down in 1989, this criteria was met by all spent fuel stored at Rancho Seco. Cooling time for the spent fuel removed from the Rancho Seco reactor ranged from 12 to 24 years.

The licensee developed a worksheet for identifying the fuel to be placed in each canisters. The worksheet listed the selected fuel by ID number, enrichment, burn-up, and effective neutron multiplication factor ($k_{eff}$). The worksheet for the fuel planned for placement in the first canister was reviewed. Enrichment was verified to be below the 3.43 percent limit in Table 2.1. Burn-up was also verified to be below the Table 2.1 limit of 38,268 Megawatt-days/metric ton (MWd/MTU). For the spent fuel originally planned for canister #1, the highest burn-up was 37,550 MWd/MTU. The limit for decay heat from Table 2.1 was 13.5 kilowatts (Kw). The total decay heat for the canister was 8.774 Kw. The FSAR, Section 3.1.1.2, "Thermal Characteristics," specified that the hottest spent fuel assembly would be 0.764 Kw. The highest decay heat of any one spent fuel assembly planned for canister #1 was 0.5 Kw. The licensee planned to load the canister with a mixture of fuel ranging from 0.158 Kw to 0.5 Kw. Mixing the hotter and cooler fuel to average the heat load of the canister was also planned for future canisters.

In 1996, the licensee conducted an examination of all spent fuel assemblies to assess the condition of the fuel cladding. Technical Specification 2.1 required that spent fuel with known cladding defects be stored in special failed fuel canisters. Of the 493 spent fuel assemblies stored at Rancho Seco, 10 were classified as damaged fuel. These fuel assemblies required storage in a special failed fuel canister. Of the 21 canisters planned for the ISFSI, 1 was specially designed for storage of damaged fuel. The failed fuel canister can hold up to 13 spent fuel assemblies.

Procedure RSAP-0238, "Control and Accountability of Special Nuclear Material (ISFSI)," and RSAP-0112 "Fuel Assembly Visual Inspection," had been developed by the licensee to control fuel movement activities. The procedures provided sufficient controls for selection of fuel assemblies for placement in the designated position in the assigned canister. Appropriate qualifications for personnel performing the work were specified. The procedures required independent verification by two separate individuals, in addition to the individual performing the work, to verify the placement of the correct fuel assembly in the designated canister position. Attachment 1, "DSC Loading Plan," to procedure RSAP-0238 provided a loading schedule for each canister and a drawing showing the 24 locations in the canister. Specific spent fuel assemblies were assigned by identification number to each location for all the canisters to be loaded. The loading schedule had been signed-off by the special nuclear materials manager and independently verified by the technical services engineer.

Initiation of fuel movement began on April 3, 2001, and required 13 ½ hours to load the 24 spent fuel assemblies. During movement of the spent fuel, the certified fuel handlers used a fuel movement and loading schedule that listed each of the spent fuel assemblies, the location in the spent fuel pool rack of the spent fuel assembly, and the position in the canister where the spent fuel was to be inserted. The certified fuel handler initialed the schedule after each spent fuel assembly was removed from the rack and after the assembly was placed in the correct position in the canister. A second person on the fuel handling bridge verified the data. After all the spent fuel was placed in the canister, a management representative individually checked each spent fuel assembly in the canister to confirm proper placement. A video tape was made of the spent fuel assemblies in the canister as further documentation of proper placement in the canister.

During the final management confirmation of the spent fuel placement in the canister, the seal between the canister and transfer cask became dislodged and allowed spent fuel pool water into the gap, as discussed in Section 2.2. As a precautionary action, the licensee unloaded the canister and removed the canister and transfer cask from the spent fuel pool for examination. Once it was realized that the canister had dropped approximately ⅜", the licensee also determined that a visual inspection of the spent fuel should be performed.

The licensee decided to continue the loading process and to load the spent fuel planned for canister #2 into canister #1. The worksheet for the spent fuel planned for loading into canister #2 was reviewed by the NRC inspector against the criteria of Table 2.1 of Technical Specification 2.1. Enrichment was verified for each of the spent fuel assemblies to be below the 3.43 percent limit. The highest enrichment of any individual spent fuel assembly was 3.21 percent. The highest burn-up for an individual spent fuel assembly was 35,174 MWd/MTU which was below the 38,268 MWd/MTU limit. Total decay heat for the 24 spent fuel assemblies was 9.005 Kw, which was below the technical specification limit of 13.5 Kw with the highest decay heat of any one spent fuel assembly being 0.486 Kw. This was below the 0.764 Kw limit specified in the FSAR.

Fuel loading was resumed on April 10, 2001, with the fuel that had been originally planned for canister #2. Fuel loading took 8 hours and was completed on the same day.

3.3 Conclusion

The licensee had developed a procedural process and a worksheet to document placement of the spent fuel assemblies into the canisters. The worksheet included data for the various parameters described in Table 2.1, "Spent Fuel Limits," of Technical

Specification 2.1 to facilitate verification that the selected fuel was in compliance with the technical specification limits.

The fuel loading worksheet for the spent fuel originally planned for the first canister was reviewed. The spent fuel characteristics were in compliance with the technical specifications. Decay heat for the canister was calculated as 8.774 Kw.

As a result of the problem with the seal during the initial loading of the canister, the decision was made to remove the spent fuel and conduct a visual examination. To proceed with loading activities, the spent fuel planned for the second canister was designated for loading into the first canister. A review of the worksheet data for this spent fuel found the fuel characteristics to be in compliance with the technical specifications. Decay heat for the canister was calculated as 9.005 Kw.

## 4 PROCEDURES AND TECHNICAL SPECIFICATION COMPLIANCE (60854, 60855)

### 4.1 Inspection Scope

Procedures developed by the licensee to control work activities related to the ISFSI for loading, transporting and storing the canisters were reviewed to verify usability, completeness, adequacy of precautions and warnings and incorporation of requirements from the FSAR and technical specifications. Procedures for removal of the spent fuel from a loaded canister were also reviewed to verify the licensee had developed adequate plans to unload a canister. During loading of the first canister, compliance with technical specifications and FSAR requirements was confirmed.

### 4.2 Observations and Findings

The primary procedure for conducting dry cask storage activities was DFC-001, “Dry Fuel Casking, ISFSI Loading,” Revision 2. This procedure was divided into separate sections for each of the key activities including transfer of the canister to the spent fuel pool, loading of the canister with spent fuel, removal of the canister from the spent fuel pool, welding of the lid, vacuum drying, transfer of the loaded canister to the ISFSI and insertion into the horizontal storage module. The procedure was very comprehensive and organized as a checklist for documenting activities. Cautions and notes were included throughout the procedure. Technical specification requirements and time limits for activities were clearly included at the appropriate locations. Step-by-step instructions for the various work activities were sufficiently clear and detailed to ensure adequate implementation by the workers.

Selected technical specification and FSAR requirements were verified as being incorporated into procedures. Technical Specification 3.1.1 required the licensee to achieve a vacuum pressure of $\leq$3 Torr on the canister at the completion of vacuum drying. With the vacuum pump turned off, pressure had to remain below the 3 Torr limit for 30 minutes. To account for instrument error of ±0.05 Torr for the instrument used for the test, the acceptance criteria was established as 2.95 Torr in procedure DFC-001, Section 14. Vacuum drying on the first canister started on April 12, 2001, and took almost 50 hours. Several leaks on the system were fixed during the drying process. Sign-off on procedural Step 14.23.7 by the quality control inspector confirmed that the pressure was maintained below the 2.95 Torr limit for 30 minutes for canister #1.

Technical Specification 3.1.2 established a helium leak rate of $\leq 10^{-5}$ standard cubic centimeters/second (std-cc/sec) as the limit for leakage of the inner lid seal weld. This requirement was incorporated into Section 14 of procedure DFC-001. Completion of the helium leak rate test and compliance with this technical specification requirement was documented by the quality control inspector on April 14, 2001, in Step 14.24.38 of procedure DFC-001 for canister #1.

Technical Specification 3.1.3 required the canister to be backfilled with helium to a pressure of 0 to 2.5 pounds/square inch (psig) after completing the vacuum drying process. Backfilling the canister with helium ensures that the atmosphere surrounding the spent fuel is conducive to long term dry storage of the spent fuel. Canister #1 was backfilled with helium to 1 psig. This was documented in Step 14.26.11 of procedure DFC-001.

FSAR, Volume 1, Section 10.3.15, Heat-up Duration of a Loaded Canister Filled with Water, established time limits between the time the canister was removed from the spent fuel pool and the water was drained from the canister. This is typically referred to as the “time to boil” limit. This limit is established in the FSAR as a conservative time limit to ensure boiling will not occur in the canister, which can become a criticality concern. Temperature readings on the canister were taken periodically while the canister was out of the spent fuel pool and being drained. Temperatures remained around 100°F. The applicable time limit provided in the FSAR was dependent on the heat load of the spent fuel and the temperature of the spent fuel pool water. Two tables were provided, one for spent fuel pool temperatures below 110°F and one for temperatures below 80°F. The spent fuel pool water temperature was below 68°F throughout the loading of the first canister. The decay heat of the first canister was 9.005 Kw. The FSAR specified that a canister with a heat load of ≤9.3 Kw and a spent fuel pool temperature of ≤80°F was limited to 86 hours between removal of the canister from the spent fuel pool and draining of the water from the canister. Removal of the first canister loaded with spent fuel from the spent fuel pool occurred at 9:39 am on April 11, 2001. Welding of the inner lid cover and draining of the water from the canister was completed on April 12, 2001, at 15:06. Elapsed time was 29 ½ hours.

A foreign material exclusion program was established and documented in MAP-0011, “Foreign Material Exclusion and Cleanliness Control,” Revision 9. The licensee implemented this program around the spent fuel pool area while the cask was in the pool and being loaded with spent fuel. All loose items on individuals working around the open canister were either removed or securely taped. No items were dropped in the spent fuel pool during the pre-operational test or the actual loading of the first canister.

Once a canister was loaded into a horizontal storage module, a thermal monitoring program was required by Technical Specification 5.5.3. The thermal monitoring program ensured that temperatures were maintained below limits that could affect the concrete in the horizontal storage module or the spent fuel cladding. Temperature increases in the horizontal storage module would indicate that the inlet or outlet vents had become plugged. Procedure DFC-001 included Attachment 5, “Horizontal Storage Module Temperature Monitoring,” for recording the temperature readings. Step 22.18.1 of procedure DFC-001 required completion of Attachment 5 after the canister had been successfully loaded into the horizontal storage module. Attachment 5 required temperature readings at 24 hours and at 7 days after insertion. If a temperature difference of $\geq$100°F was measured between the roof vent temperature and ambient temperature, then corrective actions were required to either remove blockage from the vents or to analyze the condition to determine if adverse effects on the concrete or spent fuel cladding would occur. The requirement for monitoring the air temperature and the time limit specified in Attachment 5 were consistent with the requirements specified in Technical Specification 5.5.3.2.

For the ongoing temperature monitoring program, Technical Specification 5.5.3.1 required the licensee to monitor temperature readings on a daily basis. FSAR Section 5.5 required readouts for the temperature monitoring system to be located in a continuously manned location and at the ISFSI electrical building. The licensee had installed a temperature monitoring system with readouts in the control room and in a small building located on the ISFSI pad. This system was confirmed as operational during the pre-operational test.

The licensee had developed separate procedures for unloading a canister, should a potential problem occur involving the spent fuel or confinement capability of the canister. The two main procedures associated with unloading a canister were reviewed. Procedure DFC-002, “Dry Fuel Casking, ISFSI Unloading,” Revision 0, described the process to retrieve a canister from a horizontal storage module. Procedure OP-C.1007, “Dry Shielded Canister Reflood and Fuel Removal,” Revision 1, provided directions for drilling holes in the outer cover of the canister to gain access to the vent and siphon port, connecting the reflood manifold to the canister, connecting the vent line to a sparger in the spent fuel pool, aligning the manifold valves, and performing the reflood operations. Special cautions were included in the procedure concerning the hazard potential from steam being generated when the water was added to the canister. A vent pressure gauge was included in the system and a limit of 16 pounds/square inch was specified for filling the canister. Upon completion of reflooding, the cover plates would be cut off using Manual M41.01-888, “Tri-Tool Operators Manual, Dry Storage Canister Lid Removal.” Procedure OP-C.1007 then described the process of placing the canister back into the spent fuel pool and unloading the spent fuel. Both procedures DFC-002 and OP-C.1007 provided detailed checklists for conducting activities. The activities were described to the same level of detail as procedure DFC-001 and included the necessary precautions and references to time limits established in the FSAR.

The FSAR, Volume 1, Section 7.2.2, stated that if it becomes necessary to unload a canister, then the licensee must sample the atmosphere within the canister prior to the removal of fuel. Radioactive gases were to be directed through the gaseous effluent system in the fuel storage building. Procedure OP-C.1007, Section 2.4.3.7, stipulated that a sample of the internal gases of the canister should be obtained and analyzed to determine if possible fuel damage had occurred. Step 2.4.3.8 specified that the canister was to be vented into the fuel storage building ventilation duct work. A radiation protection guidance document developed to support the implementation of DFC-001 provided additional guidance for establishing radiological controls for ISFSI activities. The guidance document, dated March 8, 2001, in Section 5.19, provided additional detail for sampling the canister gases prior to reflooding the canister. A sample bomb/rig would be used to collect the gas sample. A survey instrument would monitor the sample during collection. An increase in radiation levels would indicate fuel damage. If no measurable levels of radiation were detected in the gas sample, then a gamma analysis would be performed on the sample. Based on review of the procedures and the radiation protection guidance document, the licensee had developed sufficient procedures and sampling criteria to be able to unload a canister with potentially damaged fuel.

Other procedures that supported the dry cask storage program, reviewed during the pre-operational test program, included OP-C.95, “Loss of Offsite Power,” Revision, 13, RP.305.08A, “Routine and Radiation Work Permit Surveys,” Revision 5, DFC-004 “Prime Mover and Transfer Trailer Procedure,” Revision 1, CAP-0006 “Chemistry Frequencies, Ranges, and Limits,” Revision 15, and CHM-1000 “Gaseous Effluent Sampling,” Revision 8. All procedures reviewed provided adequate information to support the dry cask loading operations. No issues or conflicts with DFC-001 or DFC-002 were noted.

To verify the usability of the procedures and to verify the staff’s understanding of correct implementation of the procedures, numerous observations were made of the staff performing activities during the pre-operational test. Workers conducted activities in accordance with the procedural steps and documented actions completed. It was evident that numerous practice sessions had been conducted using the procedures to ensure that activities were correctly sequenced and steps were clearly written for consistent implementation. Workers were knowledgeable of the requirements in the procedures and understood why certain precautions were identified for certain work activities. Discussions with several workers indicated a very good understanding of the technical specification requirements associated with the loading of the spent fuel into the ISFSI. These workers indicated a willingness to bring to the attention of management any issue that appeared unusual or was a safety concern. The workers also felt empowered to stop work for any unsafe work condition.

4.3 Conclusion

Procedures for controlling dry cask storage activities, including activities in the fuel storage building, during transport to the ISFSI and insertion of the canister into the horizontal storage module were found to be detailed and complete with adequate precautions and warnings. Technical specification and FSAR requirements had been incorporated into appropriate portions of the procedures.

Adequate procedures had been developed for the retrieval of a canister from the ISFSI and removal of spent fuel from the canister. The procedures were detailed and included necessary precautions. Requirements to sample and analyze the gases in the canister prior to reflooding were included.

During loading of the first canister, workers consistently demonstrated compliance with procedural requirements. Procedural checklists were completed and required quality controls were implemented. Operations were conducted safely and in compliance with the license during the loading of the first canister.

## 5 SPENT FUEL POOL (60801, 60854, 60855)

### 5.1 Inspection Scope

Technical specifications for the spent fuel pool, established in the Rancho Seco Part 50 license, were reviewed. These included limits and surveillance requirements for spent fuel pool water level, temperature and water chemistry. Procedures for fuel handling operations and plans for treating a stuck fuel assembly were reviewed.

### 5.2 Observations and Findings

The Rancho Seco Part 50 license included the Permanently Defueled Technical Specifications. Technical Specification D3.1.2 required that at least 23 feet 3 inches of water be maintained in the spent fuel pool when fuel handing operations were not in progress. Technical Specification D3.1.1 required that at least 37 feet of water be maintained when fuel handling operations were in progress. Surveillance requirement D4.1.1 required verification of spent fuel pool water level on a daily basis. The licensee performed verification of water level during each 12-hour shift. A review of the control room log verified that required surveillances were being performed. Spent fuel pool water level was typically maintained above 38 feet. Additionally, the control room staff normally maintained a surveillance camera on the spent fuel pool water level indicator in the spent fuel pool. During the loading of the first canister, spent fuel pool water was maintained above 38' 6".

Technical Specification D3.2 required that the spent fuel pool temperature be maintained below 140°F. Surveillance requirement D4.2 required daily verification of the temperature. The control room staff had maintained logs verifying surveillances of the spent fuel pool temperature at least once each shift. During loading of the first canister, spent fuel pool temperature was maintained at or below 65°F.

Technical Specification D3.4 required that radiation levels in the spent fuel storage area be monitored by a fixed radiation monitor. Radiation level readings were available in the control room on the spent fuel pool area radiation monitor readout, which included a high level alarm.

Technical Specification D3.5 required spent fuel pool water chemistry to be maintained within specified limits for chlorides and fluorides. Technical Specification D4.5 required monthly analysis to verify compliance with these limits. The inspector verified that plant personnel had performed the required analysis on a monthly frequency. Current values were logged and posted in the control room for reference. All values recorded were well below the technical specification limits.

The licensee's surveillance procedure SP.38, "Variable Frequency Surveillance of the Fuel Handling System Interlocks," required functional tests of the fuel handling system interlocks. Records of the last two surveillances were reviewed, dated January 30, 2001, and March 13, 2000, respectively. Records documented that the required surveillances had been satisfactorily completed.

Procedure A.13, "Fuel and Component Handling," was reviewed. This procedure provided instructions for performing fuel handling equipment checkout and for moving spent fuel. The procedure had been updated for loading spent fuel into a canister. The procedure included limits and precautions which addressed compliance with Technical Specifications D3.1.1, D3.2, D3.4, and D3.5.

The superintendent of technical services was interviewed regarding contingency plans for a fuel assembly becoming stuck while loading a canister. The licensee had discussed this issue internally and planned to stop work and conduct a management assessment at the time a fuel assembly became stuck. The licensee had also requested a technical assessment from Babcock & Wilcox, the fuel vendor, concerning how much pull could be applied to a stuck fuel assembly in an attempt to free it. The licensee's canister acceptance program also included verifying the dimensions on the canister's internal sleeves using a spacing tester to ensure adequate clearances before loading the canister with spent fuel.

### 5.3 Conclusion

Spent fuel pool water level, temperature, and chemistry had been maintained within required limits and adequate procedures were established to ensure monitoring of these limits on the required frequencies.

Procedures for fuel handling operations were reviewed and found to be adequate, including provisions for movement of spent fuel assemblies to a canister. The licensee had considered the possibility of a stuck fuel assembly during canister loading. To minimize the risk of this, verification of the dimensions of the sleeves inside the canister was conducted as part of the canister acceptance program. Contact had been made with the fuel vendor concerning acceptable actions to free a stuck fuel assembly.

## 6 SAFETY REVIEWS (37801, 60851, 60854)

### 6.1 Inspection Scope

The licensee is required to maintain a functional safety review program that controls facility design changes, modifications, procedure changes, tests, and experiments. This inspection evaluated the implementation of the licensee's safety review program to verify that changes made to the dry cask storage program and equipment were in compliance with the requirements of 10 CFR 50.59 and 10 CFR 72.48 and were reviewed by qualified personnel.

## 6.2 Observations and Findings

Design changes related to the spent fuel pool or the reactor facility were required to comply with criteria in 10 CFR 50.59. Changes made to dry cask storage components or the ISFSI were required to meet 10 CFR 72.48. Changes which could affect the transportation license for the canister or shipping cask were required to meet requirements in 10 CFR 71.107(c). The licensee had combined all three design change programs into one and used the same form for all safety evaluations performed under 10 CFR Parts 50, 71 or 72. Procedures RSAP-0901, “Safety Review of Proposed Changes, Tests and Experiments,” Revision 18, and RSAP-0907, “Facility License Amendment Procedure,” had been developed by the licensee for conducting safety evaluations. RSAP-0901 was used for screening changes to determine if the change required NRC approval. For changes involving either an unreviewed safety question or a facility license/technical specification change requiring NRC approval, RSAP-0907 was used to prepare a safety analysis and no significant hazards consideration. Procedure RSAP-0901 incorporated the required screening guidance from the regulations and provided good instructions for performing the necessary evaluations.

The licensee had completed development of Revision 19 to RSAP-0901 to incorporate the changes to 10 CFR 50.59 and 10 CFR 72.48, required after April 5, 2001. The safety evaluation criteria specified in RSAP-0901 for Revision 18, in effect during the pre-operational test, was in compliance with the requirements in 10 CFR Parts 50, 71 and 72 for use prior to April 5, 2001. Revision 19, in effect during the actual loading of the first canister, adequately incorporated the requirements for compliance starting April 5, 2001.

Discussions were held with the plant review committee secretary concerning how changes made by the vendor on the cask design used at Rancho Seco would be incorporated into the safety evaluation process and be reviewed by the Rancho Seco staff. Other than the requirements in 10CFR Part 21 for defects, there was no formal process that required the vendor to notify Rancho Seco of design changes. Likewise, there was no requirement for Rancho Seco to notify the vendor of design changes, other than notifications required by 10 CFR Part 21. The current working relationship between the licensee and the vendor facilitated sufficient communications such that discussions concerning design changes that could effect the other organization were occurring. However, once the ISFSI is fully loaded, these interface activities were expected to substantially decrease. This was discussed with the licensee’s personnel for action as they deemed appropriate.

Individuals performing safety evaluations in accordance with RSAP-0901 were required to meet certain training requirements. Only trained personnel were qualified to complete the forms required for the initial safety evaluation. Additional requirements were established for secondary reviewers. For issues that did not require evaluation beyond the screening process, sign off by a qualified secondary reviewer was required. For issues that required a full safety evaluation, review and approval by the plant review committee was required.

A listing of all individuals who served as members or alternate members on the plant review committee and a listing of all individuals considered qualified to perform safety evaluations was maintained by the licensee. Names recorded on the list were compared to training records to verify that the individuals listed had received the required training to perform safety evaluations. All training was found to be current. Discussions with selected individuals involved with the safety review process indicated the employees were knowledgeable in conducting safety reviews using the NRC criteria.

The lesson plan for Revision 19 to procedure RSAP-0901, was reviewed. The training material was prepared as part of a "read and sign" program for all plant review committee members and all qualified reviewers on changes in the 10 CFR 50.59 and 72.48 process that would become effective with the issuance of Revision 19. The training material was reviewed and assessed to be adequate. The lesson plan was undergoing final revision at the time of the pre-operational test inspection.

A sampling of 10 CFR 50.59 and 72.48 safety evaluations performed over the past year were selected and reviewed. The safety evaluations reviewed included changes to the following documents. A variety of documents listed below were reviewed including procedure changes and resolution of issues identified through the licensee's internal safety reporting process referred to as potential deviations from quality (PDQ) and deviations from quality (DQ):

- Test Procedure STP.1345C, "Dry Fuel Casking Procedure," Rev. 1 - Change directing the drainage from the cask cavity to the spent fuel pool cooler sump instead of the spent fuel pool

- Defueled Safety Analysis Report, Section 1.5.53, Criterion 62 - Prevention of Criticality in Fuel Storage and Handling

- Procedure CAP-002, Rev. 13 - Change in flow rate for radioactive effluent releases.

- Master Equipment List MEL 00-0008, Rev. 0 - Remove piping from the fire protection system for specific zones

- Proposed license amendment PA-195 - Eliminate the Rancho Seco Nuclear Generating Station security plan requirements upon the transfer of the spent nuclear fuel from the spent fuel pool to the ISFSI

- Procedure MAP-0011 "Foreign Material Exclusion and Cleanliness Control"

- Procedure MAP-0010 "Control of Heavy Lifts," Rev. 6

- Procedure RSAP-0901 "Safety Review of Proposed Changes, Tests and Experiments," Rev. 18

- Potential Deviation from Quality (PDQ) 01-0017 - Impact Limiter, Rev. 0

- Potential Deviation from Quality (PDQ) 00-0057 - Shifting of East and West Walls of the Fuel Storage Building, Rev. 0
- Deviation from Quality (DQ) 01-0001, - Peeling Paint on HSM's 2 and 6, Rev. 0
- Deviation from Quality (DQ) 00-0055 - Fuel Storage Building Service Crane, Rev. 0
- Deviation from Quality (DQ) 00-0096 - Cask Work Platform, Rev. 0

Forms were properly completed including required signatures. Technical justifications for the screenings and evaluations appeared appropriate for all documents reviewed except PDQ 0057.

PDQ 0057, issued on June 12, 2000, stated that "the walls (east and west) in the fuel storage building appear to have shifted, relative to each other, as observed at the expansion joint in the walls." The shifting of the walls resulted in a misalignment of the overhead crane rails at the expansion joint. On June 14, 2000, the Commitment Management Review Group (CMRG) reviewed PDQ 0057 and determined that the issue should be upgraded to a deviation from quality (DQ) and a study should be performed to determine if there is any potential impact on fuel off-load. As part of the review of the issue, the licensee identified that misalignment of the crane rails had been observed in the past, possibly going back to initial construction; however, not to the extent reported in DQ 0057. Inspection of the spent fuel building found no evidence of cracking, spalling or settling of walls, floors or ceilings other than what had been previously identified. Leakage from the spent fuel pool into the spent fuel pool liner had actually shown a decrease. The recommendation in DQ 0057 was to continue to provide surveillance to monitor future shifting of the crane rails. DQ 0057 was closed on November 15, 2000 and action was taken to return the rails to proper alignment. A 10 CFR 50.59 safety determination was performed as part of the closure process for DQ 0057. This was performed in accordance with procedure RSAP-0901, "Safety Review of Proposed Changes, Tests and Experiments," Revision 18. As part of the safety determination, the licensee was required to review the various licensing basis documents that could be affected by this issue. In Section 1.2 of the safety determination form, the licensee referenced the Defueled Safety Analysis Report (DSAR) and determined that movement of the walls had no impact on Section 5.0, "Structures and Containment Systems." Based on this determination, the licensee closed the issue without performing a safety evaluation to determine if an unreviewed safety question existed with the movement of the walls. The safety determination form was signed off on November 21, 2000.

A review of the issue related to the walls shifting, as identified in DQ 0057, was performed by the structural engineer on the NRC's pre-operational test inspection team. In addition to DQ 0057, the NRC inspector reviewed DQ 0055, which had been issued on June 8, 2000. DQ 0055 addressed the same issue, but from the perspective of the affects of the wall shifting on the overhead crane operations. The problem analysis section of DQ 0055 identified that the west rail had moved 3/4 to 1 inch and the east rail had moved 1/4 to 3/8 inch. Movement for both rails was in the same direction.

Since the rails did not shift equally the same distance, then stresses would be expected to develop in the walls. The enclosure where the spent fuel is stored actually consists of two buildings, the fuel storage building and the auxiliary building, separated by an expansion joint. A person enters a door on the auxiliary building side, walks a short distance, then steps across the expansion joint and is now standing near the edge of the spent fuel pool. The spent fuel pool is on the fuel storage building side of the expansion joint. The auxiliary building side of the expansion joint is the side that had shown movement in the walls as determined by binding on the guide wheels of the overhead crane as it moved over the rails on the auxiliary building side. The crane runs on overhead rails in the north-south direction. The rails are continuous between the two buildings and are split at the expansion joint between the fuel storage building and auxiliary building. The misalignment of the rails described in DQ 0055 and DQ 0057 were observed at that expansion joint.

A review of Sections 5.3, “Auxiliary Building,” and Section 5.4, “Fuel Storage Building,” of the DSAR identified references to design loads, dead loads, live loads, earthquake loads, wind loads, rain loads and thermal stresses for the building walls. Section 5.3.2.2, “Design Criteria,” states that the main consideration in establishing the structural design criteria for the auxiliary building is to provide a structure that will withstand normal operating loads and the loads from an earthquake. The strength of the structure at working stress and ultimate capacity is compared to various loading combinations to ensure safety. The structure is designed to meet the performance and strength requirements under both the design load and factored loads. Section 5.3.2.3 states that the stresses due to seismic forces in concrete and reinforced steel are checked using the values obtained from the dynamic analysis of the building. In critical areas, the structure is analyzed by both the working stress and ultimate strength stress.

Based on the review of the DSAR, design criteria for the structural integrity of the auxiliary building walls is included as part of this licensing basis document. Since the walls did not move the same distance, there would be additional stresses created on the walls. It was not apparent from documentation reviewed that the licensee had an appropriate basis for concluding that there was no change to the facility as described in any licensing basis document. Consequently, this matter is considered an Unresolved Item pending receipt and review of further information from the licensee to support their conclusion (URI 50-312/0103-01).

6.3 Conclusion

The licensee’s program to review design changes, facility modifications, procedure changes, tests and experiments in accordance with 10 CFR Parts 50, 71 and 72 had been combined into one program. This program was current for the requirements at the time of the pre-operational test and was revised to implement the new 10 CFR Parts 50 and 72 requirements that became effective April 5, 2001.

Selected safety screenings and evaluations were reviewed to verify compliance with the requirements of 10 CFR 50.59 and 10 CFR 72.48. A safety screening completed by the licensee relating to shifting of the east and west walls in the fuel storage building had been determined to not require a safety evaluation. It was not apparent from documentation reviewed during the inspections that the licensee had an appropriate basis to determine that no change had been made to the facility as described in the licensing basis documents. This issue will be tracked as an Unresolved Item pending receipt and review of further information from the licensee to support their conclusion (URI 50-312/0103-01).

Training records were reviewed for individuals listed as qualified to perform safety evaluations. Training was found to be adequate and individuals interviewed were knowledgeable in the requirements for conducting safety evaluations.

## 7 HEALTH PHYSICS (60854, 60855, 83750)

### 7.1 Inspection Scope

The licensee's health physics program implemented during the current reactor facility dismantlement has been reviewed during numerous inspections over the past several years to verify compliance with federal regulations. Application of this program to the dry cask storage project and incorporation of special requirements from the ISFSI technical specifications and FSAR were reviewed.

### 7.2 Observations and Findings

The licensee had been implementing a radiation safety program for the site to support dismantlement and decommissioning activities. This same program, which has been reviewed by the NRC during numerous inspections over the past several years, was used to control work activities for the dry cask storage program. The use of radiation work permits, ALARA concepts, dosimetry, contamination control, instrumentation, and other basic health physics requirements of 10 CFR Part 20 were being adequately applied to the work activities in the fuel storage building and at the ISFSI.

The licensee had conducted an ALARA evaluation for the fuel transfer activities and had developed a conservative estimate of planned exposures for the dry cask storage project and work activities. Provisions were in place to minimize personnel exposures. These included washing down of the transfer cask as it was removed from the pool to reduce contamination, the use of temporary shielding during welding and continuous health physics coverage to monitor changing radiological conditions and take necessary actions to keep exposures low.

The radiological controls during loading of the first canister were observed during this inspection. There were two radiation protection technicians assigned to each of the three fuel load teams. The teams had practiced fuel loading activities and were knowledgeable of radiation protection controls.

RWP No. 105 had been issued on February 7, 2001, for all activities involved with the dry cask loading operations. All individuals had been briefed on the RWP requirements. The RWP specified minimum protective clothing requirements for performing work in posted contamination areas. The area around the spent fuel pool had been posted as a contaminated area. This posting had been established not because there was contamination, but because the potential existed when the loaded cask was lifted out of the pool.

To control personnel outside the fuel storage building during lowering of the cask onto the transport trailer, the north laydown area outside the fuel handling building was controlled by security and radiation protection. Two barrier ropes were established to demarcate the area and workers were required to be signed in on RWP No. 105. In leaving the area, the workers had to perform a frisk of their hands and feet. Workers were observed complying with the radiological controls during both the pre-operational test and during loading of the first canister. Both radiation protection personnel and security aggressively enforced the RWP requirements during both the pre-operational test and during the actual fuel movement. The radiological postings on the transport trailer were also verified as adequate.

Survey instruments used by the licensee for neutron monitoring included the Eberline Model ASP-1 and Eberline PNR-4. Calibration of the PNR-4 instruments was reviewed. The PNR-4s were calibrated as specified in the licensee's procedure RP.311.V.02, "Eberline Model PNR-4 Neutron Counter," Revision 0, which stated that the instrument may be sent to an approved National Institute of Standards and Technology (NIST) secondary laboratory. The PNR-4s were calibrated by Southern California Edison using a plutonium-beryllium (PuBe) source and a transfer standard to moderated californium-252. The calibration certificates for each instrument were reviewed. The instruments were in current calibration.

Special Test Procedure STP.1353, "Cask Neutron Shield Scan," Revision 0, was reviewed. This special test procedure would confirm the adequacy of the neutron shield in the transfer cask to ensure no voids had occurred during fabrication. The licensee planned to implement this procedure prior to moving the first loaded canister to the ISFSI. The procedure was thorough and provided adequate precautions and ALARA requirements. The expected neutron dose rates at each axial grid location was provided in an attachment. There were adequate data sheets available to record the actual neutron results. A neutron survey rotating arm would be attached to the top of the transfer cask by bolting the rig into the lid lifting holes. The survey instrument was calibrated with a 20-foot cable for remote read-out capability. The rotating arm had a locking-pulley system to move and lock the PNR-4 survey instrument in place to record the highest reading. The cask neutron survey scan procedure provided adequate guidance to perform the confirmatory neutron surveys and maintain ALARA requirements.

For personnel neutron monitoring, the Landauer neutrak dosimeter was used. The dosimeter was accredited under a National Voluntary Laboratory Accreditation Program (NVLAP) demonstrating compliance with ANSI HPS N13.11-1993, based on testing with moderated californium-252.

The Siemens electronic personnel dosimeter-n (EPD-N) was used for tracking personnel daily dose estimates. The electronic dosimeter was currently factory calibrated to thermal neutrons. The licensee had adjusted the electronic dosimeter calibration factor to respond to the neutron energy range for the ISFSI.

The Siemens electronic personnel dosimeter serial numbers and calibration data were entered into the radiation protection access control computer system. The access control system verified the electronic personnel dosimeters had current calibration dates prior to the respective person entering the radiologically controlled area.

The licensee was conducting a study during the loading of the first canister to compare neutron readings between the Siemens electronic personnel dosimeter, the neutron survey instruments and the personnel neutrak dosimeter. The results of the licensee's study comparing the neutron readings from the two personnel dosimeters and the neutron surveys and the determination of correction factors for the Siemens electronic personnel dosimeters will be reviewed during a future inspection. This issue will be tracked as an Inspection Followup Item (IFI 72-11/0101-01).

Training and qualifications were reviewed for the radiation protection manager and radiation protection technicians assigned to dry cask storage activities. Procedure RSAP-1204, "Training Programs," Revision 6, and RP 305.22, "Departmental Training and Qualification," Revision 3, established the training requirements. Procedure RSAP-1204 required that all site managers, supervisors, technicians and professionals meet the training and qualification requirements in ANSI N18.1-1971. The radiation protection manager and contract technicians met the ANSI N18.1-1971 requirements for work experience and training. In addition, the training for the contract technician's was reviewed to verify the procedure requirements in RP 305.22 were met. The contract technicians had performed the required training and reading assignments, except for one technician who still had additional reading to complete prior to the start of fuel loading activities. The training documentation reviewed was satisfactory.

The licensee monitored the environmental radiation levels around the site with 33 environmental dosimeters. The dosimeters were placed in specific locations in the restricted area for the purpose of monitoring plant personnel who did not make radiologically controlled area entries. The licensee performed an annual evaluation of the dosimeters. The evaluations were reviewed for the period 1996 through 2000. The licensee adequately evaluated and documented the dosimetry results. The licensee's evaluation was an appropriate justification to document that the dose limits for individual members of the public specified in 10 CFR 20.1302 were not exceeded.

The licensee had placed an additional eight dosimeters on the outside security isolation zone fence around the ISFSI. The dosimeters had been located on the ISFSI fence since the third quarter of 1996 and had been changed out on a quarterly basis. The ISFSI area dosimeter data was reviewed from the third quarter of 1997 through the fourth quarter of 2000. Beginning with the third quarter of 1999, the licensee began using a different dosimetry processor, which had a lower minimum threshold for reporting results. The data adequately documented the pre-operational history of the direct background radiation for the ISFSI area.

The licensee had provided for an independent evaluation of radiation protection readiness for fuel transfer activities prior to the pre-operational test. This audit identified a number of issues to be addressed prior to commencing fuel transfer. Eight of these issues had been identified as audit items. The items were closed by April 2, 2001, prior to commencing the loading of the first canister.

Several commitments had been established in the FSAR and technical specifications related to radiological protection specific to the dry cask storage program. These commitments were verified as being incorporated into the procedures and implemented during the loading of the first canister.

Technical Specification 5.5.4 required the licensee to perform a survey of the transfer cask during loading and transfer operations to ensure that surface dose rates were within analyzed values. Analyzed values were specified in several sections of the FSAR. FSAR Section 10.3.11 established limits for dose rates on the canister. The first limit was 200 mrem/hr at the top shield plug centerline, before installing the inner lid, with water in the canister. Procedure DFC-001, Step 12.21.92, documented the measurement of the dose rate of the canister to comply with this technical specification. For the first loaded canister, the dose rate at the centerline of the shield plug before installation of the inner lid was 30 mrem/hr gamma. No neutrons were detected.

During welding of the inner lid, 60 gallons of water was drained from inside the canister to prevent a heat sink from being created by water inside the canister being in contact with the lid. This created increased dose rates that would be encountered by the welders. After the 60 gallons of water was drained and prior to placing the inner lid on the canister, dose rates increased to 80 mrem/hr on contact with the shield plug. With the inner lid positioned in place, dose rates dropped to under 30 mrem/hr contact and 20 mrem/hr at 30 cm. Radiation levels on the work platform around the cask were 1-3 mrem/hr and less than 1 mrem/hr in the adjacent work area. The welders and NDE personnel limited their time around the inner lid and were closely watched by radiation protection personnel to ensure ALARA principles were being implemented. With the use of the automatic welder, the amount of time requiring personnel to be around the top of the canister was greatly reduced.

FSAR Section 10.3.11 identified a radiation limit for the canister with the water removed and the outer lid placed in position. This limit was 400 mrem/hr on contact. Procedure DFC-001, Step 16.4.10, documented the centerline surface dose rate on the outer lid with the water removed as 12 mrem/hr gamma and 30 mrem/hr neutron for a total of 42 mrem/hr.

FSAR Section 10.3.13 established dose rate limits for the transfer cask loaded with a canister. The dose rate at 3 feet from the cask with water in the canister was limited to 200 mrem/hr. At 3 feet without water in the canister, the limit was 500 mrem/hr. Procedure DFC-001 required verification of compliance with these limits in Steps 12.21.92, 17.14.17 and 17.17.3. Step 12.21.92 documented the dose rate as less than 1 mrem/hr gamma and neutron at 3 feet from the side of the transfer cask with water in the canister. Step 17.14.17 documented a gamma dose rate of less than 1 mrem/hr and a neutron dose rate of 2.5 mrem/hr at 3 feet from the transfer cask lid.

This measurement was taken after the water was removed from the canister and the cask was ready to be lowered from the fuel storage building onto the transport trailer. Step 17.17.3 documented a dose rate of less than 1 mrem/hr gamma and 2 mrem/hr neutron at 3 feet from the bottom of the cask after it had been loaded onto the transport trailer. As an ALARA provision, a temporary shield plug was used on the transfer cask for onsite transport. This provision was described in Section 4.2.5.3 of the FSAR. Procedure DFC-001 included directions for installing the shield plug in Steps 17.17.4.5 and 17.17.4.6.

In addition to the radiological data documented in Procedure DFC-001, the licensee conducted numerous radiological surveys of the transfer cask and canister during work activities, and especially during activities that could change the dose rate. Survey forms had been developed for documenting the various radiation surveys. Surveys included both radiation levels and contamination levels.

After the first canister had been loaded with fuel, then unloaded due to the seal failure, the canister and transfer cask were removed from the spent fuel pool, decontaminated, surveyed and inspected. When the canister was initially removed from the spent fuel pool for decontamination and inspection, radiological monitoring personnel located a hot particle on the top of the canister reading 100 mR/hr as the canister came to the surface of the spent fuel pool. The hot particle was rinsed off prior to removing the canister from the spent fuel pool.

During the survey of the transfer cask after the canister had been removed, small levels of contamination were detected on the inside of the cask. The survey determined that most of the interior of the cask was free of contamination, except for the inside bottom. A reading of approximately 6,000 disintegrations per minute/100 $cm^2$ (dpm/100 $cm^2$) was detected. The licensee found that this contamination was on a lubricant, N5000, that had been used to lubricate the rails on the transfer cask to reduce friction when removing the canister from the cask during insertion into the horizontal storage module. The lubricant adhered more to itself than the stainless steel, and thus balled up. The contamination and lubricant were successfully removed from the inside of the transfer cask and the cask was successfully decontaminated.

The inside of the canister showed higher levels of contamination, as would be expected, since it was in contact with the spent fuel. A hot particle reading 4 mrad/hr was removed. Contamination smears measured radiation levels up to 34,000 dpm/100 $cm^2$ beta/gamma. No alpha contamination was measured. General dose rates inside the top of the canister were 1 - 3 mR/hr. The highest reading on the outside of the canister near the bottom was 10 mR/hr on contact. The outside of the canister was successfully decontaminated prior to being placed back into the transfer cask.

Technical Specification 5.5.4 established smearable surface contamination limits for the outer surface of the canister as 2200 dpm/100 $cm^2$ beta/gamma and 220 dpm/100 $cm^2$ alpha. FSAR Section 4.4.1, required a contamination survey to be conducted to a depth of about 1-foot below the top surface of the canister to verify that the canister was not contaminated prior to movement to the ISFSI. Since a seal was used by the licensee to prevent contaminated spent fuel pool water from entering the annulus between the canister and the transfer cask, surveying the top 1-foot of the canister would provide an indication of whether the canister had become contaminated. If smearable contamination exceeding the limits was found, the annulus would have to be flushed with clean demineralized water until acceptable contamination levels were measured. To remove contamination on the outside of the transfer cask, the licensee rinsed the cask with clean demineralized water as it was being removed from the spent fuel pool. This process worked very well in cleaning the cask. For the first canister loaded, procedure DFC-001, Step 12.22.16, documented the smear survey conducted to demonstrate compliance with the limit for the outer surface of the canister. Contamination levels were less than 1,000 dpm/100 $cm^2$ beta/gamma. No alpha was detected.

After the canister had been loaded into the horizontal storage module, the radiation protection technicians conducted a contamination survey of the interior of the transfer cask. This was documented in procedure DFC-001, Step 22.17.30, which found contamination levels of less than 1,000 dpm/100 $cm^2$ beta/gamma and less than 20 dpm/100$cm^2$ alpha.

For the horizontal storage module, three radiation limits were established in FSAR Section 10.3.12. These were 400 mrem/hr at 3 feet from the horizontal storage module surface, 100 mrem/hr centerline outside the door to the horizontal storage module, and 20 mrem/hr at the end shield wall exterior. Step 22.17.26 of Procedure DFC-001, documented the survey of the horizontal storage module for the first canister loaded. The dose rate 3 feet from the surface was 1.8 mrem/hr gamma. The contact dose rate at the centerline to the door was 3 mrem/hr gamma. The east and west shield wall dose rates were below detectable limits of 0.2 mrem/hr. No neutron radiation was detected at any of the locations around the horizontal storage module.

FSAR Section 10.3.7 established a 2 mrem/hr limit at the outer security fence boundary of the ISFSI. Procedure DFC-001, Step 22.17.25, documented the survey of the outer fence area after the first canister had been placed in the horizontal storage module at the ISFSI. Radiation levels were below minimum detectable limits of 0.2 mrem/hr gamma and 0.5 mrem/hr neutron for the instruments used for the survey.

Multiple steps throughout the DFC-001 procedure, including Steps 6.5.1, 8.4, 8.7, 17.7 and 17.12, required that the rad waste area exhaust fan system be operable and in service per procedure A.14B, "Auxiliary Building Heating, Ventilation and Air-Conditioning (HVAC) Systems," whenever the fuel storage building roll-up door/hatch was open. The rad waste area exhaust fan system discharged into the auxiliary building stack ventilation exhaust system which was monitored by a gaseous effluent radiation detector. Procedure A.14B required the radiological detection systems to be in calibration to be considered operable. A review of records found the detection system to be operable and calibrated.

Step 6.2.4 of Procedure DFC-001 required that radiation levels in the spent fuel storage area be monitored by a fixed radiation area monitor. This monitor provided a read-out in the control room that alarmed at 10 mR/hr. During a tour of the control room, the monitor was verified as operable and set to the proper alarm point.

The FSAR, Section 3.1.2.2, described three types of contaminated waste produced as a result of dry cask storage activities. These were 1) the water drained from the canister, 2) the potentially contaminated air vented from the canister and 3) wet and dry active waste generated from the loading, drying, sealing and decontamination of the canister. Procedure DFC-001 adequately addressed the steps required to drain the water from the canister back into the spent fuel pool and to vent the potentially contaminated air from the canister. The vent line from the canister was routed to the intake of the fuel storage building ventilation system which subsequently goes to the auxiliary building ventilation and is discharged through the stack. The discharge is monitored by a radiation detector. The licensee considered ALARA in routing the vent line to the ventilation system to avoid potential contamination in the area around the venting system.

7.3 Conclusion

The licensee's radiation protection program used for site decommissioning and dismantlement activities was applied to the work activities associated with the dry cask storage project. The program had been effectively implemented in the areas required by 10 CFR Part 20.

The licensee had performed an ALARA evaluation of activities and had established provisions in procedures to ensure adequate health physics monitoring and controls were established.

Personnel dosimetry, including neutron badges and survey instrumentation, were used on the project and were calibrated.

Radiation protection personnel assigned to the project were properly trained and qualified. Personnel were aware of the radiological controls to be implemented for the dry cask storage project and were observed by the NRC inspection team on numerous occasions conducting the required radiological surveys and implementing proper radiation controls.

Numerous commitments and requirements had been incorporated into the ISFSI technical specifications and FSAR. A review of selected requirements found good correlation between the requirement and instructions provided in the procedure used for loading the first canister into the ISFSI.

## 8 TRAINING PROGRAMS (60854)

8.1 Inspection Scope

Training provided to the licensee's team members on fuel movement procedures and the completeness of training records were reviewed. The effectiveness of the training program to prepare the staff to conduct dry cask storage activities was assessed.

8.2 Observations and Findings

NRC Inspection Report 50-312/00-04; 72-11/00-01, dated October 10, 2000, provided a comprehensive review and assessment of the training program for the fuel team members. Training had been conducted in accordance with RSAP-1205, “Dry Fuel Storage Equipment Operator Training and Certification Program.” Training records had been found to be adequate.

During the pre-operational test inspection, a review was completed to verify the continuing adequacy of the training program. Training material was reviewed and found to be current. Training documentation was reviewed against the names of individuals listed as fuel team members . Names of individuals who had not yet completed the required training were being tracked by the licensee as requiring training completion. No issues or concerns were identified.

During the pre-operational test and during the fuel loading activities for the first canister, numerous discussions were held with workers concerning work activities, radiological control requirements, cautions and actions to take during unexpected events. The workers demonstrated a strong knowledge of the dry cask storage program requirements and had a good understanding of the basis for the key elements of the program. Workers exhibited a level of confidence related to their assigned tasks and were able to answer detailed questions concerning how various technical specification requirements were being implemented by the procedures. Based on observation of performance and conversations with the workers, the training program was determined to be effective.

8.3 Conclusion

The dry cask storage training program had been reviewed during a previous inspection and was confirmed during this inspection as being current and effectively implemented. Training records were being maintained. Workers demonstrated a good knowledge of technical specifications and an understanding of procedural requirements indicating that training had been successfully implemented.

## 9 QUALITY ASSURANCE PROGRAMS (40801, 60854)

9.1 Inspection Scope

The quality assurance program implemented at the Rancho Seco ISFSI had been evaluated against the requirements of 10 CFR Part 72, Subpart G, as part of the ISFSI licensing process. This inspection reviewed the implementation of the ISFSI quality assurance program related to the audit and surveillance program.

9.2 Observations and Findings

The NRC had reviewed and approved the Rancho Seco Quality Manual as part of the licensing process. The Rancho Seco Quality Manual was implemented by the licensee for both the Part 50 license and the Part 72 license. The NRC had inspected the implementation of the Rancho Seco Quality Manual during previous inspections of site decommissioning activities and found that the quality assurance program was effectively implemented. During this inspection, application of the quality assurance program to the dry cask storage activities was reviewed in the area of audits and surveillances.

The licensee's audit and surveillance program was described in Procedure RSAP-1306, "Quality Audits and Surveillance Reports," Revision 7. This procedure was reviewed to determine if the licensee was performing adequate assessments of the various contractor's and vendor's quality assurance programs. Surveillance and audit reports identified in Attachment 1 to RSAP-1306 were reviewed with the quality assurance personnel who typically performed the assessments. The licensee's nuclear quality assurance inspectors and auditors performed both scheduled and unscheduled surveillances and audits. A review of several surveillance and audit reports did not identify any adverse practices or problems with audit and surveillance methods. An appropriate level of detail was included in the applicable checklists. The scope of the audit and surveillance activities was considered appropriate.

Interviews were conducted with personnel assigned to perform the surveillances and audits. The personnel were knowledgeable of their specific ISFSI role and job function and reflected a good sense of pride in their job and work activities.

The corrective action program used for dry cask storage activities was the same process used for Part 50 decommissioning activities. This program had been inspected previously as part of the decommissioning activity inspections and had been found to be adequately implemented.

9.3 Conclusion

The licensee was implementing a quality assurance program for the dry cask storage activities utilizing the same program implemented for the site decommissioning effort. Audits and surveillances of vendors and contractors that provided equipment for the ISFSI were being performed. The scope of the audits and surveillance activities was considered appropriate.

## 10 PROCUREMENT CONTROLS AND10 CFR PART 21 (60854)

10.1 Inspection Scope

Controls for ensuring that equipment, materials and services conform to procurement specifications were evaluated. Procedures were reviewed to verify provisions were established to ensure identification, control, handling, storage and shipping of components were within specifications and instructions. Purchase orders were reviewed to verify quality assurance requirements of 10 CFR Parts 21 and 72 had been incorporated.

The licensee's programs for reporting defects and non-compliance in accordance with 10 CFR Part 21 was also reviewed.

10.2 Observations and Findings

The licensee had developed procedure RSAP-0409, "Procurement Program For Defueled Plant," Revision 2, to establish uniform guidelines to ensure applicable regulatory and technical requirements, design bases, quality assurance program requirements and other performance requirements necessary to ensure adequate quality were included or referenced in documents for procurement of material, equipment and services. Program requirements included evaluating qualifications of suppliers, ensuring qualified suppliers remain qualified, and invoking applicable technical, regulatory, administrative and reporting requirements, such as 10 CFR Part 21, "Reporting of Defects and Noncompliances," on suppliers. Procedure RSAP-0409 described an acceptable program for controlling procurement of equipment, materials and services to support the dry cask storage project.

Interviews were conducted with selected licensee personnel to verify an adequate understanding of the procurement controls as they related to the dry cask storage project. Selected purchase orders for components and services important to safety , as defined in 10 CFR 72.3, were examined to verify that adequate quality requirements and regulatory requirements had been imposed.

The licensee's program for implementing the requirements of Part 21 was described in Procedure RSAP-0912, "10 CFR 21 Reporting Of Nuclear Plant Defects or Noncompliances," Revision 7. This procedure was reviewed and found to incorporate the requirements of 10 CFR Part 21.

10.3 Conclusion

An acceptable program had been established and implemented by the licensee to control the procurement of equipment, materials and services to ensure that acceptable quality requirements were applied.

The licensee had established satisfactory procedures for reporting defects and noncompliances in accordance with 10 CFR Part 21.

## 11 FIRE PROTECTION (36801, 60854, 60855)

11.1 Inspection Scope

The licensee was required by Technical Specification 5.7 to establish limits for flammable fuels during cask transfer activities. The licensee's program for controlling flammable liquids at the ISFSI and provisions for responding to a fire were reviewed.

11.2 Observations and Findings

Fire controls were required at the ISFSI to ensure an acceptable fire loading, as analyzed in the FSAR, Section 8.2.5, was maintained during the transfer of a loaded cask. The analysis in the FSAR postulated a worse case fire where 300 gallons of diesel fuel formed a pool directly beneath a loaded transfer cask which would burn for

15 minutes entirely engulfing the cask. Technical Specification 5.7 established a more limiting value of 200 gallons per vehicle during loading operations at the ISFSI. The technical specification also specified that only diesel fueled vehicles were allowed inside the ISFSI fence.

A review was completed of procedures DFC-001 “ISFSI Loading,” Revisions 2 and 3, and DFC-002, “ISFSI Unloading,” Revision 1. These procedures included controls for the use of vehicles and equipment at the ISFSI. Sections 18.1, 19.1 and 20.1 of procedure DFC-001, and Section 6.2.3 of procedure DFC-002, referenced the requirement in Technical Specification 5.7 and limited vehicles/equipment within the ISFSI boundary to electric or diesel powered. Diesel powered vehicles/equipment were limited to a maximum of 200 gallons of diesel per vehicle/piece of equipment.

Access of vehicles to the ISFSI was controlled by security personnel. The licensee had issued a memorandum dated Mach 7, 2001, to security personnel from the security superintendent, entitled “ISFSI Protected Area Vehicle Authorization List.” This memorandum listed eight vehicles or equipment that were allowed access to the ISFSI protected area. These vehicles or equipment were either electric or diesel powered. All of the diesel powered vehicles or equipment had fuel capacities of less than 200 gallons each. Throughout the dry run and the loading of the first canister into the horizontal storage module, the inspectors noted that only vehicles on the ISFSI protected area vehicle authorization list were allowed into the ISFSI protected area.

Interviews were conducted with personnel during the dry run regarding fire protection. All individuals questioned, whether from the fuel handling crew, health physics, or security, were aware that only vehicles or equipment on the authorized list were permitted in the ISFSI protected area and that this was required to limit the amount of fuel that could be involved in a fire.

Procedures OP-C.48, “Fire,” Revision 9, Procedure RSAP-0227, “Control of Fire Protection Impairments,” Revision 13, and the Decommissioning Fire Protection Plan, Revision 6, dated February 15, 2001, were reviewed. Provisions had been included in these documents for response to fires and explosions at the ISFSI. The site emergency plan also included provisions for classifying emergencies involving fires and explosions.

The licensee had made arrangements with two offsite fire organizations to provide response and support during a fire at the ISFSI. Contact was made by the NRC inspectors with the Herald and Galt Fire Departments to verify that adequate interface activities had occurred between the licensee and the fire departments concerning the ISFSI. Managers from both fire departments had been provided an opportunity to tour the ISFSI and confirmed that their departments were prepared to respond.

Section 6.3.4 of procedure DFC-001, and Section 6.3.3 of procedure DFC-002, each addressed considerations of a post-fire recovery plan.

11.3 <u>Conclusion</u>

The licensee had developed an acceptable program for controlling flammable liquids at the ISFSI to comply with technical specification requirements and to keep flammable liquids below the level analyzed in the FSAR for the worst case fire scenario. Security maintained a list of vehicles allowed into the ISFSI. Personnel questioned during the pre-operational test activities were aware of the limits for flammable liquids.

Support from two local fire organizations had been arranged to support fire fighting activities at the ISFSI. Both organizations were contacted by the NRC and confirmed their preparedness to provide support to the licensee.

## 12 EMERGENCY PLANNING (36801, 60854)

### 12.1 Inspection Scope

Implementation of the emergency plan for the ISFSI was reviewed. This included the adequacy of emergency procedures, training, drills/exercises and arrangements with offsite support organizations.

### 12.2 Observations and Findings

Provisions for responding to an emergency at the ISFSI were included in the site Emergency Plan, Change 4. The site emergency plan was a combined Parts 50 and Part 72 plan that included provisions for responding to emergencies at both the reactor facility and the ISFSI. Design basis accidents analyzed for the ISFSI, as described in FSAR, Section 8.2, "Accident Analysis for the ISFSI," were incorporated into Section 3 of the emergency plan. The various accidents described in the FSAR included accidental cask drops, earthquake, blockage of the horizontal storage module air inlet and outlet, tornado winds and leakage of a canister.

A review of the ISFSI emergency plan was conducted as part of the ISFSI licensing process by NRC headquarters. This included a site visit by the NRC licensing reviewers on February 17-18, 1999. On October 27, 1999, the NRC completed the review of Revision 4 of the emergency plan and issued a safety evaluation that found the emergency plan met the requirements in 10 CFR Parts 70.32 and 72.32.

The licensee had incorporated provisions for implementing the emergency plan for the ISFSI into the site emergency procedures. Emergency Plan Implementing Procedure EPIP-5001, "Recognition and Classification of Emergencies," Revision 8, provided guidance on classifying the different types of emergency conditions. Either an Unusual Event or Alert could be declared for an event at the ISFSI. The procedure included a section specific to ISFSI emergency conditions that based the classification of the emergency on whether potential damage had occurred to the spent fuel, i.e., an Unusual Event, or whether actual damage had occurred, i.e., an Alert. An Unusual Event would also be classified if a loaded canister was dropped from a height of greater than 15 inches.

A review of the other site emergency procedures, primarily developed for the reactor decommissioning emergency response program, found adequate provisions were already in the emergency procedures to cope with an emergency condition at the ISFSI in the areas of response teams, notifications, technical support, evacuations, transport of a contaminated and injured person to the hospital and authorizing emergency exposure limits during the emergency response.

The licensee had established a list of emergency response positions and the associated training for each position in Attachment 7.2, “Training Matrix,” to EPIP-5600 “Emergency Response Training,” Revision 10. For each position in the emergency organization, there were four individuals trained. Records reviewed indicated that all training was current with the exception of the radiation protection and chemistry superintendent. This individual was designated as a radiological assessment coordinator. There were three other individuals qualified to serve in this position, which provided adequate coverage for the position. The licensee made arrangements for the completion of the training for the radiation protection and chemistry superintendent. Interviews were conducted with selected operations and health physics personnel to determine their level of knowledge of the various types of accidents that could occur during loading the ISFSI and during ISFSI operations. Personnel interviewed were aware of the types of accidents that could occur and what their response actions should be.

The licensee conducted a drill/exercise program at the site to ensure the readiness of the emergency response personnel and to test equipment. Procedure EPIP-5600, “Emergency Response Training,” Revision 10, Attachment 7.3, described the drill and exercise program for Rancho Seco. Three types of drills were required annually. These were a fire drill, medical drill and annual exercise. The medical drill was conducted on July 19, 2000, and involved the participation of the University of California Medical Center. Emergency personnel at the site responded to an incident involving an injured and contaminated person. Contamination control and first aid were implemented and the individual was prepared for transport to the hospital. Actual transport to the hospital was not performed. At the hospital, receipt of an injured and contaminated person was demonstrated. The hospital established provisions for controlling the spread of contamination and demonstrated the ability to provide medical treatment for the injuries.

On December 4, 2000, the licensee conducted the annual exercise The exercise involved the loss of offsite power while a canister loaded with spent fuel was being moved from the spent fuel pool to the wash-down platform. An earthquake and the loss of offsite power occurred while the canister was hanging over the pool. Major damage occurred to the training and records building and a leak was detected in the spent fuel pool liner. The exercise was successfully conducted.

The licensee had also included dry cask loading activities in the 1999 exercise. This exercise was conducted on December 1, 1999. This exercise involved a lightning strike to the gantry crane during the movement of the shield plug over the spent fuel pool above a loaded canister. The crane’s brakes failed and the shield plug falls into the spent fuel pool causing damage to the spent fuel in the canister. This exercise was also successfully conducted. Both exercises provided good training for site personnel in preparation for dry cask loading activities.

The emergency plan, Section 8.4, required the licensee to provide to the NRC the exercise objectives and scenario for the annual exercise at least 60 days prior to the exercise. This information was provided to the NRC on October 2, 2000, for the exercise conducted on December 4, 2000. The exercise objectives and scenario for the December 1, 1999, exercise had been provided to the NRC on September 30, 1999.

The licensee had established Memorandums of Understanding or other agreements with various offsite response agencies. Section 8.6.2 of the emergency plan established the requirement for these written agreements. The organizations that would provide support during an emergency at the Rancho Seco site were listed in Section 4 of the emergency plan. Organizations in which agreements had been established were:

| Function | Agency | Document | Expires/Comments |
|---|---|---|---|
| Fire Department | Herald Fire Department | Memorandum of Understanding | 12/31/2003 |
| Fire Department | Galt Fire Protection District | Purchase Order | 12/31/2003 |
| Ambulance/EMS | Galt Fire Protection District | Purchase Order | 12/31/2003 |
| Ambulance/EMS | Herald Fire Department | Memorandum of Understanding | 12/31/2003 |
| Ambulance | Sacramento County | Memorandum of Understanding | This agreement shall continue as long as nuclear fuel is store on site at the Rancho Seco Nuclear Generating Station |
| Air Ambulance | Life Flight (UC Davis Medical Center ) | Contract | 12/31/2001 |
| Hospital | UC Davis Medical Center | Contract | 12/31/2001 |

The licensee had last reviewed the status of the Memorandums of Understanding and contracts on January 10, 2001, and determined that all required documents were current.

The licensee had conducted tours of the ISFSI for offsite responders in June and July 2000. The NRC inspector contacted the Herald and Galt Fire Departments. Managers from both departments had been provided information concerning the ISFSI, stated that they had been provided an opportunity to tour the facility, and confirmed that in an emergency their departments were prepared to respond.

The ISFSI is a passive installation with no systems requiring power in order to maintain cooling or confinement of the spent fuel. Support systems, such as security and temperature monitoring, do require availability of power. The licensee described the provisions for power to the ISFSI in Section 4.3.2 of the FSAR. This description included reference to the emergency diesel generator associated with the microwave communications building as a source of backup power to the ISFSI. During the pre-operational test inspection, the NRC inspector verified that the emergency diesel was available and had been tested, and that emergency response procedures were available in the control room.

12.3 Conclusion

The licensee had adequately implemented provisions for responding to an emergency at the ISFSI. This included an emergency plan, emergency procedures, training, drill/exercise program and arrangements with offsite support organizations.

Memoranda of Understanding or contracts had been established with offsite support organizations that would provide response during an emergency at the ISFSI. Contact with the two fire departments that would provide fire and ambulance services confirmed the availability of the support.

Site wide exercises conducted in 1999 and 2000 were based on emergency scenarios related to dry cask loading activities. These exercises were successfully conducted and helped prepare site personnel for unexpected incidents that could occur during cask loading activities.

## 13 HEAVY LOADS (60854, 60855)

13.1 Inspection Scope

Heavy load activities were observed during the pre-operational test at the fuel storage building, during transport of a weighted canister from the fuel storage building to the ISFSI and during insertion of the canister into a horizontal storage module. Since the turbine gantry crane, used for moving heavy loads in the fuel handling building, was not a single failure proof crane, a drop analysis had been performed by the licensee to evaluate the effect of dropping a loaded cask on various structures along the safe load path.

13.2 Observations and Findings

The licensee had analyzed the various loads associated with the dry cask storage program and included a description of the critical lifts in Section 8.1.1.4 of the FSAR, Volume 1. To verify the adequacy of the equipment to be used for the heavy load activities, the licensee conducted a number of equipment tests and heavy lifts. During the pre-operational test, the licensee demonstrated the use of the turbine building gantry crane for moving the transfer cask and a weight training canister to the work area in the fuel storage building, moving the transfer cask loaded with the training canister from the fuel storage building work area onto the transport trailer, and transporting the weighted cask to the ISFSI. Procedures DFC-001, “ISFSI Loading”, Revision 2, and MAP-0010, “Control of Heavy Loads,” Revision 6, were used during these demonstrations. The safe load path that was identified for movement of the spent fuel from the fuel storage building to the ISFSI was reviewed. No important equipment related to the spent fuel pool or plant operations were located under or near the safe load path that could be effected by an accidental drop of a loaded canister.

Pre-job briefings were conducted prior to implementing heavy load activities. The pre-job briefings were comprehensive and included good discussions concerning acceptance criteria, safe work practices, evacuation alarms, responsibilities and radiological controls. During the pre-operational test, workers performed tasks as if actual canisters loaded with spent fuel were being moved. Observations were made of workers performing rigging and support for the heavy lifts. Personnel were knowledgeable and efficient in performing their work activities. The individual controlling the crane, using a radio controller, performed work safely and cautiously. A review of training records of the crane operators confirmed that their training and qualifications were current.

The turbine gantry crane was not a single failure proof crane. The crane was rated at 130 tons. The fully loaded cask filled with water was estimated to weigh 125 tons. This included the weight of the lifting fixtures. The licensee performed a drop analyses to evaluate the fuel pool structures, the outside cask catcher structure, and the ground area just outside the cask catcher foundation, where the cask is lowered from the fuel storage building for placement onto the transfer trailer. The height the cask will be above the ground when removed from the fuel storage building is slightly over 40 feet. Impact limiters made of foam were used on concrete structures to absorb the cask drop energy and protect the concrete structure. The ground area just outside the cask catcher structure foundation was provided with an 8' 7" deep sand layer to absorb the cask drop energy and minimize the cask deceleration, thereby reducing the damage to the cask and the cask content, should an accidental drop occur.

The drop analyses calculations were reviewed to determine if appropriate inputs, method of analysis, and assumptions were used. The calculations were performed adequately. The conclusions regarding the cask and structural adequacy for potential drops were reasonable.

The turbine gantry crane operations were reviewed to verify that limit switches operated satisfactorily and that the cask would not be moved over the spent fuel assemblies in the spent fuel pool. The crane maintenance records and test data were reviewed and were found to comply with ANSI B30.2-1976, "Overhead and Gantry Cranes," related to testing and maintenance.

A number of licensee documents were reviewed to evaluate the licensee's efforts to ensure the adequacy of the heavy loads program for the dry cask storage project. These included:

- Rancho Seco Procedure DFC-001, "ISFSI Loading," Revision 2.

- SMUD Document Number M41.04-12, Spent Fuel Pool Structural Analysis Report, Submittal # 2, 1/13/97.

- SMUD Document Number M41.04-13, Design Report Spent Fuel Impact Limiters, Submittal # 5, 5/7/98.

- SMUD Document Number ERPT-M0229, Analysis of Cask Drops Accidents During Spent Fuel Cask Handling Operations, Revision 3.

- Crane Certification Co.'s Certification No. CCC-29580, dated 11/15/99, including work sheets.

- Rancho Seco Surveillance Procedure Manual Procedure No. SP.536 Quarterly Gantry Crane Cask Limits Testing, 1/10/2001.

- Rancho Seco Training information for course OD50F0300 GANTRY CRANEOJT, March 2001.

- SMUD Document Number ERPT-C0118, Bechtel Summary of Concrete Tests, Rev. 0.

- Technical Specification for the NUHOMS 10'-6" Wide Cask Transfer Trailer, NUH-07-106, Revision 2, Vectra Fuel Services, San Jose, California.

- SMUD Document Number M41.04-89, Submittal #1, Dynamic to Static Correlation for 11 pcf Foam.

- SMUD Document Number M41.04-90, Submittal #2, Correlation Factors for Dynamic to Static Strength for 7 and 11 pcf Foam.

- SMUD Document Number M41.04-89,Submittal #2, Static QC Test Data for 7 & 11 pcf Foam.

No concerns or issues were identified during the review of the documents listed above.

13.3 Conclusion

The licensee adequately demonstrated that heavy loads could be safely moved from the fuel storage building to the ISFSI by moving a simulated cask loaded with dummy fuel assemblies. The safe load path was verified as adequate and the analysis performed by the licensee to evaluate the effect on structures if a heavy load was dropped was found to be acceptable.

## 14 WELDING/NON-DESTRUCTIVE TESTING/VACUUM DRYING (60854, 60855)

14.1 Inspection Scope

The welding program for the inner and outer top cover plates was reviewed including welding procedures, design of the welds, work packages, and welders' qualifications. The automated welding system was demonstrated during the pre-operational test using a mockup of a canister. Provisions for monitoring hydrogen during welding were reviewed.

Nondestructive examination (NDE) technique to verify the adequacy of the welds included visual, dye penetrant test and helium leak detection. The dye penetrant test and leak detection inspection procedures were reviewed along with the NDE inspector's qualifications. The dye penetrant test examinations were witnessed as they were performed on the mockup and on the first canister loaded with spent fuel.

The licensee planned to use a vendor for cutting open a loaded canister, should this be necessary. A video taped demonstration of the cutting machine removing a lid from a mock-up canister was reviewed by the NRC inspectors.

14.2 Observations and Findings

The licensee had assembled a dedicated welding team and provided materials and facilities for performing procedure development work for the welding program using canister mock-ups. The material types and welding equipment used on the mock-ups were the same as those used on the actual canister. Thus, the welding methods and equipment used on the mock-ups were directly transferable to the welding of the actual canisters to be loaded.

As part of the pre-operational test, the licensee demonstrated the welding techniques and nondestructive testing of welds on a mock-up canister. The licensee also provided a walk through of the canister water removal process, vacuum drying, nitrogen flushing, and final helium backfilling of the canister.

A review was completed of the procedures and documents associated with the welding and nondestructive testing of the canisters. All tasks were governed by written procedures which provided sequential steps with blanks for initials to record completion of the respective task. The review of documents included:

- Rancho Seco Procedure DFC-001, “ISFSI Loading,” Revision 2.
- Plant Maintenance Manual M.305, Welder and Brazer Qualifications, Revision 5.
- Plant Maintenance Manual M.308, Mandatory Welding Practices, Revision 5, Welder Qualifications.
- Plant Maintenance Manual M.304, Welding and Brazing Procedure, Revision 7.
- Procedure Qualification Record No. MW-8t for Machine Gas Tungsten Arc Welding.
- Welder Qualification records for J. Hanson, P. Easley, W. Schommer, D. Currie, S. Colley, and R. Rider.
- NDEI-0902, Qualification and Certification of Nondestructive Examination (NDE) Personnel.
- NDE -908, Liquid Penetrant Examination Requirements.
- NDE Technician Qualifications.
- NDE Qualification Records for G. Howard, Sr. Nuclear Plant Inspector.
- Qualification Report for High Temperature (125 to 225 degree F) and Low Temperature (40 to 60 degree F) Liquid Penetrant Examinations.

These documents were found to be detailed in their depth of instruction, thus, demonstrating considerable planning and effort had been expended in their development. The procedures were found to be appropriate for the job. No significant errors or deficiencies were noted in the documents reviewed. The documents controlling the welding and NDE processes and the welders' and NDE inspectors' qualifications were in compliance with the requirements of the ASME Code, 1992 Edition with 1993 Addenda.

Mock-ups of the canister were used for the welders to practice welding. These mock-ups were located in a training area. The materials, diameters, and thicknesses of the training mock-ups were identical to the canisters to be used for the spent fuel, except for length. The training mock-ups were approximately 2 feet in length. This was sufficient for the welding technique and cutting demonstrations. During the pre-operational test inspection, one of the mock-ups was set up in the spent fuel building in the location where the actual canister would be staged for welding after being loaded with spent fuel. To simulate the proper height of the canister for demonstrating welding, the mock-up was placed on a wood structure. The use of a wood structure necessitated the attachment of a welding ground connection to the edge of the mock-up to complete the electrical connection, rather than having the welding ground connected to the metal structure that the actual canister would stand on during the welding. This connection was sufficient for the welding technique demonstration, though the ground clamp did interfere with the motion of the welding machine during welding of the outer top cover plate.

All welding was performed using the automatic gas tungsten arc welding (AGTAW) process. At least two welders were present on the job at all times. Welders alternated duties during the demonstration. Alternating duties was instituted because fuel loading and subsequent top cover plate welding will be inside the fuel storage building, requiring the welders to "dress out" in protective gear. When so dressed, worker fatigue must be considered.

The pre-job briefing conducted prior to welding on the mock-up was thorough and detailed. A step-by-step procedure checklist controlled all phases of the work. Problems encountered during the pre-operational test were discussed and field changes incorporated. There was good discussion and interaction within the working group during the pre-job briefing and the actual work activities of the demonstration welding. The welding team displayed considerable experience in all aspects of the welding and NDE.

The demonstration of the fit-up and machine welding process covered all of the crucial steps that were involved in welding the lids including: checking for uniformity of the root gap, installation of tack welds, performing root and cover pass welds, surface preparation for dye penetrant test inspection and the dye penetrant test inspection of the root pass and other passes. Discussions with the weld team revealed they were knowledgeable of the history of previous problems encounter during canister welding at other sites and had considered the lessons learned from these previous welding activities.

The licensee had also qualified a manual gas tungsten arc procedure for welding the canister. The manual process was used for tack welding of the inner and outer top cover plates and for welding of the cover plates on the vent and siphon ports. The manual process was also staged as a backup process for welding the inner and outer top cover plates in the event that problems occurred with the automatic welding machine.

The canisters were designed, to the maximum extent practical, in accordance with ASME B&PV Code Section III. However, since the design of the canisters did not allow full compliance with all aspects of the ASME Code, Section III, such as volumetric inspection of the closure lids, the ASME Code could not be implemented without allowing some exceptions to its requirements. Utilizing NRC Interim Staff Guidance (ISG)-10, “ASME Code Exceptions,” the NRC Safety Evaluation Report specified the following tests to verify weld strength and leak tightness:

- A multi-layered dye penetrant test for the outer top cover plate for each 1/4 inch of deposited filler material per Section V, Article 6, and NB-5245.

- A design stress reduction factor of 0.6 applied to the weld design.

- A permanent record of the dye penetrant test examinations taken during the final interpretation period described in ASME, Section V, Article 6, T-676.

- A helium leak test for the inner top cover using the guidance of ANSI N14.

The inspectors noted the requirements from the Safety Evaluation Report had been appropriately incorporated into procedure DFC-001 and the appropriate NDE procedures.

The licensee had asked for an interpretation of the requirement related to the permanent record specified in ASME, Section V, Article 6, T-676, and had been informed that a photographic record of relevant acceptable dye penetrant test indications would satisfy the requirement. During the dye penetrant test examination demonstration of the root and final layers of the inner top cover plate weld, the dye penetrant test examiner demonstrated the use of the special camera purchased for the recording of acceptable relevant dye penetrant test indications.

Technical Specifications 3.1.2 required that the canister helium leakage rate of the primary inner seal weld shall be $\leq 10^{-5}$ std-cc/sec. The licensee’s Level III leak detection examiner demonstrated the special tools that had been manufactured for helium leak testing of the inner top cover weld during the pre-operational test. The tool included a sniffer probe that could be attached to the welding machine head to be swept along the surface of the weld to detect leakage, as well as the special fixtures designed to cover segments of the lid weld and the vent and siphon cover welds in order to accurately quantify detected leakage. After the welding of the inner lid on the first loaded canister, the helium leak test was successfully performed. No leaks were detected. Completion of the test was documented in procedure DFC-001, Step 14.24.38 on April 14, 2001.

Technical Specifications 3.1.1 required that the canister vacuum pressure be $\leq$3 Torr for not less than 30 minutes within 96 hours of the canister being removed from the spent fuel pool. The licensee demonstrated to the NRC, during the pre-operational test, the procedure for de-watering and vacuum drying the canister prior to final sealing. This demonstration included a step-by-step walk through of the de-watering and vacuum drying sequences of Section 14 of procedure DFC-001. Section 14.23 of procedure DFC-001 had established the vacuum pressure limit as 2.95 Torr for the acceptance criteria to account for instrument error on the pressure gauge. The demonstration was conducted by members of the licensee's dedicated team of personnel qualified on the equipment, and included identification and/or manipulation of all the required pumps, valves, and components. The water removed from the canister would be returned to the spent fuel pool and the vapors from the vacuum drying process were to be processed through filters and vented into the auxiliary building exhaust system. During loading of the first canister, vacuum drying was achieved below the 2.95 Torr limit within 49 hours and 30 minutes. Vacuum drying was completed on April 14, 2001, and documented in procedure DFC-001 Step 14.23.7.

During the actual loading of the first canister, welding of the inner lid was observed. The automatic gas tungsten arc welding machine produced a high quality weld. The dye penetrate test and helium leak test were successfully completed. Personnel performing the helium leak test were qualified per Section SNT-TC-1A of ASME , Section V, Articles T-110 and T-140. No issues with welding or the NDE examination were identified.

The licensee had established an airflow under the inner lid to prevent the accumulation of any explosive gases in the canister during welding. The air was vented to the auxiliary building exhaust system, which was monitored for radioactive gasses. The monitor was installed such that it would provide an alarm function in the control room. The air being removed from under the lid was also monitored for hydrogen. An alarming hydrogen gas monitor was located near the welding work area and was connected to the exhaust line from the canister. Steps 13.6.3 thru 13.6.5 of procedure DFC-001 included directions for conducting the hydrogen monitoring during welding. During the loading of the first canister with spent fuel, the licensee performed the required hydrogen monitoring. No elevated hydrogen levels were detected. Procedure DFC-001 included limits for taking action if the hydrogen levels were exceeded. A limit of 60 percent of the lower explosive limit had been established as the maximum acceptable hydrogen level. An administrative limit of 20 percent of the lower explosive limit had been established in which an evaluation of the situation was required. An argon purge capability was available for use if hydrogen levels were detected above the administrative limit.

If the Technical Specifications 3.1.2 and 3.1.3 requirements for vacuum pressure or helium leak rate could not be met after the lids had been welded on, the licensee could be required to cut open the canister and return the spent fuel to the spent fuel pool. In order to provide for this, the licensee had procured a portable cutting machine that could be mounted on the top of the canister to cut through the welds of the outer and the inner top lids. The inspectors reviewed a video tape demonstrating the cutting machine removing the lids from one of the canister mock-ups. The inspectors also visited the warehouse and inspected the cutting machine in storage and viewed a mock-up that had been cut by the cutting machine during development of the procedures for cutting open a canister.

14.3 Conclusion

The creation of a dedicated team for the purpose of developing and implementing the canister seal welding and testing program was a commendable step by the licensee. Procedures governing the overall scope of the job were detailed. Observation of the welding and nondestructive testing on the mock-up canister verified the skills of the welding and NDE team. Work practices, such as making trial welds and cuts on full scale mock-ups prior to making a lid weld, were an effective method to further ensure quality work. The welding and testing team members were knowledgeable and able to produce quality welds.

Welding performed on the first canister was successfully completed using the automatic welding process. Nondestructive testing of the welds included visual inspections, dye penetrant testing and helium leak testing. Welds were found to be of high quality. Hydrogen monitoring of the canister gap under the lid during welding did not indicate the presence of hydrogen.

The licensee had obtained a cutting machine to remove the welded lids from a canister, should this be necessary. The cutting machine had been used to remove lids on mock-ups to verify operation of the equipment.

## 15 SECURITY (60854, 81001)

15.1 Inspection Scope

The licensee had developed a security program, described in the ISFSI Physical Protection Plan, Amendment 0, to comply with the requirements of 10 CFR Part 72 Subpart H, “Physical Protection.” This inspection reviewed the implementation of the ISFSI Physical Protection Plan and the readiness of the licensee to implement security actions.

The licensee was currently implementing both a Part 50 security program under Docket 50-312 and an ISFSI security program under Docket 72-11, with overlap between the two programs. The Part 50 security program was required to provide protection to the spent fuel while it is stored in the spent fuel pool. As the spent fuel is moved to the ISFSI, a transition from the Part 50 security program to the ISFSI security program will occur. Portions of the ISFSI security program had not been fully implemented at the time of this inspection. Equivalent provisions were being currently implemented under the Part 50 program.

15.2 Observations and Findings

The licensee's ISFSI Physical Protection Plan, Amendment 0, dated February 1, 2000, had been submitted to the NRC and approved on June 30, 2000, as a provision of the ISFSI license, SNM-2510. The ISFSI physical protection plan incorporated the ISFSI contingency response plan. The licensee had established an acceptable management process for approving and processing future changes to the ISFSI physical protection plan and procedures. No changes, however, had been submitted to the NRC since approval of the plan in June 2000.

The safeguards event logs and security incident reports were reviewed. The licensee had established adequate reporting criteria and understood the types of security events that should be included in the 24-hour event log and those events that required reporting to the NRC within 24 hours of occurrence.

The ISFSI physical protection plan established requirements for staffing levels and security patrols to be implemented once all spent fuel was moved to the ISFSI and the Part 50 security program was terminated. Currently, staffing levels and security patrols were conducted primarily under the Part 50 security program. The Part 50 security program was a more extensive program than required for the site once the spent fuel is moved to the ISFSI. Staffing levels and provisions for security patrols will be reviewed during a future inspection to ensure transition from the Part 50 security program to the ISFSI security program was successfully completed to comply with the requirements established in the ISFSI physical protection plan. This issue will be tracked as an Inspection Followup Item (IFI 72-11/0101-02).

The protected area physical barriers, detection aids, and isolation zones were inspected to determine compliance with the ISFSI physical protection plan. The areas inspected included the ISFSI protected area barrier and isolation zones and the design and capabilities of the detection aids systems. The protected area was surrounded by an adequate fence. Additionally, a second (debris) fence was installed outside of the protected area fence. The licensee had adequate provisions to secure the two fences prior to the initial storage of spent fuel. An isolation zone on the interior and exterior of the protected area fence had been established.

The ISFSI protected area was monitored by an intrusion detection system. The licensee demonstrated functional tests of each alarm zone. All alarms annunciated in a continuously monitored alarm station The licensee conducted weekly performance based tests of the protected area barrier and the intrusion alarm system to ensure that system failures were discovered and corrected.

The licensee is required by 10 CFR 73.51(d)(3) to provide continual surveillance to the ISFSI protected area perimeter. The licensee intended to provide continual surveillance of the protected area perimeter through installation and operation of a closed circuit television (CCTV) camera system. However, the licensee did not plan to install the system until several months following the initial transfer of spent fuel to the ISFSI. The ISFSI physical protection plan did not specify how continual surveillance of the protected area perimeter would be maintained during the interim period following initial fuel transfer and installation of the CCTV system. The licensee was requested by the NRC to provide additional information to support compliance with the requirement in 10 CFR 73.51(d)(3).

On March 19, 2001, the licensee submitted a letter to the NRC describing compensatory actions for continual surveillance until the CCTV camera system was operational. The compensatory actions identified by the licensee were found to be acceptable.

Lighting of the ISFSI protected area and adjacent areas was reviewed. The inspectors determined through a review of the lighting surveys conducted by the licensee that the lighting inside the protected area was sufficient to provide adequate assessment of activities and alarms. However, installation of required lighting in nearby adjacent areas had not been completed. Completion of this activity was not required until after all of the spent fuel was moved to the ISFSI. This issue will be tracked as an Inspection Followup Item (IFI 72-11/0101-03).

The licensee demonstrated the availability of backup power for a portion of the security equipment. A backup power supply had not been installed for all systems and components and would not be fully functional until all spent fuel had been moved to the ISFSI. Availability of backup power will be reviewed during a future inspection. This issue will be tracked as an Inspection Followup Item (IFI 72-11/0101-04).

The access control program for personnel, packages, and vehicles was reviewed. Through observations, interviews, and a review of procedures, the inspectors determined that upon securing the barriers (fences) around the ISFSI protected area, the licensee would have adequate provisions in place to ensure that only authorized personnel gain unescorted access to the ISFSI. Persons having a need to enter the protected area, but not authorized unescorted access, would be escorted within the protected area. Authorization for unescorted access to the protected area would be verified using positive identification and an access list approved by the ISFSI manager. The licensee had adequate provisions in place to search all personnel, packages, and vehicles for explosive devices prior to granting access into the protected area. Search of personnel would be conducted by a physical (pat down) search.

A review of the lock and key procedures and records was performed. The records indicated that the locks and keys were rotated annually or changed when employees who had access to security locks and keys were unfavorably terminated. Security of the additional sets of lock cores and keys was effective in preventing compromise. Records of keys, locks, core sets, and all changes were being maintained.

The licensee had established a new security alarm station concept to be implemented once all spent fuel was removed from the spent fuel pool and placed in the ISFSI. The current Part 50 onsite security alarm station would not be required at that time and the licensee planned to transfer security alarm activities to the new security alarm station. Once the licensee transfers security operations to the new alarm station, an inspection will be conducted of the facility's operations and communications capabilities. This issue will be tracked as an Inspection Followup Item (IFI 72-11/0101-05).

The licensee had committed in the ISFSI Physical Protection Plan to establish a testing and maintenance program for the security systems. Only portions of this program had been established to support the initial fuel loading activities. Those portions were found to be acceptable. Implementation of the remaining portions of the testing and maintenance program will be reviewed during a future inspection and will be tracked as an Inspection Followup Item (IFI 72-11/0101-06).

Provisions for compensatory measures were reviewed, including deployment of compensatory measures and the effectiveness of those measures. Through interviews and a review of the licensee's procedures, the planned compensatory measures were found to be consistent with the requirements in the ISFSI physical protection plan. The security personnel available for assignment to compensatory security posts were determined to be properly trained for those duties.

The ISFSI security contingency plan was included in Chapter 10 of the ISFSI physical protection plan. The security contingency plan established the requirements for the onsite ISFSI response force to be available for response to an event. The licensee's provisions for an onsite response force was reviewed and determined to be capable of meeting the response requirements.

Offsite response to an event was provided by the Sacramento County Sheriff's Department. A December 18, 1981, letter supplemented by a December 19, 2000, letter from the Sheriff's Department specified the response time and the number of armed responders available to respond to the ISFSI to support the onsite security force. Provisions in place with the Sacramento County Sheriff's Department were found to be acceptable.

The ISFSI Training and Qualification Plan, Revision 0, dated February 1, 2000, was reviewed to verify that training of ISFSI security personnel had been conducted in accordance with the plan. ISFSI staff personnel were observed during the performance of their duties. Personnel demonstrated good knowledge of the procedural requirements for the tasks performed. The security organization had conducted all required training in accordance with the ISFSI training and qualification plan. A review of composite security training records confirmed that required training and medical evaluation had been conducted every 12 months, as required.

The licensee had committed in the ISFSI physical security plan to maintain certain security records and reports. Records and reporting requirements were currently being performed under the Part 50 security program, and were commensurate with the requirements established in the ISFSI physical security plan. This would continue until all spent fuel was moved to the ISFSI and the Part 50 security program was replaced with the ISFSI physical security program. Transition of the records and reporting program from the Part 50 security program to the ISFSI security program will be evaluated during a future inspection and will be tracked as an Inspection Followup Item (IFI 72-11/0101-07).

15.3 Conclusion

The licensee was currently implementing both a Part 50 security program and a Part 72 ISFSI security program, with overlap between the two programs. The Part 50 security program was required while spent fuel was in the spent fuel pool. As the spent fuel is moved to the ISFSI, a transition from the Part 50 security program to the ISFSI security program will occur.

The ISFSI Physical Protection Plan, Amendment 0, was approved by the NRC with the issuance of the ISFSI license, SNM-2510, on June 30, 2000. The licensee had made no changes to the ISFSI physical protection plan since NRC approval. The licensee had established an acceptable management process for approving and processing future changes to the ISFSI physical protection plan and procedures.

An effective protected area barrier, isolation zones, and detection system were established that would provide delay and detection of individuals attempting unauthorized entry into the ISFSI protected area. The licensee planned to install a CCTV camera system for continuous surveillance of the ISFSI protected area perimeter. Adequate compensatory actions were identified for the interim period between the initial movement of spent fuel to the ISFSI and installation of the CCTV camera system.

Provisions were established to implement a thorough program for searching personnel, packages, and vehicles prior to entering the ISFSI protected area. These provisions were implemented and remained in effect prior to initial storage of spent fuel at the ISFSI.

Onsite security response force capabilities were determined to be acceptable. Provisions had been made with a local law enforcement agency for offsite response support during a security threat.

Training of ISFSI security personnel had been conducted in accordance with the ISFSI training and qualification plan and procedures. ISFSI staff personnel demonstrated good knowledge of the procedural requirements for the tasks they performed.

## 16 NOTIFICATIONS (60854)

### 16.1 Inspection Scope

The licensee is required to make certain notifications to the NRC in accordance with 10 CFR Part 72. The licensee’s procedures for implementing the notification requirements was reviewed. Implementation of the new notification requirements for 10 CFR 50.72 and 50.73 were also verified.

### 16.2 Observations and Findings

Technical Specification 5.4.1 required that written procedures be established for making reports to the NRC. The licensee had developed procedure OAP-0064, “Reporting and Notification,” Revision 14, to implement NRC reporting requirements. Procedure OAP-0064 was compared to the requirements established in various sections of 10 CFR Part 72 that apply to the ISFSI.

The licensee was required by 10 CFR 72.74 to notify the NRC Operations Center within 1-hour of discovery of an accidental criticality or any loss of special nuclear material. Declaration of an emergency condition, notifications for specific non-emergency conditions and written reporting requirements were specified in 10 CFR 72.75. Procedure OAP-0064 adequately addressed the reporting requirements specified in these regulations.

The reporting requirements for 10 CFR 20.2202 and 20.2203 required notification of exposure incidents, either immediately or within 24 hours and a written report for exposure, radiation levels and concentrations of radioactive material exceeding the constraints or limits. Procedures OAP-0064 and RSAP-0903, “External Plant Reports and Posting of Notices,“ Revision 17, adequately addressed these requirements.

The licensee must submit an annual report required by 10 CFR 20.2206 of the results of individual monitoring for each individual required to be monitored in accordance with 10 CFR 20.1502. Procedure RSAP-0903, adequately addressed the requirements of 10 CFR 20.2206. The reports were required by April 30 of each year. The licensee had submitted the required reports for each individual monitored during the year 2000.

The NRC had amended the event reporting requirements in 10 CFR 50.72 and 50.73 to reduce or eliminate the unnecessary reporting burden associated with events of little or no safety significance. The final rule was effective January 23, 2001. A review of procedures RSAP-0903 and OAP-0064 found that the new requirements for 10 CFR 50.72 and 50.73 had not been incorporated into these procedures. Since the old requirements of 10 CFR 50.72 and 50.73 were more restrictive than the new requirements, the licensee was considered to still be in compliance with the reporting requirements.

10 CFR 72.80(g) required the licensee to notify the NRC of its readiness to begin operation at least 90 days prior to the first storage of spent fuel or high-level waste in an ISFSI. The licensee satisfactorily met the requirement in a letter dated March 4, 1996. A subsequent letter was received from the licensee dated January 22, 2001, which provided an updated schedule for pre-operational testing and fuel transfer operations.

### 16.3 Conclusion

The reporting requirements, as contained in the licensee’s procedures, were found to be consistent with the regulations in 10 CFR Part 72, 10 CFR Part 20 and 10 CFR Part 50.

## 17 RECORDS/DOCUMENTATION (60854)

### 17.1 Inspection Scope

NRC regulations require the licensee to establish and maintain records related to cask certifications, training, and special nuclear material possession. Procedures were reviewed to verify the licensee had established a process for generating and maintaining the required records for the required periods and, as necessary, establishing duplicate records.

### 17.2 Observations and Findings

The licensee had established a system to maintain and control documents related to the design, manufacture and testing of the ISFSI and associated components such as the transfer cask and the canister. The licensee also maintained records of individual personnel training and of special nuclear materials possessed.

A tour of the onsite records' storage locations was conducted. The licensee had two principal locations for the storage of records, a designated fire-rated vault and a temporary storage location. Both were located in the administrative building.

The inspector selected several records to demonstrate the licensee's ability to locate and retrieve a record. Some of these records included the NRC certificate of compliance (CoC) for the spent fuel storage cask and information related to cask fabrication specified in 10CFR72.234(d) and (e). The licensee was able to retrieve all records requested.

On December 13, 2000, the licensee requested exemption from the requirement of 10CFR72.72(d) to maintain duplicate sets of spent fuel and high level radioactive waste records. On February 14, 2001, the NRC Office of Nuclear Material Safety and Safeguard, Spent Fuel Project Office, issued an environmental assessment and finding of no significant impact on this request. On March 15, 2001, the NRC granted the exemption.

17.3 Conclusion

The licensee had established a records filing system for the ISFSI and associated components. The licensee demonstrated the ability to retrieve selected records.

The licensee had requested and exemption from the requirement of 10CFR72.72(d) to maintain duplicate sets of spent fuel and high level radioactive waste records. This request was approved by the NRC on March 15, 2001.

## 18 SPECIAL TOPICS: COATINGS (60854)

18.1 Inspection Scope

Because of the problems experienced over the past several years with coatings used on canisters interacting with the borated spent fuel pool water, the licensee conducted special tests to confirm the acceptability of the coating used on their canister. The tests reviewed turbidity, generation of hydrogen gas and any other factors that could affect the suitability of the coating material. During the loading of the first canister with spent fuel, periodic observations were made to verify that no interaction was occurring between the coating and the spent fuel pool water.

18.2 Observations and Findings

Tests were conducted by the licensee on the electroless nickel coating used on the canisters at Rancho Seco. Past problems in the industry have occurred with coatings which interact with the borated spent fuel pool water resulting in the generation of hydrogen. Industry problems have also occurred in which the water in the spent fuel pool became so cloudy that the top of the canister could not be seen in order to continue loading spent fuel. This turbidity problem required the licensee to use special filters in the spent fuel pool to keep the water clean.

NWT Corporation conducted a series of tests for Rancho Seco and issued a report entitled, “Measurement of Hydrogen Generation From Electroless Nickel Coated Carbon Steel Fuel Canister Spacer Disks,” dated July 5, 2000. The report described the test equipment set up, the testing methodology, and results and analysis of the tests that were performed on two coated spacer disks.

The testing methodology used was scientifically sound and the test rig was well engineered. Especially notable was the ability to increase solution temperature during the test period to simulate the effects of heat-up from the loaded spent fuel on the coating. The test results showed that there was essentially no detectable hydrogen generation during the time that the spacers were exposed to spent fuel pool conditions and that turbidity stayed within the licensee’s predetermined acceptability limits for visibility.

During the tests, an increase in nickel concentration was observed in the test solution. Values ranged from 0.9 to 3.1 mg/in$^2$ of spacer area. Based on the measured values in the solution, the amount of nickel lost from the spacer disks during the tests represented only 4 percent. This was a relatively insignificant amount which would not decrease the amount of nickel below the minimum plating thickness requirement the licensee had established in the FSAR of 0.5 mils.

During the loading of the spent fuel into the first canister on April 3-4, 2001, and during the remaining time the canister was in the spent fuel pool, observations were made to determine if any cloudiness of the water was occurring or any bubbles forming that could indicate hydrogen generation. Throughout the time the canister was in the spent fuel pool, no indication of interaction between the coating and the spent fuel pool water was observed. After the problem with the seal, the canister was removed from the spent fuel pool and drained on April 6, 2001. On April 10, 2001, the canister was returned to the spent fuel pool, reloaded with spent fuel and removed from the spent fuel pool on April 11, 2001. Again, no interaction between the borated spent fuel pool water and the canister coating was observed.

18.3 <u>Conclusion</u>

The licensee had performed a special test on the coating used on the canister to verify the compatibility of the coating with the borated spent fuel pool water. The test, conducted by an independent laboratory, found that the coating did not generate hydrogen or create water clarity problems while the canister was in the spent fuel pool. While dissolution of the coating from the spacer disks was noted during the test, the amount lost was determined to be insignificant.

During the loading of the first canister with spent fuel, no indication of interaction problems between the coating and the spent fuel pool water were observed.

## 19 SPECIAL TOPICS: STATION BLACKOUT (60854)

### 19.1 Inspection Scope

Because of the power shortage problems currently being experienced in California, there was the potential that power could be lost during dry cask loading related activities. Contingency plans developed by the licensee for this occurrence were reviewed.

### 19.2 Observations and Findings

The licensee recognized the potential for problems with the availability of power during dry cask loading operations. Rolling brown-outs and black-outs were a possibility. Most activities related to the ISFSI operations would not be adversely effected by a site blackout. However, activities related to moving spent fuel assemblies during canister loading or lifting heavy loads could be adversely affected if offsite power was lost. In order to address this problem, the licensee had identified a number of actions that could be taken. These were described in office memorandum, MNTS01-012, “Actions Taken to Assure Adequate Power Supply During Movement of a Loaded Cask,” dated March 12, 2001. A key action required prior to performing spent fuel movement activities was to contact the offsite power dispatcher to assess grid reliability. Spent fuel movement would not be initiated unless offsite grid status was satisfactory.

To further ensure that a situation would not occur in which a loaded cask could be left suspended due to a station blackout, the licensee rented a diesel generator to power the gantry crane. The gantry crane was used to move the loaded canister from the spent fuel pool to the transporter. The spent fuel pool bridge, which was used to move the spent fuel from the fuel racks in the spent fuel pool to the canister was not on emergency power, but could be operated mechanically if power was lost. This would allow for the spent fuel to be placed in a safe configuration either back into the fuel rack or in the canister during a power outage. The roll-up doors to the fuel storage building could be manually closed and battery lighting was installed in the spent fuel pool area. Although the area radiation monitor would be inoperable during a loss of offsite power, radiation monitoring would be provided by radiation protection personnel with hand held instruments. Telephones for contacting offsite authorities would be functional during a loss of offsite power. In addition, cellular phones could be used as a backup method for offsite contact.

In addition to the office memo that specifically addressed dry cask loading operations, procedure OP-C.95, “Loss of Offsite Power,” Revision 13, addressed required actions for loss of offsite power to other site systems. This included loss of building ventilation resulting in the potential for increased contamination problems, verification that the diesel fire pump was operational, compensatory actions by security, and issues concerning communications, control room annunciators, and portal radiation monitors at exit areas to the radiological control area. The procedure provided a recovery process to follow when power was restored. The procedure was detailed and addressed the major problem areas that would occur during a blackout.

19.3 Conclusion

The licensee had developed a plan for responding to a station blackout during dry cask loading activities. This included contacting the offsite power dispatcher prior to fuel movement activities to ensure grid reliability. As a backup, a diesel generator was available to operate the gantry crane to avoid a situation of a loaded cask being suspended in air due to a loss of offsite power.

## 20 Exit Meeting

The inspectors presented the inspection results to members of licensee management at an exit meeting on March 15 and April 3, 2001, for the pre-operational test and a telephonic exit on April 25, 2001, for the loading of the first canister. The results of a follow-up inspection were presented at an exit onsite on June 14, 2001 and on June 25, 2001, a telephonic exit was conducted concerning the unresolved item described in this report. The licensee acknowledged the findings presented. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

<u>**ATTACHMENT**</u>

**PARTIAL LIST OF PERSONS CONTACTED**

<u>Sacramento Municipal Utility District</u>

M. Bua, Radiation Protection/Chemistry Superintendent
D. Clark, Test Director
J. Delezenski, Nuclear Quality Assurance/Licensing/Administrative Superintendent
T. Dundon, Nuclear Training Supervisor
D. Dungey, Security
J. Field, Technical Services Superintendent
A. Frazier, Shift supervisor
D. Gardiner, Decommissioning Manager
B. Jones, Licensing Engineer
M. Hieronimus, Nuclear Operations Superintendent
F. Kellie, Industrial Hygienist
W. Koepke, Quality Control (NDE Level III)
D. Koontz, Fuel Team Leader
L. Langley, Security
J. Loy, Fuel Team Leader
G. Martin, Supervisor, RP Operations
J. Meyer, Vendor Audit Supervisor
E. Nava, Security Manager
S. Nichols, Radiological Health Supervisor
S. Redeker, Plant Manager
G. Roberts, Nuclear Maintenance Superintendent
B. Rogers, Supervising Radiation Specialist
T. Soule, Security
D. Tipton, Fuel Team Leader
J. Witte, Technical Services Engineer
N. Zimmerman, Engineer

<u>Consultants and Contractors</u>

J. Barrett, Welding Consultant, Barrett Robotic Welding
B. Ashe-Everest, Fuel Specialist, Southern California Edison
W. Schommer, Welder, Bigge
D. Shafer, Fuel Specialist, Southern California Edison
M. Steinbacher, Radiation Protection Supervisor, Numanco

## INSPECTION PROCEDURES USED

| | |
|---|---|
| 36801 | Organization, Management and Organization Controls |
| 37801 | Safety Reviews, Design Changes and Modifications |
| 40801 | Self Assessments, Auditing and Corrective Actions |
| 60801 | Spent Fuel Pool Safety |
| 60851 | Design Control of ISFSI Components |
| 60854 | Preoperational Testing for an ISFSI |
| 60855 | Operations of an ISFSI |
| 81001 | ISFSI Security |
| 83750 | Occupational Radiation Exposure |

## ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

| | | |
|---|---|---|
| 50-312/0103-01 | URI | Adequacy of the licensee's safety evaluation of fuel storage building walls |
| 72-11/0101-01 | IFI | Neutron dosimetry program |
| 72-11/0101-02 | IFI | Transition of Part 50 security program to a Part 72 program |
| 72-11/0101-03 | IFI | Lighting in areas adjacent to ISFSI |
| 72-11/0101-04 | IFI | Backup Power for security |
| 72-11/0101-05 | IFI | Security alarm station |
| 72-11/0101-06 | IFI | Security testing and maintenance program |
| 72-11/0101-07 | IFI | Security records and reporting program |

Closed

None

Discussed

None

## LIST OF ACRONYMS

| | |
|---|---|
| CCTV | Closed Circuit Television |
| CFR | Code of Federal Regulations |
| CoC | NRC Certificate of Compliance |
| dpm | Disintegrations per minute |
| DQ | Deviation from Quality |
| DSAR | Defueled Safety Analysis Report |
| DSC | Dry Shielded Canister (referred to as the canister in the report) |
| EP | Emergency Plan |
| EPIP | Emergency Plan Implementing Procedure |
| FSAR | Final Safety Analysis Report |
| ISFSI | Independent Spent Fuel Storage Installation |

| | |
|---|---|
| MP-187 | MultiPurpose Transportation Cask (referred to as transfer cask in this report) |
| mR | milliRoentgen |
| NDE | Nondestructive Examination |
| NRC | Nuclear Regulatory Commission |
| PDQ | Potential Deviation from Quality |
| ppm | Parts per million |
| SMUD | Sacramento Municipal Utility District |
| SNM | Special Nuclear Material |
| std-cc/sec | Standard Cubic Centimeters/Second |