

## **RANCHO SECO – TRANSITION TO FULL DECOMMISSIONING**

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### **ABSTRACT**

The Rancho Seco Nuclear Generating Station ceased operation in June of 1989 and entered an extended period of Safstor to allow funds to accumulate for dismantlement. Fuel was to have been moved to the completed Independent Spent Fuel Storage Installation (ISFSI), but is awaiting transfer cask licensing and fabrication. As an interim activity for staff awaiting fuel movement, dismantlement of the steam systems was begun in early 1997. These systems have been removed now and many outside systems have also been removed.

Based on the successful work to date, the SMUD board of directors approved full decommissioning in July 1999. A schedule has been developed for completion of decommissioning by 2008, allowing decommissioning funds to accumulate, as they are needed. Organization changes are in progress and detailed planning has begun. Dismantlement work has started in the Auxiliary Building.

### **INTRODUCTION**

Rancho Seco is a 913-megawatt B&W design nuclear power plant owned by the Sacramento Municipal Utility District that began commercial operation in 1975. It was shut down in June of 1989 as the result of a voter referendum. Due to a minimal decommissioning fund balance, the decision was made to enter an extended period of SAFSTOR to allow the activity to decay and the fund to build to a level that would allow dismantlement, projected to begin in 2008.

In 1991, the decision was made to place the spent fuel into dry storage, allowing the plant to enter a “hardened” SAFSTOR condition and cutting the required staff significantly. An ISFSI has been built and contracts for casks and fuel storage liners are in place, but numerous delays have continued to postpone fuel transfer. The current schedule calls for fuel transfer to be complete by the early 2000.

With the staff waiting for fuel movement and the possibility for significant cost savings by using the Envirocare disposal site, a three-year incremental decommissioning project was proposed to dismantle the Turbine Building systems and a portion of the Tank Farm systems (1). The project was approved for 1997, with annual renewals based on performance. This work has been successfully completed leading to approval of full dismantlement in July of 1999.

The plant staff is being reorganized to support a focus on decommissioning rather than the maintenance and operation of the station. The personnel resources on site are currently assigned to support both the dry fuel project and the decommissioning of the facility. With significant physical work going on for the first time in ten years, of paramount importance is a safety culture that encourages watching out for one another and accountability for infractions.

The plant systems are being reconfigured to facilitate dismantlement. Current issues involve backing out of operating systems to allow their removal and characterization of major components to support planning for their removal. A self-contained spent fuel cooling system has been installed to allow the isolation of the Spent Fuel Building until fuel is moved (Estimated mid 2001). A reverse-osmosis water-treatment system was leased to process the accumulated wastewater, allowing removal of evaporators and other installed liquid radwaste components.

Longer term planning includes possible large component chemical decontamination and size reduction to allow disposal at Envirocare. Chemical decontamination may not be necessary depending on the success of the Envirocare effort to amend their license to permit class B and C waste.

### **INCREMENTAL DECOMMISSIONING PROJECT**

In 1995 the Envirocare disposal facility became available as an option for disposal of very low activity waste. With a waste cost significantly below that estimated for Ward Valley, the Envirocare facility provided an opportunity for significant savings for disposal of very low activity waste, such as steam and cooling systems in the Turbine Building, which had become contaminated from system-to-system leaks. Studies also showed that a significant portion of the waste in the Auxiliary Building and the Reactor Building would qualify for disposal at Envirocare. The Turbine Building was selected for initial dismantlement activities because of the large volumes of potentially contaminated materials and the very low activity levels expected which would allow minimal radiological controls on the work.

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An interdisciplinary team of loaned employees was formed to manage the work and the waste. The team included personnel from the radiation protection, operations, maintenance and engineering groups. Specialized waste and decommissioning personnel were brought in to supplement the group. It then took more than a year to get the required contracts and additional specialized employees in place before waste could be shipped. However, dismantlement activities began with site personnel as soon as procedures and engineering were in place.

Contracts were required for waste processing, waste disposal, waste shipping, contract labor and equipment, asbestos abatement, lead paint abatement, and specialized personnel. All of these contracts were competitively bid resulting in long lead times. J.A.Jones Construction Services was selected to provide the dismantlement personnel, material needs and deconstruction oversight. GTS/Duratek was selected to provide waste services and specialized personnel. Frank W. Hake and Associates was also selected to provide waste processing services.

Previous characterization work had determined that most Turbine Building systems would be non-radioactive with the exception of the Turbine Plant Cooling Water System, Main Steam,

Auxiliary Steam, First and Second Point Heaters, Reheaters and the Turbine. However, all systems were removed to simplify final survey activities.

Through the end of 1999 the project has completed the removal of all steam systems in the Turbine Building and outside areas. With the replacement of the Spent Fuel Cooling System the outside cooling systems have been dismantled and few potentially radioactive components remain in the outside areas. With this success dismantlement activity has moved to the Auxiliary Building.

## **DRY FUEL PROJECT**

The decision to move the fuel to dry storage was originally made to allow the plant to go to a hardened safstor condition that would allow the utility to minimize the staff and therefore the cost. SMUD decided that a transportable dry cask system was needed to allow the fuel to be transported to the DOE without replacing it in a fuel pool for repackaging. No such system existed at the time that would accommodate Rancho Seco's fuel. SMUD decided to develop and purchase a "first ever" large-scale canister based transportable spent fuel storage system.

SMUD signed the contract in 1992 for the design, licensing and fabrication of a transportable storage system. In 1995 the ISFSI was constructed and fabrication of the cask and associated equipment began. However, in 1996, quality issues forced work to be stopped. In 1997, a new supplier resumed the design and license work. Work is now expected to be complete to allow a mid 2000 start to fuel movement with possible completion by mid 2001.

The transportable storage system consists of a transportation cask, twenty-one dry shielded canisters, twenty-two horizontal storage modules and a multi-axle trailer. The cask serves for on-site transfer and off-site transportation overpack for the canisters. The canisters hold the spent fuel in a structural array and are seal welded at both ends. The horizontal storage modules are thick reinforced concrete storage bunkers used to store the canisters. The twenty-second module is expected to provide storage for greater-than-class-C waste from reactor vessel internals.

## **BOARD APPROVAL**

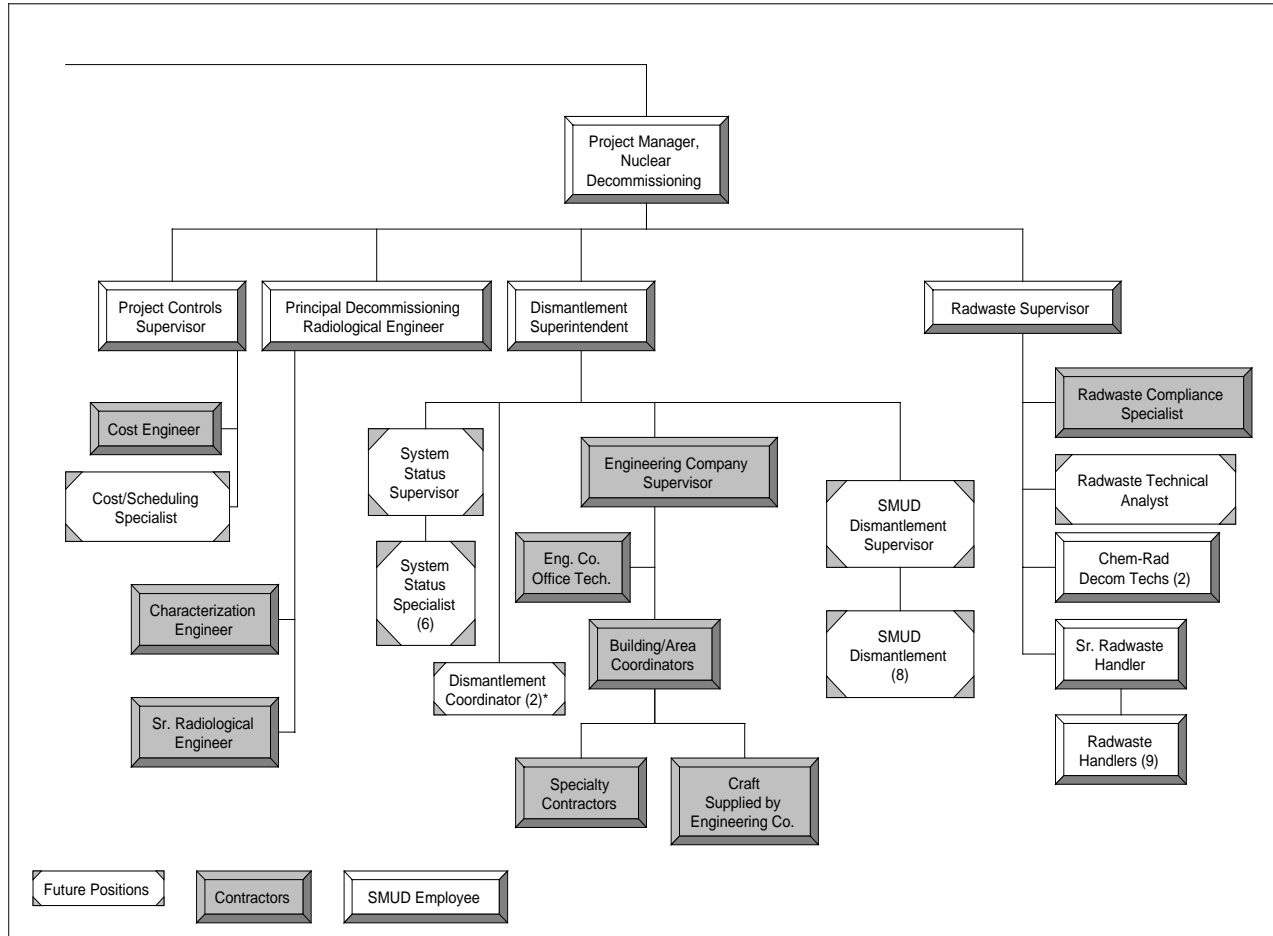
Based on the success of the incremental decommissioning project to date, on July 1, 1999, the SMUD Board approved continuing the decommissioning project to completion (2). The approval of the entire project is necessary to allow appropriate planning for long-lead decommissioning items. With this approval the planning has begun. Based on the fact that insufficient funding exists for the rapid completion of decommissioning, the rate of dismantlement will be slow initially, picking up after the completion of fuel transfer to dry storage. Current planning shows a 2008 completion date.

## **PLANNING**

In recognition of the fact that decommissioning is to continue to completion the staff is being reorganized to transition from an operating plant organization to one better suited for the challenges of decommissioning. The transition will not be complete until fuel is moved and a

licensed operations staff is no longer needed. The planned decommissioning project team is shown in Figure 1.

**Figure 1 Decommissioning Project Team**



The original cost estimate used a system-based approach that did not lend itself to use in project tracking. A new cost estimate was developed that was based on the tasks that were expected to be performed in an area by area order. This estimate was then loaded into a scheduling program to develop the entire project schedule and man-loading. Tracking tools were developed for schedule and cost to monitor progress. The approximate schedule is listed in Table 1.

## WORK PROCESS

Procedures were developed to control the dismantlement process (3). Systems and portions of systems are turned-over for removal under an Incremental Decommissioning Package (IDP). Isolation of operating systems is done using a Design Change Package (DCP). Removal is done with Decommissioning Work Permits (DWP) assigned on an area by area basis. The DWP defines exactly what is to be removed, the order of removal, and any hazards or hazardous

materials in the area and how they are to be handled. It is used for worker briefing and clearance preparation including system draining. The operations group then marks the pipe and equipment items ready for removal.

**Table 1 Major Item Schedule**

<b>Activity Description</b>	<b>Start</b>	<b>Finish</b>
Auxiliary Building System Removal	Sept. 1999	Dec. 2002
Reactor Building Preparation	Jan. 2000	Dec. 2000
Reactor Building System Removal (non-RCS)	Jan. 2001	Dec. 2005
Remove RCP Motors	Jan. 2001	May 2001
Move Spent Fuel to ISFSI	May 2000	Dec. 2000
Spent Fuel Pool Dismantlement	Jan. 2001	July 2003
Remove Reactor Coolant Piping	Jan. 2004	May 2004
Remove Reactor Coolant Pumps	May 2004	Dec. 2004
Remove Steam Generators and Pressurizer	May 2004	July 2005
Remove Outside Tanks	Feb. 2001	Oct. 2001
Remove Underground Piping	Jan. 2002	Dec. 2002
License Termination Plan Preparation	Jan. 2000	Oct. 2003
Reactor Vessel Internals Removal	Jan. 2005	July 2006
Reactor Vessel Cut-up	July 2006	May 2007
Building Decontamination	July 2003	Feb. 2008
Perform Final Survey	Oct. 2006	Oct. 2008

Piping and equipment items are marked with the system that they came from to help radwaste personnel determine the disposition. Through-wall or underground piping stubs are marked with the system and line number to facilitate later removal or decontamination.

### **SPENT FUEL POOL ISLAND**

To allow the removal of normal plant cooling systems and the isolation of the spent fuel pool, a small self-contained cooling and water cleanup system was designed and installed. The system is unique in that it uses a refrigeration system for cooling. All of the equipment sits next to the pool, except for the condensing unit that is just outside the building. The system includes a filter and a portable demineralizer unit.

The pool has a relatively constant leak rate of approximately 50 gallons per day that was directed to the liquid radwaste system. To avoid treating this water a return system was also installed that passed through a filter and demineralizer. This also stops the reduction in boron concentration that was occurring from the leakage and replacement with demineralized water.

### **LIQUID RADWASTE SYSTEM RECONFIGURATION**

More than half of the equipment in the Auxiliary Building is part of the Liquid Radwaste System. To allow removal of a significant portion of the Auxiliary Building equipment the Liquid Radwaste System had to be reconfigured to a significantly smaller, simpler system. Most

of the tanks, pumps, and valves, both of the evaporators and all of the filters and ion exchange vessels were abandoned. To accomplish this, accumulated water was processed with a leased reverse osmosis system and all remaining resin was transferred to high integrity containers for storage.

The reverse osmosis system will return when the fuel is removed from the pool and be used to process the 460,000 gallons and any water that has accumulated in the liquid waste system. Once all borated water has been processed, future accumulations can be processed with a portable ion exchange system prior to release.

The remaining liquid radwaste system now consists of three sumps and pumps, three holding tanks and their recirculation pumps, two tanks that hold concentrated waste water and their pumps, a connection area for temporary equipment, and a drum-drying system for disposal of the concentrates. As the project progresses this system is expected to be further downsized.

### **ASBESTOS AND LEAD PAINT REMOVAL**

The removal of asbestos from piping and components has been a major effort. The standard procedure was to survey the item for activity, tent the area and remove the asbestos. It was determined that if the component or pipe could be surveyed and released, the whole pipe section could go to the asbestos disposal site, minimizing the removal effort. This led to the practice of glove-bagging the area of pipe to be cut and surveying the inside after removal, leaving the asbestos on the outside of the pipe. For large-bore pipe, if the pipe was internally contaminated it was moved to a central asbestos tent and remediated in batches. Piping within the Auxiliary Building was glove-bagged in sections so that small-bore piping could be sent to the waste site with the asbestos intact, minimizing the remediation effort.

Essentially all paint has been treated as lead based. Where torch cutting is required, a lead contractor removes the paint. If possible, cutting is done with saws or machining devices, with the lead paint chips held in place by applying shaving cream to the cut area. Composite sampling of paint chips has yielded results of less than 1 PPM of PCBs.

Chemical addition systems were flushed and released by a contract service prior to removal. Some lines were found to be plugged with caustic and will be removed later.

Asbestos and lead paint work is mostly complete in the Auxiliary Building with work just beginning in the Reactor Building. The plan is to stay ahead of removal work.

### **PLANNED ACTIVITIES**

Activities planned for the year 2000 include beginning in the Reactor Building with removal of insulation and ventilation systems. A major cleaning will be done to improve working conditions and allow system and area characterization. A polar crane upgrade to radio control is planned. A temporary building will be placed over the equipment hatch to allow an alternate access point and a laydown area for equipment processing and packaging.

Continuing activities in the Auxiliary Building include a source term reduction program for ALARA purposes ahead of the dismantlement work. Hot-spots have been identified and will be scheduled for removal ahead of dismantlement activities in the area. Most are small drain valves that are easily removed. Tank cleaning will be performed ahead of tank dismantlement.

Once the fuel has been removed from the pool and the water processed, the racks will be removed and the bottom cleaned. The pool walls themselves will be removed because pool leakage has come through the concrete causing much of the walls to be volumetrically contaminated.

A possible chemical decontamination of the steam generators, pressurizer and the reactor coolant pumps is being considered to allow them to meet the current Envirocare of Utah waste acceptance criteria.

## **FUTURE ISSUES**

The most significant issue facing the project that could impact completion is disposal of class B & C waste (and class A waste greater than Envirocare license limits). Current planning calls for this waste to go to the Barnwell site. However, the Barnwell site could easily be closed (or closed to Rancho Seco waste) by the time the material is ready for disposal. The good news is that Envirocare has requested a license amendment to accept all low-level radioactive waste. When (and if) this will be approved makes the future planning for the project significantly more challenging.

## **REFERENCES**

1. D. Gardiner, J. Newey, "Rancho Seco Secondary System Dismantlement", Presented at Waste Management 99, Tucson, Arizona.
2. SMUD, Rancho Seco Nuclear Power Plant, Post Shutdown Decommissioning Activities Report; Amendment 2, Docket 50-312, November 1999.
3. Rancho Seco Procedures Manual, "Control of Incremental Decommissioning Projects", RSAP-1900, Revision 4, September 1999.