RANCHO SECO SECONDARY SYSTEM DISMANTLEMENT

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ABSTACT

The Rancho Seco Nuclear Generating Station ceased operation in June of 1989 and entered an extended period of SAFSTOR. Dismantlement of Turbine Building systems began in 1997 and is nearing completion. Approval for dismantlement was based on savings that could be realized over the decommissioning cost estimate. Financial success has been achieved through an aggressive decontamination and survey-for-release program. High packaging efficiency has been achieved for the waste sent for disposal. Hazardous materials have been a major issue. This paper describes the problems encountered and solutions found in that effort.

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 for 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 end of 2000.

The baseline decommissioning cost estimate uses a value of $405 per cubic foot for disposal at the planned Ward Valley disposal site. While this value is no longer valid, and the site opening is in question, it was used for comparison purposes. 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.

With the staff waiting for fuel movement and the possibility for significant cost savings, a three-year incremental decommissioning project was proposed to dismantle the Turbine Building systems and a portion of the Tank Farm systems. The project was approved for 1997, with annual renewals based on performance. This paper describes the progress to date and the problems encountered.

PLANNED ACTIVITIES

Before actual dismantlement could begin, significant up-front work was required. Contracts were needed for disposal, shipping, waste processing and labor. Engineering was required for the abandonment of systems and components and the necessary isolations from active systems. Procedures governing dismantlement were also required.

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 are being removed to simplify final survey activities.

Actual dismantlement began with demineralized water systems, the condensate polishers and chemical addition systems. Next came feedwater heaters and reheaters, followed by the turbine, feed pumps and finally the condenser. Most dismantlement of minimally contaminated components is done with standard oxyacetylene torches. Completion of the Turbine Building is expected in mid 1999, with outside work continuing in the Tank Farm and pipe chase areas.

RADIATION PROTECTION

Radiation and contamination levels in the Turbine Building components are very low (with a few exceptions), allowing minimal radiation protection considerations. No significant activity existed in the building outside of components. When measured with a thin window pancake probe, most components indicated only a few hundred counts if any at all. This annulled protective-clothing requirements beyond work gloves and personal coveralls, with frisking out of work areas the only necessary personnel monitoring

The most contaminated components found so far were the main steam lines, the high-pressure turbine and the moisture separator/reheaters (MSR). These components had fixed contamination up to 50,000 cpm and loose contamination levels up to 20,000 dpm/100 cm^2 (33,300 Bq m^{-2}) in isolated locations. Spraying a fixative on the surfaces prior to handling controlled loose contamination. With only a few exceptions, dose rates on components were less than 0.1 mR/hr (1 μSv).

SURVEY FOR RELEASE

One of the most effective cost-saving measures is the program of surveying material for release as non-contaminated. Most material was expected to be free of contamination, but all system components in the Turbine Building are required to be surveyed as they are removed and size reduced. Some system components require minimal surveys due to system history of no internal contamination. Steam systems require extensive surveys of all surfaces to allow free release. The criteria for release is “no detectable activity” in accordance with NRC IE Notice 85-92.

If surfaces exist that are not accessible, then the component must be cut open to allow survey or be disposed of as contaminated. To avoid this for some components with inaccessible areas that are expected to be clean, a procedure was developed to allow an evaluation to be done of projected contamination levels for inaccessible areas. An “Inaccessible Contamination Evaluation,” or ICE for short, is done for these components. It requires system knowledge, survey of accessible areas and might include a sampling of inaccessible areas by destructive means. Items released under this program include the third, fourth, fifth and sixth point heaters, most of the auxiliary boilers and the outer turbine covers. Major portions of the condenser are expected to be released in this manner.

The free release program has not been without its problems though. Two different incidents occurred where the radiation monitors at the scrap yards rejected truckloads of scrap metal. In one case a very small area was apparently missed in the survey process. In the other, re-survey of the material by special means showed that a very small amount of activity (below levels that could be detected by normal survey procedures) was distributed over many pieces causing the scrap yard monitors to alarm. The activity levels were not high enough to cause any concern over unmonitored exposure to members of the public in either case.

The corrective actions included survey procedure revisions to include griding of materials and initialing the grids when released and extensive training on the procedures. Also, a greater portion of the material that might contain very low levels was sent for decontamination, and a truck monitor was purchased. The truck monitor provides a final check before release to ensure that aggregate quantities can be evaluated. These measures have resulted in increased cost due to increased survey time and decontamination time, but the free release of material is still the most cost-effective disposition for material.

The survey program has been responsible for the recycle of approximately 5 million pounds of material that might have been sent for disposal.

DECONTAMINATION

A booth was installed to allow grit blasting of lightly contaminated materials. It was found to be very cost effective for high-density carbon-steel materials and was used on a large portion of the steam system components and piping that were found to be contaminated. Components were pre-sized to fit in the booth and have all necessary surfaces exposed. Once blasted on contaminated surfaces, a complete survey was done for material release. Since the more contaminated materials were sent directly to packaging for disposal, few items failed the survey after blasting. Approximately 2 million pounds of material has been successfully decontaminated and sent for recycling in this manner.

Some of the components that were mostly clean, but could not easily be decontaminated or surveyed were sent offsite for processing if it was deemed economical to do so. These components included portions of the MSRs and the first and second point heater tubes.

PACKAGING AND DISPOSAL

For those items that could not be free released, decontaminated on site or economically sent for processing, disposal was the remaining option. Disposal cost is mostly a function of dollars per cubic foot. Therefore, packaging efficiency or density of the burial package is the most important factor driving disposal cost. Standard disposal to qualify as debris requires waste to have one dimension that is not greater than 10 inches. This requires most waste material to be cut to meet these criteria. Packaging efficiency has been achieved mostly by moving the material that does not pass release criteria to a staging shop where material is torch cut to a size and shape that can easily be packed. Other innovative approaches have been developed, such as placing smaller pipe in larger pipe. The result has been extremely heavy containers, with some 100 cubic foot boxes exceeding 30,000 pounds. The total sent for disposal, to date, is approximately 8000 cubic feet.

Some major components that were contaminated have been transferred to other licensees, thus avoiding disposal cost. Included in this category is the high-pressure turbine rotor and two MSR tube bundles that have been sent to another nuclear power plant. Many of the pumps and motors from the Auxiliary Building are to be sent to a vendor that will refurbish and provide them to other plants.

HAZARDOUS MATERIALS

Hazardous materials issues continue to have a major effect on the project. These materials include asbestos in insulation, wiring, and roofing, lead in painted surfaces and residual chemicals in chemical addition systems. Also, industrial hygiene issues have been addressed because of thermal cutting of various metals. Insufficient money was provided in the decommissioning cost estimate for hazardous material handling and disposal issues. Asbestos remediation, initially projected at $2 Million, is now projected to cost $5 Million.

The removal of asbestos from steam 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 lead 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. If the pipe was internally contaminated it was moved to a central asbestos tent and remediated in batches.

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.

Chemical addition systems were flushed and released by a contract service prior to removal. In spite of this action, chemicals were found in piping that had been released.

MISCELLANEOUS ISSUES

Most of the decommissioning activities occurred outside or in fairly open structures. This works well when the weather is good, but in winter rains and summer heat some activities are impacted. Rancho Seco has an open air Turbine Building and crane lay-down areas where large components are cut up. Workers and survey technicians could not work on some summer afternoons. Radioactive components had to be moved into storage when the rains came.

Material handling was a major problem due to the large volume of potential waste materials and the number of processing steps that each item had to complete before release or packaging for disposal. Major components were removed such that work areas became filled with material being cut up and waiting for survey, decontamination or size reduction. It was hard to balance the personnel needed to perform all these functions so that material did not back up. Management did not like large potentially radioactive components piled all over the site. As more radiation protection technicians and decontamination technicians arrived the material problem was brought under control.

RESULTS

After a slow start waiting to get contracts and personnel in place, the project pace has picked up and a major portion of the material and components in the Turbine Building have been removed and processed. Work is beginning in the Tank Farm area. The costs saved over the projected costs for these activities are significant. The procedures, contracts and the organization have been developed during the Turbine Building work that will allow the project to move on to the more radioactive systems in the Auxiliary Building and the Reactor Building. Planning is currently going on for decommissioning to move on to these buildings.