

Decommissioning Demonstration – San Onofre Nuclear Generating Station South Yard Facility – 16544

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ABSTRACT

Following the decision to retire Units 2 and 3 at the San Onofre Nuclear Generating Station (SONGS), Southern California Edison (SCE) staffed a multi-discipline team to investigate decommissioning best practices. SCE also tasked this team with reducing the overall radiological footprint and radioactive material inventory in the near term.

The SCE decommissioning activities investigation team targeted projects at the facility which could reduce the source term and risk, and investigate management approaches with decommissioning contractors. SCE, through this team, contracted *EnergySolutions* to provide a solution for processing and disposal of equipment and materials at a storage facility south of the plant. The South Yard Facility included offices, instrument repair facilities, a large machine shop, outage equipment storage, waste management facilities, and decontamination facilities. SCE contracted *EnergySolutions* to manage, supervise, plan, and provide labor for the disposition of the legacy waste stored at the South Yard to include the Radioactive Equipment/Materials Storage (REMS) Pad and South Yard Facility. Under the Contractor Work Authorization (CWA), SCE authorized *EnergySolutions* to consolidate, package, transport, and dispose of the Low Level Radioactive Waste (Class A) and Mixed Low Level Radioactive Waste from the aforementioned areas. The scope also included disposition of material that was expected to be free from radiological contamination, but required management as a hazardous waste. The legacy waste consisted of an inventory of containers designated as trash provided by SCE, as well as, all materials stored within the rooms of the SYF.

INTRODUCTION

Southern California Edison (SCE) and *EnergySolutions* coordinated to establish the scope of the South Yard Facility (SYF) Project and to determine a path forward for various waste streams (legacy waste). *EnergySolutions* management committed to provide a solution for the compliant disposition of legacy waste in a timeframe established by SCE.

EnergySolutions entered into a turn-key agreement with SCE for the management, supervision, plan development, labor and disposition of the legacy waste stored at the South Yard to include the REMS Pad and South Yard Facility. Under a Contractor Work Authorization (CWA), SCE authorized *EnergySolutions* to consolidate, package, transport, and disposition the Low Level Radioactive Waste (Class A) and Mixed Low Level Radioactive Waste from the aforementioned areas.

History

SCE had legacy waste stored at the South Yard, in both the REMS Storage Pad and the SYF. The legacy waste consisted of an inventory of containers designated as trash provided by SCE, as well as, all materials stored in the rooms of the SYF.

The rooms of the SYF were located inside of a Radiologically Controlled Area (RCA) and contained various items used during day-to-day plant operations, outages, waste transfer, and refueling activities. SCE and EnergySolutions performed multiple walk-downs prior to contract award and during the project to determine which material should be saved and which material should be disposed of. The following provides a summary of materials and equipment within specific rooms of the SYF that required disposition:

- The Count Room consisted of Radiation Protection (RP) supplies, radiological survey instrumentation, and sources. This room was used for counting disc smears and air samples, as well as daily source checks of instrumentation.
- The Camera/Instrument Room contained cameras, radios, computer parts, cables, and various supplies to support remote radiological monitoring. This room was used for storage only.
- The Hot Tool/Camera Room contained radiologically contaminated remote monitoring equipment such as television monitors, cables, cameras, etc. and the tools to repair this equipment. This room was used as storage and repair shop and contained a Contaminated Area (CA) specifically designated for repair of items that had removable contamination externally and/or internally.
- The REMS Rebuild Room contained tooling and large equipment such as lathes and mills that were used for the repair of contaminated equipment. Additionally, the room housed several containers of contaminated equipment and Dry Active Waste (DAW). This room was used for storage of tools, packaged radioactive material, and had multiple equipment repair work stations designated as CA's.
- The REMS Storage Room contained packaged equipment, as well as hundreds of smaller tool boxes designated for refueling activities. This room was used for storage only.
- The Decon Room contained multiple pieces of CO2 blasting and power washing equipment designated for decontamination of tooling. Additionally, the room contained a Decontamination Booth for work activities revolving around highly contaminated equipment. This room was an Alpha Level III designated area.
- The south exterior side of the SYF was designated as the Canopy area. This area housed multiple containers, large pieces of equipment, air tanks and compressors.

SONGS also had two Reactor Coolant Pump (RCP) motors designated as direct disposal at the Clive Facility in Clive, UT. The first RCP motor was stored in the SCE Westminster Facility in Westminster, CA after being refurbished in Lynchburg, VA. The second RCP motor was stored in the South Yard after being removed from the plant and connected to dryers for future re-use or sale.

Figure 1 RCP #2 located in South Yard



Project Overview

Legacy Waste

As shown in Table I, SCE provided EnergySolutions with an inventory of 69 containers that were designated as inventory/trash. These containers were brought inside the airlock of the SYF to be opened, inventoried, sorted, segregated, and repackaged in Department of Transportation (DOT) compliant containers. The inventory of containers consisted of the estimated volume listed in the table below.

Table I Proposed Inventory

Quantity	Container	Estimated Volume (M³)
8	20' Cargo Containers	290
6	10' Cargo Containers	109
55	REMS Containers	125
	Total	524

Rooms in the SYF contained material destined for disposal. These rooms consisted of the estimated volume listed in Table II.

Table II SYF Building

SYF Waste Location	Estimated Volume (M³)
REMS Rebuild Room	425
REMS Storage Room	340
Hot Tool/Camera Room	11
Decon Room	11
Camera/Instrumentation Room	17
Count Room	13
Canopy	283
Miscellaneous	28
Total	1,128

The material in each of these rooms was removed, drained of all liquids, sorted, segregated, and packaged in DOT compliant containers destined for direct disposal or for processing. The total amount of legacy waste was estimated at 1,652 M³.

All waste material was segregated based on the type of waste and specific radiological criteria detailed in the South Yard Facility Work Plan. The Radiation Protection Technician (RPT) surveyed all Low Level Radioactive Waste (LLRW) material to be packaged. If an item was $> 0.50 \text{ uSv}$ ($>50 \text{ uR/hr}$), $>17 \text{ Bq/100cm}^2$ beta-gamma ($>1,000 \text{ dpm/100cm}^2$ beta-gamma), or $>0.34 \text{ Bq/100cm}^2$ alpha ($>20 \text{ dpm/100cm}^2$ alpha), then the item was designated for direct disposal at the Clive Facility. If the item was $<0.50 \text{ uSv}$ ($<50 \text{ uR/hr}$) and $<17 \text{ Bq/100cm}^2$ beta-gamma ($<1,000 \text{ dpm/100cm}^2$ beta-gamma) and 0.34 Bq/100cm^2 alpha ($<20 \text{ dpm/100cm}^2$ alpha), then the item was a candidate for the Bulk Waste Assay Program (BWAP) at the Bear Creek Facility. Additionally, all Mixed Low Level Radioactive Waste (MLLRW) was compliantly packaged and designated for treatment and disposal at the Clive Facility.

RCP Motors

RCP Motor #1 located in Westminster, CA, was stored/staged in the down-ended position and packaged in a custom built IP-I container. Using an overhead crane within the facility, SCE personnel loaded the RCP Motor onto conveyance for transport.

RCP Motor #2 located in the South Yard, was stored/staged upright. All fluids were drained by SCE personnel. The RCP Motor was down-ended by Barnhart, an EnergySolutions subcontractor, using a gantry crane and was loaded onto the conveyance for transport.

Figure 2 Down-Ending of RCP Motor #2 located in South Yard



Each RCP Motor was 82 M³ and weighed 67,240 kg. These shipments were considered wide loads and required special permits for the transportation to Clive, UT.

ORGANIZATION AND RESPONSIBILITIES

During field operations, *EnergySolutions* utilized an integrated management approach that included off-site management oversight and technical support. The on-site team consisted of a Project Manager, Lead Safety Professional, Certified Waste Broker/Shipper, Waste Packaging Specialists, Senior Radiation Protection Technicians, Senior Decon Technicians, and Craft support personnel. The onsite team consisted of *EnergySolutions* and contract personnel such as Newex and CB&I performing the aforementioned positions.

QUALITY ASSURANCE AND QUALITY CONTROL

The *EnergySolutions* Quality Assurance/Quality Control (QA/QC) Program was used in conjunction with the SCE QA/QC Program to ensure that all the necessary quality requirements were satisfied during the project. All activities affecting quality were controlled administratively by project procedures and enforced by the project staff. Specific elements of the QA/QC Program included the selection of proper personnel, personnel training, the use of project procedures and permits, as well as survey/shipping documentation and records review and management as follows:

Selection of Personnel

The selection of the *EnergySolutions* project staff was based upon their experience and familiarity with similar projects. All project personnel had the experience and qualifications in performing similar types of work and surveys. In addition, project personnel were required to have had prior work experience with the radionuclide(s) of concern as well as the instrumentation and analytic techniques used for the detection of any residual contamination.

In general, all the project personnel had either Commercial Nuclear Power Plant or Decontamination and Decommissioning (D&D) experience.

Personnel Training

During site access training, all project personnel were trained to the specific SCE on-boarding requirements. Prior to beginning field activities, all project personnel received training to the project specific plans and permits. All *EnergySolutions*, *Newex*, and *CB&I* personnel were qualified radiation workers and were experienced in the performance of their assigned duties. Additionally, after the daily pre-job briefings, the designated lead for each group logged into the SCE database to generate a training compliance document for each individual. This document was reviewed on a daily basis prior to work start.

Project Plans

The project work plans and permits specified the on-site operating requirements. Approved plans and permits as specified in the QA/QC requirements included waste shipping, radiological controls to ensure the safety of project personnel, as well as survey documentation and records management. Dosimetry and radiological exposure records for all project personnel were maintained by SCE and in accordance with the implemented Radiation Protection Program.

Documentation and Records Management

Copies of all quality records were maintained on-site through the duration of the project. All quality records generated were typically reviewed independently in duplicate and maintained by the project personnel performing the work. All quality records were submitted to SCE and have been kept on file by *EnergySolutions*.

Project Controls

Standard project controls process were utilized to monitor the project from a resource, scheduling, and cost control standpoint.

Work Controls

All work was performed under the site's Radiation Protection Program. The SCE Shipping Program was utilized in combination with the *EnergySolutions*

Broker Program for all waste management and transportation related activities. The project was also conducted under the combined QA/QC Programs of EnergySolutions and SCE.

Waste Generation and Disposal

The waste generated during SYF Project activities consisted of contaminated equipment and materials, personnel protective equipment (PPE), and contaminated hazardous waste. The contaminated equipment and materials from the project were LLRW and MLLRW.

Waste Packaging

Contaminated materials were packaged in cargo containers, REMS containers, B25 boxes, and 55 gallon drums in preparation for transportation for disposal. Each package was inspected, packaged, surveyed, weighed and the weight recorded to maintain a running total for the shipment weight.

Waste Volume Disposition

Waste material identified in the proposal was packaged for disposal, removed from the inventory at the direction of SCE, or free released at the direction of SCE. The total volume of waste material dispositioned is listed in the Table III.

Table III Waste Disposition

SONGS SYF Project	Weight (kg)	Volume (M³)
Packaged Material	412,656	1,210
Free Released Material	29,484	91
Inventory Removed*	23,115	254
Oil Room Removed*	3,402	14
Lead Removed*	62,160	34
Total	530,817	1,603

**Material removed from scope at the direction of SCE*

Waste Shipments

Waste material was packaged and transported offsite for direct disposal at the Clive Facility or BWAP at Bear Creek in TN. A total of 30 shipments were made off-site with zero DOT violations and zero waste compliance issues. Clive received 25 shipments and Bear Creek received 5 shipments during the

project duration. The legacy waste from the project consisted of 28 total shipments. The RCP Motors were on 2 separate permitted shipments. The summary of all shipments is listed in the table below.

Table IV Legacy Waste Shipment Summary

Shipment Totals	
Weight (kg)	Volume (M ³)
412,656	1,210

Table V RCP Motor Shipment Summary

RCP Motors #1 and #2	
Weight (kg)	Volume (M ³)
134,479	164

PROJECT PERFORMANCE

Pre-Mobilization/Planning

During the pre-mobilization phase of the project, EnergySolutions personnel prepared the technical work plans and schedule for project execution. All pertinent project specific plans were submitted to and approved by SCE prior to work start. The project followed the SCE established Health & Safety Plan and Radiological Protection Program. The EnergySolutions Broker Program was reviewed by SCE and used in conjunction with applicable SCE shipping procedures.

Mobilization/Training

For unescorted site access, all personnel were required to complete a background check and specific training outlined in the SCE on-boarding requirements. This training consisted of, but was not limited to, Safety Conscious Work Environment, Hazardous Communications, Radiological Worker I, and Site Access Awareness.

Once personnel had obtained the appropriate level badge, project specific training took place. All project personnel attended a Project Kickoff Meeting to discuss the scope of the project, safety goals, ALARA goals, schedule, and

general roles and responsibilities. Personnel were also required to acknowledge by signature that they had read and understood the project specific plans that were being implemented.

Personnel

EnergySolutions worked closely with other companies during the project duration. Newex, as a subcontractor to EnergySolutions supplied (1) Certified Waste Broker/Shipper, (2) Waste Packaging Specialists, (2) Senior RP Technicians, and (3) Senior Decon Technicians. CB&I, as a subcontractor to SONGS, support for the project consisted of (1) Equipment Operator, (2) Carpenters, (4) Laborers, and (1) Lead Safety Professional.

Schedule

The project was scheduled for a total of 19 weeks, with field activities lasting approximately 14 weeks. All project activities were completed in this time frame. The project was awarded on August 26, 2014 with project plans submitted for review and approval during the pre-mobilization period. Personnel arrived on site and were in training for approximately 1 week in order to have unescorted access.

Field activities started on September 15, 2014 and were completed on December 17, 2014. The two RCP Motors were successfully shipped off site in September and October. Additional work identified in paragraphs below extended the onsite field activities by one week, with final shipments off-site December 30, 2014. Project closeout reports were submitted to the client in January 2015.

Safety

The project worked under the SCE Safety and Health Program currently in place site-wide and in conjunction with CB&I and EnergySolutions Safety and Health Programs. During the project duration, there were zero near misses, zero first aids, and zero recordable injuries. Prior to start of work, all project personnel participated in daily Pre-Job Briefings to discuss the following topics:

- Scope of work to be performed and any limiting conditions
- Review hazards of the job and mitigation of those hazards (including JHA's permits, LO/TO, etc)
- Review of procedures/processes involved in case of an emergency event
- Discuss Stop Work Authority
- Discuss roles and responsibilities of project personnel
- Discuss safety, radiological, and environmental/waste management requirements

- Discuss Lessons Learned and previous experience with similar tasks
- Review S.T.A.R (Stop, Think, Act, Review)
- Discuss Radiological Exposure Permit (REP) requirements and controls

In addition to Daily Pre-Job Briefings every morning, the project team also participated in an end of shift briefing to discuss ways to improve safety and efficiency of project operational processes.

ALARA

Surveys of the SYF were evaluated and an ALARA Goal was determined by EnergySolutions and presented to SCE for review. During the SYF Project, there was zero dose accumulated for the project team, zero Personnel Contamination Events (PCEs), and zero unplanned releases to the environment.

ADDITIONAL SCOPE

At the request of SCE, Change Orders (CO) were put into place in order to address additional scope identified to be completed. Under contract award CWA #2014-014, the additional scope of work included the shipment of RCP Motor J-Frames back to SONGS and the shipment of Oil/Sludge/Water for processing at Bear Creek. Under CWA #2-14-015, the additional scope of work included the U2/U3 Radwaste Offload Material to be shipped to Clive prior to year end.

Radioactive Oil/Sludge/Water – Bear Creek

The scope consisted of packaging, transport, and processing of oil/sludge/water drums and the corresponding labor to oversee the activity. After processing, the material was sent to Clive for disposal. Twelve 55-gallon drums of waste were identified for disposal. This activity was completed and material was shipped to BCO on December 8, 2014.

U2/U3 Radwaste Offload Material – Clive

The scope consisted of the processing, disposal, and transportation of LLRW and MLLRW material in (5) seavans, (1) B-25 container, and the corresponding labor to oversee the activity. These activities were completed on December 30, 2014. The table below details the quantities of material shipped to Clive for processing and/or direct disposal.

Table VI U2/U3 Radwaste Offload Shipment Summary

Shipment Totals		Waste Totals	
Weight (kg)	Volume (M ³)	Weight (kg)	Volume (M ³)
48,104	184	37,104	159

LESSONS LEARNED

Unescorted Access – The process for obtaining an unescorted site access badge for new personnel can be lengthy. Personnel can arrive on site and sit for up to two working weeks while completing the on-boarding requirements and waiting for security to complete necessary paperwork. The project determined that if all required background paperwork was submitted one week prior to arrival, the badging process was expedited once physically on site. Additionally, computer based training that was listed as an on-boarding requirement for unescorted access was only offered on specific days. It would be beneficial to have this training offered on a broader basis in the future.

South- Gate Access – The project made multiple shipments out of the SYF. Due to security changes on site in October, truck drivers were allowed to enter through the North Gate without visitor access approval. While this was beneficial to some, by reduction of paperwork, it did not benefit the project. When trucks entered through the North Gate, they took a route to the SYF that includes a sharp 90 degree turn to the right. Most flatbed trailers could not make this turn. The project found that it was beneficial to have the trucks enter directly at the South Gate, which required project personnel to be in possession of the South Gate Access Card. The project would submit the truck driver’s visitor access paperwork to security in advance of arrival and trucks were allowed entry and exit to the SYF. The process for acquiring a South Gate Access Card took several weeks and the project relied on other contracting personnel for access. For future projects, it is recommended to have a South Gate Access Card assigned to each project from the beginning.

South Yard Effluent Air – The SYF has an effluent air system that must be checked on a daily basis in order to determine that it is indeed functioning. When the effluent air system is not functioning, all work activities that could potentially produce an airborne contamination area must cease. During one of the daily checks, the system appeared to fail the daily checklist. Upon further investigation, it was determined that the procedures that governed

these daily checks were shown to be in contradiction of each other. One procedure was updated, while the other was not. Though this daily check was not the responsibility of the project personnel, it was noted that all procedures should be verified as current prior to use.

CONCLUSION

The South Yard Facility Project was successfully completed in December of 2014. Personnel assigned to the project sorted/segregated, re-packaged, and loaded for transport a total of 595,239 kg of material for processing and/or direct disposal with a total waste weight of 547,410 kg. There were zero safety incidents, zero DOT violations, and zero waste compliance issues. The South Yard Facility Project was completed safely, compliantly, on schedule, and within the established budget.