



DPG 12-305

June 18, 2012

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Docket No. 50-312  
Rancho Seco Nuclear generating Station  
License No. DPR-54

**FOLLOW UP TO RANCHO SECO REPORT ON DECOMMISSIONING FUNDING STATUS**

Attention: John Hickman

On March 29, 2012 the Sacramento Municipal Utility District (SMUD) submitted the annual report on the status of decommissioning funding for the Rancho Seco facility as required by 10 CFR 50.75(f)(1). That letter was to include the 2011 Rancho Seco Decommissioning Cost Estimate as an attachment, but the attachment was not received by the NRC.

This letter includes that attachment to ensure that the 2011 Rancho Seco Decommissioning Cost Estimate is docketed properly.

Please find that report attached.

If you or members of your staff have questions or require additional information, please contact me by email at [einar.ronningen@smud.org](mailto:einar.ronningen@smud.org) or by phone at (916) 732-4817.

Sincerely,

A handwritten signature in black ink, appearing to read "E.T. Ronningen".

Einar T. Ronningen  
Superintendent, Rancho Seco Assets

Attachment: DPG 11-732, 2011 Rancho Seco Decommissioning Cost Estimate

CC: RIC 1F.099

FSME20




# 2011 DECOMMISSIONING COST ESTIMATE

## RANCHO SECO DECOMMISSIONING




**APPROVALS**

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On the cover: IOSB – regulated by Part 50 license

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**REVISION LOG**

Revision 0: 12/21/11

## 2011 DECOMMISSIONING COST ESTIMATE

### SUMMARY

The remaining cost projected to complete the decommissioning of The Rancho Seco Nuclear Generating Station (Rancho Seco) is \$29.9 million. This includes all projected costs to terminate the Part 50 license. While previous Cost Estimates have discussed costs associated with the Part 72 license termination, the license requirements and regulatory bases are separate and therefore these costs will no longer be discussed in this document: the Decommissioning Cost Estimate is directed solely at activities associated with Part 50 license termination.

In 2009, Phase I license termination activities were completed and modification of the Part 50 license was approved by the Nuclear Regulatory Commission (NRC). Phase I costs (completed in 2009) totaled \$487.1 million. As of 2011, Phase II expenditures already withdrawn from the Decommissioning Trust Fund totaled \$0.1 million. Actual expenditures not yet withdrawn from the Decommissioning Trust Fund and estimated future costs for remaining activities total \$29.9 million making the total 2011 Decommissioning Cost Estimate \$517.1 million. Remaining activities include: the transfer of Greater Than Class "C" (GTCC) Radioactive Waste to the Department of Energy (DOE)<sup>1</sup> in 2027; disposal of Class B & C low-level radioactive waste (LLRW) in 2016 and oversight of the LLRW until disposal; and license termination activities following disposal of the LLRW. A summary of the major remaining decommissioning cost contributors is provided in Table 1. The cost estimate includes nuclear fuel storage costs only through 2008. Beginning in 2009, fuel costs are considered a normal operation and maintenance (O&M) expense and are not included in the Decommissioning Cost Estimate.

Cost changes in this estimate reflect currently available data on the cost of LLRW disposal and estimated costs for license termination activities. The costs for the decommissioning line items for Phase II by category and as a schedule of expenditures are provided in Table 2. Actual costs for funds expended in Phase I are reported in detail in previous Cost Estimates.

With Phase I of radiological decommissioning complete, the single largest remaining cost is waste disposal. With updated information on the cost of LLRW disposal, the stored Class B and C LLRW make up the vast majority of future costs at 76% of the projected total. The Class B & C LLRW produced during Phase I of the license termination process remains in storage until a suitable disposal facility becomes available, with options that will by all measures be available in 2012 but with disposal conservatively estimated to occur in 2016. The GTCC disposal remains a significant 10% of the total.

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<sup>1</sup> SMUD believes that the DOE has been paid for and is responsible for the GTCC disposal under the terms of the Standard Contract. However the DOE does not agree, thus, as a prudent business contingency, funds are set aside in the Cost Estimate and Trust Fund.

Oversight of the stored Class B & C waste accounts for 4%, while the License Termination costs represent 10% of the remaining costs.

## **BACKGROUND**

Rancho Seco is located approximately 25 miles southeast of Sacramento, California. The industrial facility is 87 acres and sits within a 2,480-acre plot of land that is owned by the Sacramento Municipal Utility District (SMUD). The station was comprised of a single B&W-designed generation unit with support facilities.

Rancho Seco commenced reactor operations September 16, 1974, and began commercial operation April 18, 1975. SMUD permanently terminated operations at Rancho Seco on June 7, 1989 following passage of a public referendum June 6, 1989. The reactor was completely defueled on December 8, 1989 and a Possession Only License, along with Permanently Defueled Technical Specifications, became effective April 28, 1992.

On May 20, 1991, SMUD submitted a proposed Decommissioning Plan to the NRC that outlined the decommissioning option of Hardened SAFSTOR. This alternative put the fuel in dry storage and placed the plant in a safe, dormant condition with a small site maintenance staff until 2008 when a Decommissioning Operations Contractor would be brought in to complete decommissioning. This allowed for the Decommissioning Trust Fund to be fully funded before dismantlement began. The NRC issued a decommissioning order and approved the Rancho Seco decommissioning funding plan on March 20, 1995.

Beginning in 1995, TLG Services, Inc. (TLG) provided SMUD with alternative cost estimates that included options for the decommissioning of the facility. Delays in the Fuel Dry Storage project caused increases in projected costs, and the alternatives were provided to take advantage of the available opportunities, including: availability of SMUD Staff on site to support dismantlement due to delays in the Fuel Dry Storage project, and; availability of Envirocare's Clive, Utah disposal facility (Envirocare is now EnergySolutions) as an appealing option for low level radioactive waste (LLRW) disposal.

In January of 1997, SMUD Board of Directors (the Board) approved the Incremental Decommissioning Project, and physical dismantlement of the facility began later that year. In 1999, the Board approved expansion of the Incremental project to include all activities necessary for license termination. In April of 2006, SMUD submitted the License Termination Plan (LTP) to the NRC, outlining the activities necessary for the NRC to allow license termination. The LTP was approved by the NRC in November 2007. In September 2009 the NRC approved SMUD's request for modification of the Part 50 license. Currently, only the Interim Onsite Storage Building (IOSB) and the land enclosed by the exterior fence (approximately 1 acre) remains licensed under Part 50.

In the interim, the NRC issued SMUD a specific license for fuel storage in the Independent Spent Fuel Storage Installation (ISFSI) under Part 72 in 2000. Transfer of all nuclear fuel to dry storage in the ISFSI was completed August 22, 2002.

With the closure of the Barnwell, S.C. waste disposal facility, there are no options for disposition of Class B and Class C LLRW available to SMUD. However, the Waste Control Specialists, Inc. (WCS) facility in Andrews, Texas is licensed and the Texas-Vermont Low-Level Radioactive Waste Compact Commission has approved importation of waste from outside of the compact. SMUD has held discussions with WCS and has received an unsolicited bid for disposal of all waste in storage. SMUD has signed a Non-Disclosure Agreement with WCS as WCS considers specific pricing information to be proprietary. This cost estimate is conservatively based on information from WCS without revealing specific pricing. In addition, EnergySolutions, Inc. has formed a separate entity with other partners known as Sempra-Safe, LLC that has licensed a resin processing technique providing an alternative for the dispositioning of the stored resin material. SMUD has received an unsolicited bid for processing and disposal of the resin material from Sempra-Safe. SMUD has signed a Non-Disclosure Agreement with Sempra-Safe as the specific pricing is again considered proprietary. This cost estimate is conservatively based on information from Sempra-Safe without revealing specific pricing information.

With both options currently licensed by the NRC, the Texas-Vermont Compact Commission actively working on procedures to allow waste importation and the information provided by both waste alternatives the projected date for disposal of the stored LLRW has been accelerated to occur in 2016 versus the 2028 model used in previous estimates. The estimated date for DOE acceptance of the GTCC waste remains 2027 based on previously available spent fuel acceptance information. Considering that the Decommissioning Trust Fund is fully funded, and SMUD is not relying on increases in Trust Fund value through investment growth to ensure available funds for decommissioning, the uncertainty in the schedule for spent fuel removal does not impact SMUD's ability to fund all decommissioning activities.



## INTRODUCTION

This decommissioning cost estimate is prepared to satisfy the requirements of Title 10 of the Code of Federal Regulations, Part 50.75. The origin of this cost estimate is the area-based decommissioning cost estimate prepared in 1999 and later updated in the year 2000 by TLG (previous estimates were system-based). Subsequently, SMUD staff updated the estimate in the years 2001 through 2005. Each of these updates prepared by SMUD staff was reviewed by TLG. Since 2006, updates are performed by SMUD staff without outside agency review. SMUD staff has determined that outside review is not necessary because all activities involving significant cost and/or schedule risk have been completed. This cost estimate updates the 2010 estimate. The current cost estimate for decommissioning Rancho Seco is \$517.1 million.

The technical portion of the TLG cost estimate was based on system and component removal and facility decontamination. With all system and component removal complete and relatively little remaining facility decontamination remaining, there is little technical basis to the remaining costs. In addition, the decommissioning costs to date have all been well within the estimated costs, and the small scope of work remaining poses little risk of changing the historical trend. The largest risk factor is the cost of disposal of the waste currently stored at Rancho Seco. These costs have been quantified through proprietary offers for disposal received by SMUD in late 2011, but SMUD is not projecting disposal of the waste until 2016. With a firm basis for estimating the remaining costs, staff has determined that outside review would not provide additional confidence in the cost basis.

This document is based upon the latest information available including actual costs to date, projections for the work remaining, and projections of SMUD overhead costs. Updated information was used to make this cost estimate as accurate as possible, and revisions to costs were made in the following areas:

- the actual costs for Phase I have been re-base-lined based on the actual withdrawals from the Trust Fund
- projected costs for the Stored Waste Oversight
- projected costs for future waste disposal

### History of Rancho Seco Decommissioning and Cost Estimates

After the cessation of plant operations on June 7, 1989, the initial decommissioning alternative chosen was a modified SAFSTOR option identified as Hardened SAFSTOR. The facility was to be placed into a safe, stable condition including transferring of the used nuclear fuel from wet to dry storage. Because of the premature shutdown, the Decommissioning Trust Fund had not collected adequate funds for decommissioning. SMUD proposed a plan, which the NRC approved, to continue annual contributions to the Decommissioning Trust Fund over the time period of the original operating license, extending through 2008, at which time the Trust would be fully funded. This allowed

collection of funds while minimizing the overall financial impact to SMUD operations. Dismantlement activities were to commence once the funding was complete.

This original plan was the basis for the 1991 cost estimate, and was the baseline used for comparison when TLG prepared the 1995 cost estimate that included several decommissioning options. The two critical bases for these cost estimates were the use of a Decommissioning Operations Contractor to perform decommissioning, and the use of the then-proposed Ward Valley Low Level Waste Disposal Site (Ward Valley) as the cost basis for radioactive waste disposal.

Difficulties in the Fuel Dry Storage project caused delays over several years. The delays resulted in increases in overall decommissioning costs. The increases were reflected in the cost estimate updates and required increasing annual contributions to the Trust Fund, impacting SMUD's annual operating budget. Because of the financial impact, options were sought to mitigate the consequences of the increased costs. TLG was tasked with estimating the cost of several decommissioning options when preparing the 1995 update, and several options were evaluated.

Shortly after the 1995 decommissioning cost estimate update was prepared, EnergySolutions (then Envirocare) began accepting LLRW from nuclear utilities. EnergySolutions did not (and currently does not) accept the full spectrum of waste that is categorized as LLRW, but the waste they do accept represents the vast majority of waste generated during a power reactor decommissioning project. The Ward Valley cost basis was over \$400 per ft<sup>3</sup> of LLRW, while the EnergySolutions cost was under \$100 per ft<sup>3</sup>. With over 200,000 ft<sup>3</sup> of material estimated to be generated during Rancho Seco decommissioning that would be acceptable for disposal at EnergySolutions, the opportunity to favorably impact the overall cost of decommissioning became possible.

In the original basis for the cost estimate, after entering Hardened SAFSTOR staffing would be reduced to correspond with the reduction in required plant systems and facilities maintenance. Delays in the fuel project resulted in maintaining site staff at a higher level longer than originally planned. While this caused increases to the annual contributions to the Trust Fund, it also maintained a large talent pool on site with considerable process knowledge of operating history and radiological conditions within the facility.

The availability of EnergySolutions combined with the presence of a large talent pool within the available staff presented an opportunity to begin the dismantlement process early. In 1996, a plan was developed to take advantage of both circumstances and perform dismantlement of the majority of the secondary systems in the Turbine Building. This was proposed to the Board as the Incremental Decommissioning Project, which they subsequently approved as a 3-year project in January 1997.

The Incremental Decommissioning Project was successful in helping to mitigate the impacts of the delay in the fuel project, and the work was completed ahead of schedule

and below projected costs. The Incremental project was so successful that the scope was expanded to include systems in the Tank Farm and other outside areas.

During the time period of Incremental Decommissioning, additional circumstances outside of SMUD's control resulted in further delays in the fuel project and additional impacts to the cost estimate and the annual Trust Fund contribution. Based upon the success of the Incremental project and the need to mitigate additional increases to the annual Trust Fund contribution, the decommissioning staff proposed a plan for continuing decommissioning through license termination with completion targeted at the end of 2008. The Board approved this plan in July 1999, and SMUD shifted from Incremental Decommissioning to Decommissioning.

Early cost estimates throughout the industry were based upon inventories of plant components and commodities by system. Based upon the experiences gained at Rancho Seco and at other decommissioning nuclear utilities, TLG shifted the performance of cost estimating from a system-based approach to an area-based approach. To facilitate shifting the Rancho Seco cost estimate to the area-based approach, staff performed an area-by-area inventory of the plant systems and components in the Auxiliary and Reactor Buildings. The cost estimate prepared by TLG in 1999 represented both the shift to the area-based approach and the schedule change of completing decommissioning in 2008. (An additional cost estimate representing an update to the 1995 system-based estimate was also performed by TLG in 1999 for comparison purposes. 1999 was the last year the system-based estimate was updated.)

With the commencement of active Decommissioning came the requirement to perform annual updates to the cost estimate. In 2000, TLG prepared an update to the 1999 area-based cost estimate. By this time, relatively long-term contracts were in place to provide labor, technical staff, transportation, radwaste packaging materials, radwaste processing, and radwaste disposal to support the decommissioning process. TLG used this actual information when preparing the 2000 cost estimate.

The date of January 1, 2000 is defined as the dividing line between Incremental Decommissioning and Decommissioning. The demarcation between the two projects may be defined as that point where the planned Turbine Building work was completed, and work in the Auxiliary Building was begun. In actuality, there was some overlap between the projects, with work occurring simultaneously on both projects for 1-2 months before and after 1/1/2000. Defining 1/1/2000 as both the end of Incremental Decommissioning (completion of work defined as within Incremental Decommissioning scope) and the beginning of Decommissioning (no work yet begun defined as within Decommissioning scope) has negligible impact on cost. However, it would be difficult to carry forward a demarcation point other than the beginning of the calendar year because Trust Fund calculations, the budget process, and the scheduling of costs over the duration of the project are all based upon calendar year.

### Phased Decommissioning

By 2001, after Decommissioning had begun, SMUD decided not to send any LLRW to the Barnwell, SC disposal facility, having never sent any material there for disposal. This decision precluded the ability to complete Decommissioning and termination of the Part 50 license. At that time, the plan to decommission in phases was implemented. During Phase I, the majority of the identified license termination activities would be completed, including large component removal and decontamination of the facility to meet NRC release criteria. Class B & C LLRW resulting from these activities would be stored in the IOSB. With Phase I complete, the Part 50 license would be modified to include only the IOSB and land surrounding it (approximately 1-acre). Phase II would include oversight of the stored waste, shipping of the waste for disposal, and completion of all license termination activities at the IOSB resulting in termination of the Part 50 license. Decommissioning of the ISFSI is not considered in this document.

All physical system removal and building decontamination was complete by the end of 2008, with Final Status Surveys completed in June 2009. In September 2009, the NRC approved SMUD's request to modify the Part 50 license, releasing all of the facility from the license except for the 1-acre area encompassing the IOSB. This completed Phase I of Decommissioning. In 2011, and for the foreseeable future, the facility remains in a SAFSTOR mode.

## **METHODOLOGY AND APPROACH**

This cost estimate reflects the actual costs of Phase I (defined as all costs of the dismantlement effort including some license termination activities that resulted in the modification of the part 50 license), and provides actual and estimated costs for Phase II (defined as costs beginning in 2009 with the oversight of stored waste through termination of the Part 50 license). The technical basis for previous estimates included detailed calculations for: system and component removal; extensive building and outside area decontamination, and; determination of radioactive waste volumes and packaging requirements. With the completion of Phase I of decommissioning, all nuclear systems and components have been removed and remaining decommissioning costs are associated with disposal of the stored LLRW, decontamination as necessary of the IOSB, and Final Status Surveys of the building and surrounding land area.

Details on the methods used by TLG in preparing the historical cost estimates are contained in the respective cost estimate documents. The methods used unique to this latest update are included in the discussion below.

### Update Methodology

Previous updates to the cost estimate utilized actual cost bases to update ongoing activities. In 2009, the future costs were reevaluated and a new baseline was established based on the limited scope of the remaining work and reflecting the need to re-establish a decommissioning organization when physical work resumes. This update includes actual costs of waste oversight and inflates future costs. The major cost categories are: “Oversight, Shipping and Burial for Waste Disposal and Contract Staff”.

### Overview of Decommissioning Cost Estimate Components

The cost estimate provides an overall cost for the duration of the project. This includes all costs incurred after transitioning from O&M-financed expenses after plant shutdown through 10 CFR 50 license termination, plus an amount to cover SMUD costs anticipated for disposal of the GTCC material.

Phase I costs are identified as a single line item of costs previously expended and withdrawn from the Decommissioning Trust Fund. Some Phase II costs have also been withdrawn from the Trust.

As the purpose of the DCE is to provide a basis for assuring sufficient funds for decommissioning, appropriate costs are identified as “withdrawn” meaning that these actual expenses have been removed from the Decommissioning Trust Fund. Some Phase II costs (2010 to date) have actually been incurred by SMUD, but have not yet been withdrawn from the Decommissioning Trust Fund. Historically, SMUD would make annual withdrawals from the Trust based on expenditures. Currently, the actual expenses are small enough that annual withdrawals are no longer taken. In order to ensure

sufficient funding remains available for decommissioning, actual expenses not yet withdrawn from the Trust are counted with future estimated costs as they are expected to eventually be withdrawn from the Trust.

Oversight represents the costs necessary to ensure safe storage of the Class B & C waste until disposal. These are annually recurring costs for monitoring and maintaining the IOSB.

Waste disposal costs for the Class B and C LLRW are based on information currently available including costs for disposal of waste at the Waste Control Specialists, Inc. facility in Andrews, Texas as well as costs for processing and disposal of resin waste by EnergySolutions, Inc. Specific costs for disposal and processing are proprietary and the information in this Cost Estimate is intended to be bounding. The cost for the GTCC waste disposal is carried forward from previous estimates. The disposal of the GTCC material is tied to the schedule for fuel storage because it is assumed the GTCC material would be placed into the same repository as the fuel when the DOE develops the repository.

Staff costs include the cost for contract staff to support LLRW shipping activities and ultimately perform the remaining license termination activities including any needed decontamination of the IOSB and performance of subsequent Final Status Surveys at the IOSB. Also included are staff costs required to oversee the radioactive waste stored in the IOSB until shipped for disposal.



## **FINANCIAL COMPONENTS OF THE COST MODEL**

The decommissioning cost estimate in total is defined as the funding required to complete decommissioning through license termination. Historically, the estimate consisted of a large number of calculated costs based on cost factors, and the cost assigned to a given line item within the estimate was not as rigorously defended as the total. A basic assumption of the estimating process has been that when specific line items have been over-estimated, the unspent funds will be required to cover the costs associated with other line items that have been under-estimated. The historical costs captured in this estimate for Phase I of decommissioning reflect that the cost of the work completed was, in general, over-estimated.

The remaining future costs within this estimate were rigorously reviewed and/or refined. The format was changed in the 2009 update for ease of performing future updates. While previous estimates considered costs for terminating the Part 72 license, it has been determined that this is not the document to capture that information. The Stored Waste Oversight costs are carried forward from the last update. The cost for LLRW disposal has been split between the resins and the reactor vessel internals components, with the possibility of resin processing/disposal vs. direct disposal as a lower-cost option. The cost model has been updated to reflect the actual activity and dose rates for the waste in storage. Available non-proprietary information provides the basis for the LLRW disposal costs. The GTCC disposal costs are carried forward from the last update.

The 1999 area-based decommissioning cost estimate prepared by TLG was comprised of a detailed list of activities to which the unit cost factor methodology was applied. This provided a sound basis for determining overall costs, but contingencies were also added. The contingency provides additional funds to cover unforeseeable costs that are within the defined scope of the decommissioning project. It is important to note that contingency funds are an important part of the decommissioning cost estimate, and represent funds that are expected to be completely expended through the decommissioning process.

All of the activities which presented significant cost risk were completed in Phase I of Decommissioning, including dispositioning of the reactor vessel, reactor vessel internals, and all interior structures in the containment building. The reactor vessel and its internal components became radioactive as a result of activation during plant operation. Portions of the internals are highly radioactive and do not qualify as LLRW, but are classified as GTCC waste and are currently in storage at the ISFSI. The radioactive waste Class B and Class C internals are in storage at the IOSB in packages suitable for transportation and disposal.

Examples of remaining contingencies include changes in the regulatory environment and projected radioactive waste disposal costs (e.g., Class B & C waste disposition options) and costs or regulatory changes that would impact remaining license termination

activities. The cost impacts of these uncertainties have been defined by TLG in previous estimates under the term “financial risk”. To date, financial risk has not been specifically addressed within any Rancho Seco decommissioning cost estimate. Outside of the scope of the cost estimate itself, staff deals with these uncertainties on a project-by-project basis. An overall risk assessment taking into account any anticipated risk factor would typically be addressed through a probability analysis, perhaps utilizing a Monte Carlo-type probability simulation. Such a detailed risk analysis is considered to be outside of the scope of the decommissioning cost estimate. However, contingency is included as a component of the estimate where prudent.

## **ASSUMPTIONS**

The following are the assumptions used in developing the Rancho Seco cost estimate. Some assumptions are generic in nature, and some are specific to the Rancho Seco site.

### Used Fuel

1. The cost to remove and dispose of the used fuel from the site is not reflected within the estimate to decommission Rancho Seco. The Nuclear Waste Policy Act assigns responsibility to the DOE’s Waste Management System.
2. The ISFSI will remain operational under the 10 CFR 72 license until the DOE takes possession of, or accepts responsibility for, the fuel. The cost for maintenance of the fuel is considered O&M and is not included in this cost estimate.
3. DOE acceptance of fuel in 2027 is carried forward from previous estimates. This will be reviewed for each subsequent estimate as there is currently great uncertainty with the acceptance date.

### Reactor Vessel Internal Components

1. The reactor vessel internal components are removed and packaged. Resulting Class B and Class C radioactive waste is stored in the IOSB until a suitable option for the material becomes available. The resulting GTCC material is stored in the ISFSI until the DOE takes possession of the material. However, the DOE has not yet established an acceptance criteria or a disposition schedule for this material. Therefore, this cost estimate is based upon industry-accepted assumptions regarding DOE schedules. Industry assumptions for the acceptance criteria are modeled on the packaging for the used nuclear fuel: the GTCC is stored in a canister with the same outer geometry as the used fuel canisters.

2. The estimated cost to dispose of the GTCC material stored in the ISFSI is reflected in this cost estimate. The cost for maintenance and transfer of the GTCC material is not included in this cost estimate. Legal opinions and court decisions indicate that the GTCC disposal is the responsibility of the DOE, however disposal costs are carried in this estimate as a prudent business practice. Because of the legal status of the disposal responsibility, the GTCC disposal cost itself can be considered “contingency”. In addition, a relatively large contingency is carried forward and is probably redundant. If SMUD’s ability to demonstrate sufficient funding for Decommissioning was compromised, legal and technical grounds exist to remove this liability from the DCE, providing additional assurance that sufficient funding is available.

#### Transportation Methods

1. Contaminated materials resulting from remaining decommissioning activities will qualify under Title 49 of the Code of Federal Regulations Part 173 as LSA –I, –II, or –III, or SCO–I or –II.
2. Transportation of Class A LLRW is by truck or rail to EnergySolutions in Clive, UT. Class B & C LLRW transportation costs are modeled on the cost of transportation of that material by truck to the Barnwell facility, which, due to the distance from the Rancho Seco facility, is considered bounding. Transportation assumes a normal maximum road weight limit of 80,000 lbs. Cask shipments may exceed 95,000 pounds.

#### Low-Level Radioactive Waste Disposal

1. The majority of the LLRW generated during decommissioning has been disposed at EnergySolutions. Future disposal rates used in the estimate are based upon historical rates and potential future rate impacts based on over 10-years of historical trends. EnergySolutions considers contract disposal rates proprietary.
2. Waste not suitable for disposal at EnergySolutions (class B & C) is being stored in the IOSB until a suitable disposal facility becomes available. No facility currently exists that is available to SMUD for the disposal of this material, though the WCS facility in Andrews, Texas is licensed and expected to begin operations in 2012. Additionally, the EnergySolutions partnership “SeptraSafe” is licensed for processing resin which would ultimately be disposed at the EnergySolutions facility or the WCS facility as appropriate.
3. Available information on disposal rates is used as the model for waste not suitable for disposal at EnergySolutions. The basis for this cost model is proprietary information provided by both EnergySolutions and WCS, however the specific information provided is not included in this document to protect the information:

the cost basis in this estimate is conservative. Because specific information on disposal costs has become available, the uncertainty has been reduced and the contingency has been reduced accordingly: contingency is not included at 5% of the total disposal costs (shipping, contracted staff as well as disposal).

#### Estimating Basis

1. Future decommissioning costs are in general reported in the current year's currency regardless of the scheduled year of the expenditure; therefore, changes in schedule do not impact the cost estimate.
2. Remaining costs are based upon an estimate of the remaining activities including contract staff to perform the activities and other costs such as waste disposal.

#### Labor Costs

1. The craft labor required to complete decommissioning is obtained through standard SMUD contracting practices.
2. Future activities such as waste shipments and license termination activities will be performed by contracted staff.
3. Costs for stored waste oversight are based upon current salary information obtained through the current budget process, and estimates of future changes in SMUD overhead costs.
4. Engineering services for such items as writing activity specifications, detailed procedures, and work procedures are assumed to be performed by contracted staff.

#### General

1. Only the 1-acre facility encompassing the IOSB remains under the Part 50 license. The Class B & Class C waste will be stored in the IOSB through 2016.
2. The approximately 10-acre ISFSI remains under the Part 72 license. The used fuel will be completely transferred to the DOE by the end of 2027.
3. Phase I of the LTP is complete. Phase II of the LTP will be completed after the Class B & C waste is shipped for disposal. Completion of Phase II of the LTP will result in complete termination of the Part 50 license.
4. Equipment such as administrative equipment (desks, chairs, etc.), forklifts, trucks, other mobile equipment and items of personal property owned by SMUD will be

easily removed without the use of special equipment at no cost or credit to the project.

5. The decommissioning activities are performed in accordance with applicable regulations.
6. The principles of ALARA used in determining work duration adjustment factors are minimal for the remaining work scope, but remain an element in the cost estimate.
7. SMUD provides the electrical power required for the decommissioning project at no cost to the project.

## 10 CFR 50.75(C ) DETERMINATIONS

In order to comply with 10 CFR 50.75(c ), a determination must be made comparing this site-specific DCE with the NRC's generic DCE calculated in accordance with 50.75( c).

### 1986 Baseline Decommissioning Cost

Per 10 CFR 50.75( c)(1)(i), the 1986 Baseline Decommissioning Cost for a Pressurized Water Reactor (PWR) rated below 3,440 MWt is calculated as follows (millions of dollars):

$$$(75 + 0.0088P)$$

Where: P = power level in mega-watts thermal (MWt)

For Rancho Seco, rated at 2,773 MWt, the 1986 baseline cost is:

$$$(75 + 0.0088 \times 2773) = \$ 99.402 \text{ Million}$$

### Current 10 CFR 50.75( c) Decommissioning Cost Determination

To determine the current value of the Baseline Decommissioning Cost Estimate, the 1986 value is adjusted by the factor specified in 10 CFR 50.75( c)(2), which is:

$$0.65 L + 0.13 E + 0.22 B$$

Where: L = escalation factor for Labor, from US Department of Labor  
 E = escalation factor for Energy, from US Department of Labor  
 B = escalation factor for LLRW burial, from NUREG-1307

### Determination of Labor Escalation

The US Department of Labor last adjusted labor in 2005 establishing a new baseline value for L:

$$L_{2005} = 2.06$$

Utilizing the most recent Employment Cost Index information available from the Bureau of Labor Statistics (Q3 2011), the value of L is calculated as follows:

$$L = 2.06 \times 114.6 \div 100 = 2.36$$



### Determination of Energy Escalation

The energy escalation is calculated based on two factors, industrial electric power (P) and light fuel oil (F) based on the following equation for a PWR (from NUREG-1307, Rev. 14):

$$E = 0.58 \times P + 0.42 \times F$$

Both of the factors P and F are determined by a ratio of current Producer Price Index information (November 2011) to the January 1986 value. The current values are calculated as follows:

$$P = 205.1 \div 114.2 = 1.80$$

$$F = 323.7 \div 82.0 = 3.95$$

The resulting energy escalation factor is:

$$E = (0.58) \times (1.80) + (0.42) \times (3.95) = 2.70$$

### Determination of Burial Escalation

This value is taken directly from NUREG-1307, Rev. 14 Table 2.1 for "Direct Disposal with Vendors" with B = 12.280

### Current 10 CFR 50.75(c) Decommissioning Cost Calculation

The resulting 10 CFR 50.75(c) Decommission Cost is as follows (millions of dollars):

$$\$99.402 \times [(0.65) \times (2.36) + (0.13) \times (2.70) + (0.22) \times (12.280)] = \$455.963$$

### Comparison to Rancho Seco Decommissioning Cost Estimate

The current total cost estimate for Rancho Seco decommissioning is \$517.081 million, which exceeds the 10 CFR 50.75(c) required minimum of \$455.963 million.

## GLOSSARY INCLUDING ACRONYMS AND ABBREVIATIONS

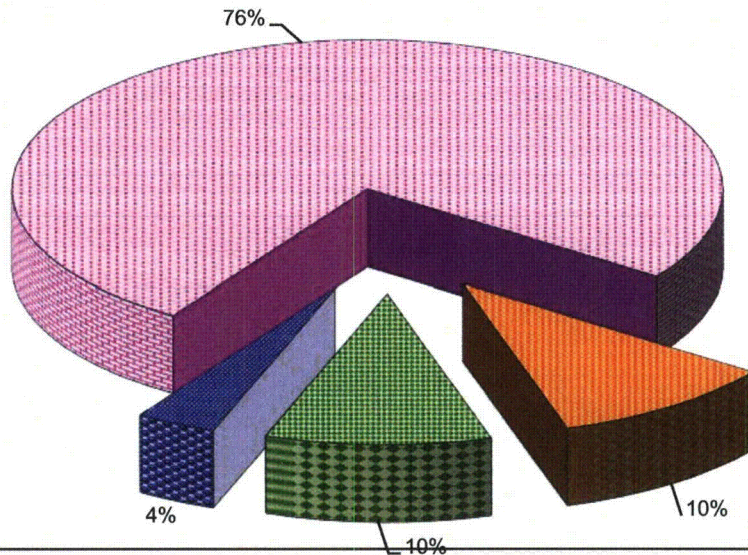
1. ALARA: As Low As Reasonably Achievable
2. Barnwell: The Barnwell, SC LLRW Disposal Facility
3. DOE: Department of Energy
4. Energy Solutions: EnergySolutions, Inc., formerly Envirocare of Utah, Inc. - headquartered in Salt Lake City that operates the LLRW disposal facility in Clive, UT and is a partner in "Sempra-Safe, LLC", a licensed resin processing technique in TN
5. GTCC: Greater Than Class "C" Waste - disposal of this waste is the responsibility of the DOE
6. IOSB: Interim Onsite Storage Building
7. ISFSI: Independent Spent Fuel Storage Installation
8. LLRW: Low Level Radioactive Waste
9. LTP: License Termination Plan
10. NRC: Nuclear Regulatory Commission
11. O & M: Operation and Maintenance
12. PWR: Pressurized Water Reactor
13. Part 50: Title 10 of the Code of Federal Regulations, Part 50 – regulations governing the former operating plant license now applicable to the IOSB
14. Rancho Seco: Used in reference to both facilities licensed by the NRC, Rancho Seco Nuclear Generating Station (Part 50) and Rancho Seco ISFSI (Part 72)
15. SMUD: Sacramento Municipal Utility District
16. TLG: TLG Services, Inc
17. Ward Valley: The proposed Ward Valley Low Level Waste Disposal Site in Needles, CA
18. WCS: Waste Control Specialist, Inc. - operates the LLRW disposal facility being constructed in Andrews, TX

## REFERENCES

1. "2010 Decommissioning Cost Estimate for the Rancho Seco Nuclear Generating Station", November 30, 2008, Rev 0
2. Rancho Seco Stored Waste Oversight cost basis, Post 2008 ARO Costs, 2003; ARO Response to Data Request and Assumptions, Attachment S11-1481-0302
3. Rancho Seco Part 72 License Termination cost basis, TLG Services, Inc "Independent Spent Fuel Storage Installation Decommissioning" Cost Summary, 2003; ARO Response to Data Request and Assumptions, Attachment S11-1481-0302
4. Rancho Seco Resin Disposal cost basis,
5. Rancho Seco Reactor Vessel Internals Disposal cost basis,
6. NUREG – 1307, Rev. 14, Report on Waste Burial Charges

**TABLE 1**  
**SUMMARY OF DECOMMISSIONING COST CONTRIBUTORS**

<b>Work Category</b>	<b>Cost in 2011\$ (2010 &amp; beyond)</b>	<b>Percent of Remaining Costs</b>
Stored Waste Oversight	1,087	4%
Future LLW Disposal	22,617	76%
GTCC Disposal	3,105	10%
Final License Termination Activities	3,069	10%
<b>Total</b>	<b>29,879</b>	<b>100%</b>



- Stored Waste Oversight
- Future LLW Disposal
- GTCC Disposal
- Final License Termination Activities

IT	Waste Disposal		Contract STAFF	CNTGCV	% CNTGCV	TOTAL	ACTUALS					2016	2017	
	SHIP	BURY					2010	2011	2012	2013	2014			2015
87						1,087	189	334	113	113	113	113	113	
	122	3,100	143	168	5%	3,534								3,534
	337	17,442	396	909	5%	19,084								19,084
	4	26	2,760	279	10%	3,069								3,069
87	463	20,568	3,299	1,356	5%	26,774	189	334	113	113	113	113	22,730	3,069
		2,388		716	30%	3,105								
87	463	22,955	3,299	2,072	7%	29,879			113	113	113	113	22,730	3,069
						487,139								
						63								
om Trust Fund						487,202								
						<b>517,081</b>								

total expected future Decommissioning Trust Fund withdrawals  
 includes all previously expended funds and estimated future costs