Application: 09-04-007
(U 39 E)
Exhibit No.: _____
Date: April 3, 2009
Witness: Various

PACIFIC GAS AND ELECTRIC COMPANY

2009 NUCLEAR DECOMMISSIONING COST TRIENNIAL PROCEEDING

PREPARED TESTIMONY

PACIFIC GAS AND ELECTRIC COMPANY
2009 NUCLEAR DECOMMISSIONING COST TRIENNIAL PROCEEDING

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PACIFIC GAS AND ELECTRIC COMPANY
2009 NUCLEAR DECOMMISSIONING COST
TRIENNIAL PROCEEDING
EXECUTIVE SUMMARY

In this Application, Pacific Gas and Electric Company (PG&E or the Company) provides an update of its Nuclear Decommissioning revenue requirement in compliance with the California Public Utilities Commission's (CPUC or Commission) 2005 Nuclear Decommissioning Cost Triennial Proceeding Decision 07-01-003. PG&E projects an overall revenue requirement increase associated with nuclear decommissioning activities of approximately $24 million per year from the 2009 approved revenue requirements.

PG&E proposes that the Commission:

- Authorize PG&E to collect through Commission-jurisdictional electric rates beginning in 2010, $9.218 million for Humboldt Unit 3 SAFSTOR, and to collect attrition of $204,000 beginning January 1, 2011, and an additional $209,000 beginning January 1, 2012;
- Authorize PG&E to collect through Commission-jurisdictional electric rates beginning in 2010, for a 3-year period, $16.982 million for the Humboldt Unit 3 Non-Qualified Nuclear Decommissioning Trust, or such other amount as shall be determined based on updated data to be provided in connection with this Application, and to adopt findings regarding its determination of revenue requirements, as appropriate, to allow PG&E to seek a ruling from the Internal Revenue Service (IRS) to allow maximum funding to the tax-qualified trusts;
- Authorize PG&E to collect through Commission-jurisdictional electric rates beginning in 2010, for a 3-year period, $23.329 million for the Diablo Canyon Units 1 and 2 Qualified Nuclear Decommissioning Trusts, or such other amount as shall be determined based on updated data to be provided in connection with this application and to adopt findings regarding its determination of revenue requirements, as appropriate, to allow PG&E to seek a ruling from the IRS to allow maximum funding to the tax-qualified trusts;

- Find that PG&E's cost estimates and resulting requested revenues are reasonable and in accordance with Sections 8321 through 8330 of the California Public Utilities Code;
- Find that PG&E's activities on completed decommissioning projects involving the Independent Spent Fuel Storage Installation were prudent and reasonable; and
- Approve PG&E's revenue requirement calculation and rate proposal for rates to become effective January 1, 2010.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 1

INTRODUCTION AND POLICY

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
INTRODUCTION AND POLICY

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
INTRODUCTION AND POLICY

A. Introduction

1. Scope and Purpose

In accordance with the Nuclear Facility Decommissioning Act of 1985 (Section 8321 et seq. of the California Public Utilities Code (Pub. Util. Code)),[1] and various California Public Utilities Commission (CPUC or Commission) decisions, Pacific Gas and Electric Company (PG&E or the Company) presents its 2009 Nuclear Decommissioning Cost Triennial Proceeding (NDCTP).

The purpose of the NDCTP is to provide a forum for the review of PG&E's updated Nuclear Decommissioning (ND) cost studies and ratepayer contribution analyses necessary to fully fund the ND master trusts to the level needed to decommission PG&E's nuclear plants. In Decision 98-03-050, the CPUC determined that funds for Humboldt Bay Power Plant Unit 3 (Humboldt Unit 3 or Humboldt) SAFSTOR Operations and Maintenance (O&M) costs should be reallocated from the Generation function to the ND function. Accordingly, the SAFSTOR O&M costs are included in this proceeding. Pursuant to policies adopted in previous NDCTP decisions, PG&E also demonstrates in this Application the reasonableness and prudence of completed early decommissioning activities at Humboldt Unit 3 since the last NDCTP.

2. Summary of Dollar Request

Based on the results of PG&E's recent analysis of the value of the ND trust assets and the expected liability to decommission the nuclear plants at some time in the future, PG&E seeks recovery for the period 2010 through 2012, through CPUC-jurisdictional rates, of:

- $16.982 million in revenue requirements relating to the Humboldt Unit 3 Non-qualified ND Trust;

[1] All code sections, unless otherwise indicated, refer to the Pub. Util. Code.

- $23.329 million in revenue requirements relating to the Diablo Canyon ND Trusts for Units 1 and 2; and
- $9.218 million in 2010 CPUC-jurisdictional revenue requirements for Humboldt Unit 3 SAFSTOR O&M expenses, and attrition associated with that amount in 2011 and 2012.

These individual elements sum to PG&E's total 2010 CPUC-jurisdictional revenue requirement for ND services of $49.528 million.

PG&E proposes that the revenue requirement associated with ND trust contributions and Humboldt Unit 3 SAFSTOR O&M costs continue to be collected through a non-bypassable charge as specified in Pub. Util. Code Section 379. The Nuclear Decommissioning Adjustment Mechanism, as authorized in Decision 99-10-057, will be used to record each separated revenue requirement and the associated billed revenues.

3. Support for Request

PG&E's request is presented in this testimony as follows:

Chapter 1 – Introduction and Policy: This chapter summarizes PG&E's request, provides the legislative and regulatory requirements for filing this Application, introduces the testimony, and explains the purpose of each of the subsequent chapters.

Chapter 2 – Humboldt Bay Power Plant Unit 3 – Nuclear Production Expenses: This chapter presents the 2010 nuclear O&M production direct expenses for Humboldt Unit 3 relating to SAFSTOR and explains how the expenses were developed. To avoid duplication and omissions of expenses and costs associated with such O&M, PG&E proposes to account for differences between forecast and actual expenses by making contributions to or withdrawals from the non-qualified decommissioning trust.

Chapter 3 – Diablo Canyon Power Plant Nuclear Decommissioning Expense: This chapter reviews the adequacy of the contributions to the decommissioning trust for Diablo Canyon and determines that for 2010 through 2012, the appropriate level of contributions is $10.939 million per year for Unit 1 and $12.077 million per year for Unit 2. These amounts are net of taxes and franchise fees and uncollectibles amounts, which are incorporated in Chapter 8.

Chapter 4 – Diablo Canyon Power Plant Nuclear Decommissioning Cost Study: This chapter presents the results of the 2009 site-specific ND cost study prepared by TLG Services, Inc., for the Diablo Canyon Power Plant Units 1 and 2 (Diablo Units 1 and 2). This testimony addresses the decommissioning alternatives evaluated, presents the cost and schedule estimates, and discusses current decommissioning regulatory guidance. The estimated cost of decommissioning Diablo Units 1 and 2 is incorporated into the analysis presented in Chapter 3.

Chapter 5 – Humboldt Bay Power Plant Unit 3 Nuclear Decommissioning Expense: This chapter reviews the adequacy of the contributions to the decommissioning trusts for Humboldt Unit 3 based on the expected decommissioning date of 2010, and determines that the appropriate level of contributions to the Humboldt Unit 3 trusts is $10.044 million per year for the years 2010 through 2012. These amounts are net of taxes and franchise fees and uncollectibles amounts, which are incorporated in Chapter 8.

Chapter 6 – Humboldt Bay Power Plant Unit 3 Nuclear Decommissioning Cost Study: This chapter presents the results of the 2009 site-specific ND cost study prepared by TLG Services, Inc., for Humboldt Unit 3. This testimony addresses the selected decommissioning alternative, presents the cost and schedule estimates, and discusses current decommissioning regulatory guidance. The estimated cost of decommissioning Humboldt Unit 3 is incorporated into the analysis presented in Chapter 5.

Chapter 7 – Humboldt Bay Power Plant Unit 3—Pre-Decommissioning Activities: This chapter demonstrates the reasonableness and prudence of projects related to the Independent Spent Fuel Storage Installation (ISFSI) that were authorized pursuant to various Commission Resolutions and that have been substantially completed as of the date of this Application. This chapter also discusses the status of other pre-decommissioning activities that are currently in process.

Chapter 8 – Nuclear Decommissioning Revenue Requirement Request: This chapter presents the expense and capital revenue requirements needed to support PG&E's ND and Humboldt Unit 3 SAFSTOR services

during the period 2010 through 2012. These revenue requirements are based on costs presented in Chapters 2, 3, and 5 of this Application. PG&E requests a total of $49.528 million in revenue requirement recovery through CPUC-jurisdictional rates in 2010, and associated attrition in 2011 and 2012.

4. Organization of the Remainder of This Chapter

The remainder of this chapter is organized as follows:

- Section B – Legislative and Regulatory Background;
- Section C – Continued Pursuit of Pre-Decommissioning of Humboldt Unit 3;
- Section D – Low Level Radioactive Waste (LLRW) Disposal Site Issues;
- Section E – Status for Federal Repository for Spent Nuclear Fuel;
- Section F – Statement of Financial Accounting Standard (SFAS) 143; and
- Section G – Conclusion.

B. Legislative and Regulatory Background

Section 8326 of the Pub. Util. Code requires that electrical utilities owning, in whole or in part, or operating a nuclear facility in California, periodically revise their ND cost estimate studies. These updated studies are to ensure that the decommissioning cost estimates take into account changes in technology and regulation of ND, the operating experience of each nuclear facility, and the changes in the general economy. The expenses associated with decommissioning nuclear facilities are to be paid with funds established pursuant to Section 8325. To the extent the monies available for decommissioning are insufficient to pay for all reasonable and prudent decommissioning costs, the Commission must authorize the electric utility to collect these charges from its customers.

In Decision 95-07-055, the Commission established investment guidelines for the ND trust funds and reporting requirements for determining those costs. One of those requirements is that engineering cost studies and ratepayer contribution analyses continue to be performed every three years. In Decision 95-12-055 (PG&E's 1995 General Rate Case (GRC)), the Commission determined PG&E trust funding and addressed the tension between ensuring

adequate funding of the trusts and avoiding over-funding at the expense of current customers:

> We retain our concern that nuclear decommissioning funds be adequate to cover future decommissioning costs, consistent with the legislative policy enunciated in the Nuclear Power Retirement Act of 1985. We are mindful, however, that today's forecasts of nuclear decommissioning costs occurring 10 to 20 years in the future are very speculative. Forecasts of economic activity and costs out that far into the future are always subject to substantial error. In the case of nuclear decommissioning costs, forecasts are likely to be even more speculative because of the nation's limited experience with such activity. Therefore, we would be fooling ourselves if we believed we could forecast those costs with any precision. Our goal is to have funds on hand that appear reasonably adequate. Moreover, in our efforts to protect future ratepayers from costs incurred by today's ratepayers we do not wish to impose costs on today's ratepayers which, if funding exceeds future costs, would represent a windfall to future ratepayers.[2]
>
> In setting an annual nuclear decommissioning revenue requirement, our objective is to provide some insurance against a circumstance which would require significant rate increases in the future to retire plant that has served an earlier generation of users.[3]

In Decision 00-02-046 (PG&E's 1999 GRC), at page 372, the Commission reiterated these principles for the purpose of determining trust funding.

In Decision 96-12-088, the Commission determined that in the absence of GRCs, the NDCTP would establish the annual revenue requirement for ND expense over a three year period. A subsequent Commission decision determined that PG&E should file applications for decommissioning in the NDCTP every three years, even though GRCs continued to determine utility rates.[4]

PG&E filed its first NDCTP Application on March 15, 2002. Joint hearings were held on common issues with Southern California Edison (SCE) and San Diego Gas & Electric Company (SDG&E), although the proceedings were not consolidated. The Commission issued a decision in PG&E's first NDCTP on October 2, 2003 (D.03-10-014).

After receiving an extension to file their next NDCTP, the three California utilities again filed applications relating to decommissioning costs on November 10, 2005. In response, the Assigned Commissioner's scoping ruling

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[2] Decision 95-12-055, 63 CPUC 2d 570, 612.

[3] *Id.*, 613.

[4] Decision 05-05-028.

concluded that the applications of all three utilities should now be consolidated, rather than merely being coordinated.

The resulting consolidated Commission NDCTP decision (Decision 07-01-003) reached several significant findings that are addressed in this Application. First, in response to an intervenor recommendation for the appointment of an independent oversight committee for Humboldt Unit 3 decommissioning, the Commission concluded that such a committee would interfere with PG&E's obligation to efficiently and reasonably manage the decommissioning process.[5] Instead, the Commission ordered each utility, in the context of showing that they had acted in a reasonable and prudent manner, to show that they had made all reasonable efforts to retain and utilize sufficient qualified and experienced personnel to effectively, safely, and efficiently pursue physical decommissioning activities.[6] Second, as part of its Decision, the Commission also ordered the utilities to demonstrate that they had conservatively forecast Low Level Radioactive Waste (LLRW) storage costs and had conservatively established an appropriate decommissioning cost contingency factor.[7]

C. Continued Pursuit of Early Decommissioning of Humboldt Unit 3

1. Background

In Decision 00-02-046, at pages 385-387, the CPUC found it reasonable for PG&E to take steps towards the early decommissioning of Humboldt Unit 3 and approved PG&E's request for authorization to spend up to $7 million from the Humboldt Unit 3 trusts to explore the licensing and permitting of a dry cask storage facility, which is an integral part of PG&E's early decommissioning alternative. In Decision 03-10-014, the Commission concluded: "PG&E recommended early decommissioning of Humboldt should be adopted." PG&E has commenced early decommissioning activities at Humboldt in accordance with Commission directives.

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[5] Finding of Fact 6, mimeo, p. 29.

[6] Ordering Paragraph (OP) 6, mimeo, p. 32.

[7] OP 7 and OP 8, mimeo, pp. 32-33.

The subsequent advice letters authorizing funding for the ISFSI project—a pre-requisite for initiating early decommissioning—are further described in Chapter 7. Approvals for other pre-decommissioning projects are also described in Chapter 7.

2. Pre-Decommissioning Activities at Humboldt Unit 3

As set forth in Chapter 7, PG&E has successfully completed activities associated with the licensing, design, fabrication, and construction of the ISFSI, and related fuel loading and decommissioning. Chapter 7 also addresses a series of pre-decommissioning activities that are currently underway. PG&E is requesting reasonableness review of the completed activities associated with the ISFSI.

3. Advice Filing for Interim Disbursements Beginning in 2009

In compliance with Section 2.01.7 of the decommissioning trust, as amended, PG&E has made an advice filing for CPUC approval of the estimated cost and schedule for decommissioning, one year prior to the time of decommissioning.

D. LLRW Disposal Site Issues

In Decision 07-01-003 (mimeo, at p. 27), the Commission stated:

> For the next proceeding, we direct all parties to conduct a thorough and complete research and analysis, and then err on the conservative (high estimate) side, when forecasting waste storage costs. This finding is applicable to all three utilities. If there is no more certainty regarding western utilities' storage options during the next triennial review, then we expect parties to conservatively estimate low level waste storage costs. The parties may also make any additional recommendations on the appropriate allowance for waste storage costs.

PG&E, SCE and SDG&E retained a consultant to fulfill this Commission objective and his study of low level burial issues is provided in workpapers to Chapter 3. The cost estimates resulting from the study, and the impact of these costs on decommissioning trust funding, are incorporated into the review of requested trust funding for Diablo Canyon and Humboldt Unit 3 in Chapters 3 and 5, respectively.

E. Status of Federal Repository for Spent Nuclear Fuel

The U.S. Department of Energy (DOE) is responsible, under the Nuclear Waste Policy Act of 1982 (NWPA), for the disposal of spent nuclear fuel created

by commercial nuclear generating plants. The target date for startup of the federal Waste Management System under the NWPA was originally 1998. However, due to a series of delays, the DOE currently has no plans to accept any spent nuclear fuel from commercial U.S. reactors before 2020.

F. SFAS 143

In June 2001, the Financial Accounting Standards Board issued a new standard on Accounting for Asset Retirement Obligations (SFAS 143). SFAS 143 establishes consistent standards among utilities and across industries. Companies with a legal obligation to retire a tangible, long-lived asset, such as a nuclear power plant, will account for these costs as a liability in financial statements. PG&E has been following this accounting practice since 2003.

G. Conclusion

As described above and in the subsequent chapters, PG&E requests that the CPUC authorize PG&E to collect through CPUC-jurisdictional electric rates $49.528 million for ND services in 2010 through 2012, as well as attrition of $204,000 and an additional $209,000, for 2011 and 2012, respectively, with such amounts to be updated as described in the following chapters. The CPUC should find that the decommissioning cost estimates and associated trust contribution analyses are reasonable and present the most up-to-date information on the potential cost to decommission Diablo Canyon and Humboldt Unit 3.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 2

HUMBOLDT BAY POWER PLANT UNIT 3 – NUCLEAR PRODUCTION EXPENSES

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
HUMBOLDT BAY POWER PLANT UNIT 3 –
NUCLEAR PRODUCTION EXPENSES

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
HUMBOLDT BAY POWER PLANT UNIT 3 – NUCLEAR PRODUCTION EXPENSES

A. Introduction

1. Scope and Purpose

The purpose of this chapter is to present the nuclear Operations and Maintenance (O&M) production expenses for Pacific Gas and Electric Company's (PG&E or the Company) Humboldt Bay Power Plant Unit 3 (Humboldt Unit 3 or Humboldt). O&M expenses include costs associated with activities needed to maintain Humboldt in accordance with the terms of its license and applicable Nuclear Regulatory Commission (NRC) requirements. Current NRC license requirements include maintaining the radioactive material at Humboldt in a Safe Storage (SAFSTOR) configuration. A more detailed discussion is provided in Section A.3 below. PG&E's other nuclear power production expenses, i.e., those associated with Diablo Canyon Power Plant, are not included in this Application.

Beginning in 2010, PG&E proposes to track its actual SAFSTOR expenses and make a "true-up" contribution to, or withdrawal from, the decommissioning trusts, based on whether the amount collected in rates is greater than or less than the expenses actually incurred. This reflects the fact that PG&E will be commencing a more robust phase of decommissioning during this Nuclear Decommissioning Cost Triennial Proceeding (NDCTP) cycle, and personnel who perform SAFSTOR O&M will also perform substantial decommissioning tasks. Using the true-up procedure described above will avoid rate recovery duplications or omissions merely because of the way in which PG&E personnel account for and spend their time. If these individuals end up spending more time on decommissioning than on SAFSTOR, customers will be held harmless through an additional contribution by PG&E to the trust. Conversely, if these individuals actually spend more time on SAFSTOR than anticipated, PG&E will not suffer a shortfall merely because additional SAFSTOR activities are required in connection with decommissioning. Under this proposal, PG&E

would agree to be subject to reasonableness review to the extent that SAFSTOR O&M exceeded estimates.

2. Summary of Dollar Request

PG&E requests that the California Public Utilities Commission (CPUC or Commission) adopt its 2010 forecast of $5.698 million of O&M expenses for Humboldt. The 2010 O&M expense forecast is a decrease from the 2008 recorded adjusted base year. This decrease reflects the fact that spent nuclear fuel is no longer contained within the spent fuel pool. In addition, PG&E requests the Commission adopt its O&M expense forecasts of $5.874 million and $6.054 million for the 2011 and 2012 attrition years, respectively. O&M expense forecasts are stated in current year (or nominal) SAP dollars. SAP dollars include certain labor-driven adders such as employee benefits and payroll taxes. Please note that the SAFSTOR O&M expenses discussed in this chapter are converted into a 2010-2012 revenue requirement in Chapter 8.

3. Support for Request

The O&M expenses for Humboldt are those associated with activities needed to maintain this facility in accordance with the terms of its license and applicable NRC requirements. PG&E's current NRC Part 50 license lists specific requirements for maintaining the radioactive material at Humboldt (other than the spent fuel that is now maintained in the Independent Spent Fuel Storage Installation (ISFSI)) in a SAFSTOR configuration. PG&E has incurred and recovered these expenses in the past and will continue to incur these costs in the future.

The SAFSTOR licensing requirements include routine and specific radiological surveys, training and qualification of radiation protection technicians and professionals, instrumentation calibration and repair, routine reports to the NRC, maintenance of the Radiological Effluent and Radiological Environmental Monitoring Programs, routine radiation exposure monitoring and analysis, and implementation of a radiation safety program to comply with Title 10 Code of Federal Regulations (CFR) Part 20 regulations and applicable NRC guidance documents. In addition, the current Part 50 license requires PG&E to comply with the Environmental

Protection Agency 40 CFR and Department of Transportation 49 CFR requirements. These requirements will continue until the Part 50 license is released by the NRC, and are separate and distinct from decommissioning activities.

There are also a number of structures, systems, and components that need to be maintained operational until liquid radwaste processing is no longer necessary. While the spent nuclear fuel has been removed from the pool, other radioactive material remains in the pool, requiring continue operation of these systems. Similarly, Humboldt must ensure containment of particulate matter within the buildings that house contaminated items. Humboldt is required to maintain negative ventilation to ensure that there is sufficient suction within these structures to confine any radioactive particulates. Humboldt is also required to maintain the systems that monitor and treat liquid and airborne effluent streams, as well as maintain the spent fuel pool level and liner gap monitoring systems until the reactor vessel is removed. This is to sustain a location for safely handling the highly contaminated items found in the reactor vessel.

PG&E developed its forecast of 2010 O&M expenses using reasonable assumptions, based on past experience and anticipated future activities, applying the same methodology used in the last NDCTP. The forecasted expenses for 2010 also include specific projects to address replacement of obsolete equipment. The 2010 planned expenses will continue investment in required SAFSTOR instrumentation and test equipment, and ensure continued activities needed to maintain Humboldt in accordance with the terms of its license and applicable NRC requirements. They represent a decrease from prior levels of SAFSTOR expense, as further described in Section D, below.

4. Organization of the Remainder of This Chapter

The remainder of this chapter is organized as follows:

- Section B – Background;
- Section C – Methodology;
- Section D – Significant Events Affecting Recorded and Estimated Expenses;

- Section E – Conclusion; and
- Section F – Tables.

B. Background

1. Description of O&M Expenses

In 1988, PG&E completed the first step in the decommissioning of Humboldt. That step involved placing the unit into a custodial mode of decommissioning defined by the NRC as SAFSTOR. SAFSTOR is a condition of monitored safe storage in which the unit will be maintained until the final dismantlement of the facility can be accomplished. PG&E expects the facility to remain in SAFSTOR until the Part 50 license is terminated in 2016.

The O&M expenses for Humboldt are for those activities that are required to meet the conditions of its modified license and to maintain the unit during this SAFSTOR period. These O&M expenses include the cost of operations, maintenance, radiation protection, and surveillance activities. Environmental monitoring costs associated with collecting samples and analyzing them in accordance with NRC license requirements are also included in these costs. The removal of spent fuel from the pool has lowered overall SAFSTOR costs.

Estimated costs for the final dismantlement of the unit are addressed in Chapters 5 and 6 of this Application, and are not included in costs reflected in this chapter.

2. Description of Decommissioning Costs

Decommissioning costs are those expenses incurred to remove equipment, structures, and portions of a facility and site containing radioactive contaminants. These equipment and structures are removed or decontaminated to a level that permits the property to be released for industrial use, as described in Chapters 4 and 6 of this Application. PG&E has established unique order numbers to track costs associated with the decommissioning of the Humboldt Unit 3 facilities. Decommissioning costs are not included in the costs reflected in this chapter.

C. Methodology

Forecasted Humboldt Unit 3 SAFSTOR expenses for 2010 through 2012 were derived by first establishing a base estimate. To determine the base estimate, all SAP planning orders that accrue to Humboldt were reviewed. PG&E's program managers manage their program costs using the SAP view of cost information. The SAP view uses a standard-cost format that expresses labor expense with benefits and payroll taxes included. For presentation of expenses by Federal Energy Regulatory Commission (FERC) accounting, SAP dollars must by translated to FERC dollars by categorizing employee benefits and payroll to separate FERC accounts. Tables 2-1 and 2-2 show how these SAP dollars translate to the appropriate FERC accounts in current year dollars (or nominal) and recorded adjusted base year dollars (2008 dollars).

Historical and current spending in SAP planning orders were analyzed. The last year of recorded data, i.e., 2008, was used. This base estimate was then adjusted for 2009 for specific programs or activities and escalated to test-year 2010. The estimated SAFSTOR O&M expenses for 2010 through 2012 are calculated by applying escalation rates provided by Global Insight, as described in Chapter 8.

D. Significant Events Affecting Recorded and Estimated Expenses

On December 11, 2008, the last cask of nuclear fuel was placed in the ISFSI. PG&E's forecast of SAFSTOR O&M has been reduced, accordingly, because PG&E is no longer required to perform testing, security, and other activities associated with nuclear fuel that had been required as part of PG&E's SAFSTOR license, because of the presence of spent nuclear fuel in the Humboldt storage pool. More limited testing and associated security are now incurred as part of the separate ISFSI license, which is being forecasted and recovered as part of overall decommissioning costs from the Humboldt decommissioning trusts.

E. Conclusion

In order to perform the activities needed to maintain Humboldt in accordance with the terms of its license and applicable NRC requirements, PG&E asks that the Commission adopt: (1) its Humboldt Unit 3 O&M expense forecast request, stated in SAP dollars, of $5.698 million for the 2010 test year,

and $5.874 million and $6.054 million for the 2011 and 2012 attrition years; respectively, and (2) its proposed "true-up" procedure described herein to avoid having duplications or omissions of rate recovery with respect to decommissioning costs and SAFSTOR expenses.

F. Tables

TABLE 2-1
PACIFIC GAS AND ELECTRIC COMPANY
2009 NUCLEAR DECOMMISSIONING COST TRIENNIAL PROCEEDING
HUMBOLDT SAFSTOR - OPERATIONS AND MAINTENANCE EXPENSES
(THOUSANDS OF NOMINAL SAP DOLLARS)

Line No.	FERC Acct.	Description	2008 Recorded Adjusted	2009 Forecast	2010 Forecast	2011 Forecast	2012 Forecast
1	524/532(a)	Total O&M Expenses	$9,183	$5,526	$5,698	$5,874	$6,054

(a) These dollars are stated in SAP dollars. SAP dollars include certain labor-driven adders such as employee benefits and payroll taxes that are charged to separate FERC accounts.

TABLE 2-2
PACIFIC GAS AND ELECTRIC COMPANY
2009 NUCLEAR DECOMMISSIONING COST TRIENNIAL PROCEEDING
HUMBOLDT SAFSTOR - OPERATIONS AND MAINTENANCE EXPENSES TRANSLATION BETWEEN SAP AND FERC ACCOUNT VIEWS(a)

Line No.	FERC Acct.	Description	2008 Recorded Adjusted	2009 Forecast	2010 Forecast	2011 Forecast	2012 Forecast
		(Thousands of Nominal Dollars)					
1	524	Misc. Nuclear Power Expenses	$7,840	$4,747	$4,895	$5,046	$5,201
2	532	Maint. of Misc. Nuclear Plant	4	0	0	0	0
3		FERC Subtotal	$7,844	$4,747	$4,895	$5,046	$5,201
4	408	Payroll Taxes	431	581	599	617	636
5	926	Pensions and Benefits	908	198	204	210	217
6		Total O&M Expenses - SAP View	$9,183	$5,526	$5,698	$5,874	$6,054
		(Thousands of 2008 Dollars)					
7	524	Misc. Nuclear Power Expenses	$7,840	$4,591	$4,600	$4,604	$4,606
8	532	Maint. of Misc. Nuclear Plant	4	0	0	0	0
9		FERC Subtotal	$7,844	$4,591	$4,600	$4,604	$4,606
10	408	Payroll Taxes	431	560	556	553	549
11	926	Pensions and Benefits	908	191	189	188	187
12		Total O&M Expenses - SAP View	$9,183	$5,342	$5,346	$5,346	$5,342

(a) These dollars are stated in SAP dollars. SAP dollars include certain labor-driven adders such as employee benefits and payroll taxes that are charged to separate FERC accounts.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3

DIABLO CANYON POWER PLANT

NUCLEAR DECOMMISSIONING EXPENSE

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 3
DIABLO CANYON POWER PLANT
NUCLEAR DECOMMISSIONING EXPENSE

A. Introduction

1. Scope and Purpose

The purpose of this chapter is to review the adequacy of the contributions[1] to the decommissioning funds for the Diablo Canyon Power Plants (Diablo Units 1 and 2 or Diablo Canyon) pursuant to California Public Utilities Code (Pub. Util. Code) Sections 8325, 8326 and 8327. This review examines the decommissioning costs estimate in order to ensure that the estimate takes into account the changes in the technology and regulation of decommissioning, the operating experience of each nuclear facility, and the changes in the general economy.[2] This requires a comparison of the current level of decommissioning contributions with an updated decommissioning cost study, using, where applicable, updated estimates of decommissioning technology, regulations, costs, escalation rates and rates of return of the decommissioning fund assets.

2. Summary of Dollar Request

After review of the expected costs to decommission Diablo Units 1 and 2, addressed in Chapter 4 of this Application, and the expected value of the decommissioning trust fund assets at the time of decommissioning, Pacific Gas and Electric Company (PG&E or the Company) concludes that the appropriate level of annual contribution to the Diablo Canyon Qualified Fund is $10.939 million for Diablo Unit 1 and $12.077 million for

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[1] PG&E makes contributions to decommissioning funds. The contributions are an expense to PG&E. Thus, “contributions” are referred to as “decommissioning expense.” However, the term decommissioning expense may also refer to the costs actually incurred when decommissioning activities are underway. In this chapter, the term decommissioning expense refers to the annual contributions to the decommissioning funds.

[2] California Pub. Util. Code, Section 8327.

Diablo Unit 2 for 2010, 2011 and 2012. The summary results of this analysis are shown in Table 3-1.

3. Use of Assumptions and Methodology Adopted in Decision 07-01-003

As discussed in Section C below, the California Public Utilities Commission (CPUC or Commission) in prior Nuclear Decommissioning Cost Triennial Proceedings (NDCTP) resolved various matters relating to decommissioning funding. Those findings and conclusions generally continue to apply to this NDCTP, although certain matters (e.g., contingency and burial costs) have been addressed again at the Commission's request.

4. Support for Request

As explained in this chapter, the revenue requirement for the 2010 through 2012 Diablo Units 1 and 2 Qualified Fund contributions are derived from an updated decommissioning study, set forth in Chapter 4, and complies with the Nuclear Decommissioning Act of 1985 (Act) and Commission precedent.

5. Organization of the Remainder of This Chapter

- Section B – Background;
- Section C – Estimating Methodology;
- Section D – Internal Revenue Service (IRS) Ruling Amounts;
- Section E – Conclusion; and
- Section F – Tables.

B. Background

In the Act, the California Legislature declared that it is "in the best interests of all citizens of California that the costs of electricity generated by nuclear facilities be fairly distributed among present and future California electric customers so that all customers are charged only for costs that are reasonably and prudently incurred."[3] The Act further declared, "the State of California should establish a comprehensive framework for timely payments of the costs of

[3] California Pub. Util. Code, Section 8322(b).

decommissioning, and provide for allocation of risks and costs among the respective interests."[4] In establishing a statewide policy respecting the economic aspects of decommissioning, the Act states that a principal consideration is "assuring that the funds required for decommissioning are available at the time and in the amount required for protection of the public."[5]

1. Tax Matters

PG&E is required by California Pub. Util. Code Section 8325 to establish an "externally managed, segregated fund…which qualifies for a tax deduction pursuant to Section 468A of the United States Internal Revenue Code" or "other funds, as appropriate, for payment of decommissioning costs of nuclear facilities."

IRC, Section 468A allows contributions to a Nuclear Decommissioning Reserve Fund (a qualified fund) to be deducted from income in the year the contribution is made, provided a taxpayer receives a Schedule of Ruling Amounts (SRA) from the IRS. Thus, revenues collected to make contributions to these qualified funds are not subject to corporate income taxes; however, the Qualified Fund itself is a separate legal entity (see Section 2 below) and is taxed on its investment earnings. Currently, the Qualified Fund is taxed at a 20 percent tax rate which is lower than the maximum corporate federal income tax rate.[6] When distributions are made from a qualified fund, assets of the trust must be liquidated and tax paid on the gains. The cash obtained from these sales is then distributed to pay the cost of decommissioning. The amounts distributed from the Qualified Fund are included in PG&E's taxable income and offset by a corresponding deduction for the nuclear decommissioning costs incurred during the year. The result is that PG&E does not receive a tax benefit in the year cash is distributed from the Qualified Fund. Rather, PG&E's tax benefit is in the year the contribution is made to the Qualified Fund.

Qualified funds have been established for both of the Diablo Canyon units.

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[4] California Pub. Util. Code, Section 8322(e).

[5] California Pub. Util. Code, Section 8322(f)(1).

[6] IRC, Section 468A(e)(2)(B)(i).

2. Types of Trusts

As discussed above, the qualified funds are a separate legal entity. The CPUC jurisdictional funds are organized under two "master" trusts:

A. CPUC Qualified Trust:

- Diablo Unit 1;
- Diablo Unit 2; and
- Humboldt Unit 3.

B. CPUC Non-Qualified Trust:

- Humboldt Unit 3.

The Humboldt Unit 3 decommissioning trusts are addressed in Chapter 5.

3. Status of Trust Funding

The market value of the Diablo Units 1 and 2 decommissioning trust funds as of December 31, 2008, were approximately $612.45 million and $843.57 million, respectively.[7] The estimated cost of decommissioning Diablo Unit 1 in 2008 dollars is $771.15 million. The estimated cost of decommissioning Diablo Unit 2 in 2008 dollars is $1,057.20 million. The estimated cost in future dollars of decommissioning Diablo Unit 1 is $1.701 billion.[8] The estimated cost in future dollars of decommissioning Diablo Unit 2 is $2.345 billion.[9] These estimated costs of decommissioning Diablo Units 1 and 2 for both current and future dollars include the contingencies discussed below.

C. Estimating Methodology

The estimate of Diablo Canyon decommissioning costs has been prepared by TLG Services, Incorporated (TLG) and is presented in Chapter 4 of this Application. The cost estimate in Chapter 4 assuming the DECON, as opposed

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[7] The liquidated value of Diablo Unit 1 was $571.63 million at December 31, 2008. The liquidated value of Diablo Unit 2 was $782.08 million at December 31, 2008.

[8] The estimated decommissioning period for Diablo Unit 1 begins in 2024 and extends through 2052.

[9] The estimated decommissioning period for Diablo Unit 2 begins in 2025 and extends through 2052.

to the SAFSTOR or ENTOMB, method of decommissioning is used for purposes of determining the contribution amounts under this chapter. DECON is defined by the U.S. Nuclear Regulatory Commission (NRC) as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contamination are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."[10] The DECON alternative results in removal of the Diablo Canyon units more quickly. The DECON method is consistent with the method proposed in the 2005 NDCTP Application. This method was unopposed. It should be noted that the TLG study does not address the cost for the removal of spent fuel from the site because such costs are assumed to be covered through PG&E's contract with the U. S. Department of Energy.

The decommissioning costs are presented in five categories: PG&E labor, equipment and materials, contract labor, process and burial, and other, where "other" can include: engineering and decommissioning preparations (*e.g.*, planning for permanent defueling of the reactor, preparation and filing of a Post-Shutdown Decommissioning Activities Report with the NRC, shutdown preparation), property tax, insurance premiums, low-level radioactive waste recycling costs, and plant energy costs. Escalation factors are applied to these costs to arrive at the forecasted nominal dollar decommissioning costs in the years in which those costs are estimated to occur. The yearly costs are translated into a required fund balance at the end of the funding period. For Diablo Canyon, the funding period ends on the last day of commercial operation for each unit, assumed to be September 22, 2024, for Diablo Unit 1 and April 26, 2025, for Diablo Unit 2. Annual contributions to the funds are calculated such that the estimated end-of-year 2008 liquidated values of the fund plus annual contributions and earnings on the funds less associated tax liabilities on those earnings will equal required fund balances at the end of the respective funding periods.

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[10] U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72 "General Requirements for Decommissioning Nuclear Facilities," NRC, Federal Register Volume 53, Number 123, age 24022, Column 3, June 27, 1988.

There are five major assumptions used in calculating the cash flow estimates:

- Low-Level Radioactive Waste (LLRW) burial cost;
- Contingency factor;
- Escalation rates;
- Equity turnover percentages; and
- Estimated rates of return on the invested funds.

1. Low-Level Radioactive Waste Burial Rate Assumptions

In Decision 07-01-003, the Commission ordered PG&E, Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E) (collectively the utilities), to conservatively determine LLRW base disposal rates for use in connection with nuclear decommissioning proceedings before the Commission. PG&E, SCE and SDG&E retained a consultant to fulfill this Commission objective and his study of low level burial issues, the 2009 LLRW Cost Study (2009 LLRW Study) is provided in the workpapers to this chapter.

The 2009 LLRW Study reflects the general effects of inflation and cost escalation over the three years since the 2005 study was prepared. The 2009 LLRW Study benefited from experience gained from fieldwork in actual decommissioning programs and from plant-related decommissioning activities, such as plant outages, retrofits, and change-out programs. The 2009 LLRW Study uses the most current information available regarding the cost of decommissioning.

The 2009 LLRW Study also incorporates new cost projections for Class A, B, and C LLRW disposal. The EnergySolutions' facility is used as the disposal site for the majority of the radioactive waste (Class A). This waste is disposed of at a rate of $62 per cubic foot for "Bulk" waste, and a rate of $252 per cubic foot for "General" waste. These rates include state of Utah taxes and Southwest Compact fees. There are no currently operating disposal facilities available to PG&E that have a license to dispose of the more highly radioactive waste (Classes B and C), for example, generated in the dismantling of the reactor vessel. As such, waste disposal costs and

waste transportation distances were estimated. For purposes of estimating the Class B and C waste transportation costs, it was assumed that this waste was shipped to Andrews County, Texas. The cost for disposal for Class B and C waste is $2,916 per cubic foot. This rate includes Southwest Compact fees. The 2009 LLRW Study was conducted to reflect the Commission's desire to conservatively estimate nuclear decommissioning LLRW disposal rates.

2. Contingency Assumptions

Contingency has been added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude. This type of contingency is consistent with "Contingencies" as defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook," which defines it as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, this cost analysis includes contingencies to cover these types of expenses.

The total amount of contingency that has been included is consistent with the "Technical Position Paper for Establishing an Appropriate Contingency Factor for Inclusion in the Decommissioning Revenue Requirements" provided in workpapers to Chapter 4. This paper's objective was to identify contingency that would "demonstrate that they [owners of California nuclear power plants] have made all reasonable efforts to conservatively establish an appropriate contingency factor for inclusion in the decommissioning revenue requirements."

Contingency was estimated on a line item basis consistent with values extracted from the AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates." The composite contingency value for the DECON alternative is approximately 17.9 percent. The value for the SAFSTOR alternative is approximately 17.5 percent. Based on the previously referenced technical position paper, additional

contingency was added to reflect an overall project contingency of 25 percent (both scenarios). This contingency was incorporated on a line item basis, with each line item receiving a pro-rated share of the increase. PG&E proposes the use of a 25 percent contingency factor (as discussed in Chapter 4), which is less than the authorized overall contingency factor of 35 percent for Diablo Units 1 and 2 approved in Decision 07-01-003. The use of this level of contingency accommodates the increasingly uncertain regulatory and business environment in which Diablo Canyon Power Plant operates.

With the 25 percent contingency factor, the decommissioning costs stated in 2008 dollars are approximately $771.15 million for Diablo Unit 1 and $1,057.20 million for Diablo Unit 2.

3. Escalation Assumptions

Escalation factors for the decommissioning period are provided by Global Insight as of September 2008 or developed by PG&E, as described below. Details regarding the data series used in the forecast period are found in Table 3-2. These forecasted escalation rates are used to restate the current estimate of decommissioning costs in 2008 dollars to the future years in which the costs will be incurred.

Consistent with the prior NDCTP, the escalation rate for materials is a composite of the forecasted rates of change for several Producer Price Indices: chemicals and allied products, machinery and equipment, construction machinery and equipment, general machinery and equipment, electric machinery and equipment, industrial commodities, and transportation equipment. Global Insight provides the forecasts for these series. The rates of change are then averaged to yield the overall escalation rate for materials. Likewise, an escalation rate for contract labor is a composite of the forecasted rates of change for several series provided by Global Insight. The escalation rate for PG&E labor is based on current PG&E union contracts.

The escalation rates for “other” are the forecasted changes in the Consumer Price Index from the Global Insight forecast.

Decision 03-10-014 Conclusion of Law 12 states that, “in determining escalation rates…the Commission should require the use of a weighted

average." As such, PG&E calculates a weighted average escalation rate based on the four escalation rates presented above and applies this rate to the decommissioning costs for PG&E labor, equipment and materials, contractor labor and other.

Decision 03-10-014 further states that "except for LLRW burial costs we will require the use of a weighted average."[11] For this reason, PG&E does not include LLRW process and burial escalation or costs in its weighted average calculation.

In the 1999 General Rate Case and 2002 and 2005 NDCTP decisions, the Commission adopted and therefore deemed reasonable, a LLRW burial escalation rate of 7.5 percent. PG&E proposes the continued use of this rate. It is PG&E's position that this rate is necessary to ensure the necessary funds for the disposal of LLRW. Under NRC regulations, it is assumed that LLRW generated during plant operations is disposed of using operating funds.[12] Currently, NUREG-1307, Rev. 13 assumes that for plants that have no disposal site available for [LLRW] (*e.g.*, plants not located within the Atlantic and Northwest Compacts), the cost for disposal is the same as that provided for the Atlantic company, for lack of a better alternative.[13] NUREG-1307, Rev. 13 further provides that when new disposal facilities become available, disposal rates will likely be significantly higher, therefore, "licensees may want to set aside additional decommissioning trust funds in order to avoid significant future shortfalls in funding and potential enforcement actions."[14] Therefore, PG&E believes that the use of a 7.5 percent burial escalation rate is appropriate and necessary to ensure adequate disposal of LLRW.

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[11] D.03-10-014, p. 27.

[12] United States Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 13, Abstract, p. iii. November 2008.

[13] United States Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 13, Abstract, p. iii. November 2008.

[14] United States Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 13, Abstract, p. iii. November 2008.

4. Equity Turnover Percentages

In Decision 07-01-003, the Commission found it reasonable to calculate the annual equity turnover rates by averaging the equity turnover rates from 1999 through 2006. Consistent with the methodology used to calculate the adopted rates in the 2005 NDCTP decision, PG&E again averages recorded equity turnover rates for the qualified trusts. For the qualified trusts, the recorded equity turnover rates for both the non-U.S. equity and U.S. equity markets from 2005 through 2008 result in an average equity turnover rate of 11.1 percent, which is lower than the turnover rate of 23.65 percent approved in Decision 07-01-003.

For the non-qualified trust, an average equity turnover rate is not applicable as the non-qualified trust is invested entirely in fixed income.

5. Rate of Return Assumptions

Assets within the qualified trust assigned to Diablo Units 1 and 2 are allocated between stocks and bonds based on the investment policy weightings. The policy weightings are 60 percent equity and 40 percent bonds. This asset allocation is consistent with the Commission's investment restrictions, inasmuch as Decision 07-01-003 provided that no more than 60 percent of the funds value can be invested in equities.

The forecast rates of return on the trusts assets in this Application assume an equity return of 8.5 percent and a fixed income return of 4.1 percent, which is consistent with the adopted 8.5 percent pre-tax return on equities and 1.7 percent less than the pre-tax return on fixed assets adopted by the Commission in Decision 07-01-003. Asset class return assumptions were developed with the assistance of PG&E's investment consultant, Russell Investment Group (Russell). Russell publishes return assumptions semi-annually, and the asset class return assumptions used above reflect its December 2008 recommendations for a long-term time horizon of 20 years.

Next, estimated investment management fees and taxes were subtracted to obtain net-of-fee (net) after-tax returns. The assumed investment management fees match recent fee rates. Taxes on bonds were estimated by multiplying the combined state and federal tax rate by annual income. Taxes on equities include tax on both dividend income and capital

gains. The estimated capital gains tax is obtained by calculating the capital gains tax rate by the annual capital gain and the turnover rate. The assumed turnover rate is 11.1 percent for the qualified trust.

Pursuant to the Energy Policy Act of 1992, the federal tax rate effective in 2008 for qualified decommissioning trusts is 20 percent. The California tax rate is 8.84 percent. The resulting net after-tax annual returns are 5.26 percent for the Qualified Fund.

Tables 3-3 through 3-6 summarize these assumptions and show the results of the cash flow analysis for Diablo Units 1 and 2.

D. Internal Revenue Service Ruling Amounts

PG&E is required to obtain a new SRA reflecting the updated funding assumptions approved by the Commission in this NDCTP. Treasury Regulations require that the SRA for contributions beginning in 2010 be calculated based on fund balances as of December 31, 2009.[15] Accordingly, PG&E will file an advice filing with the Commission early next year to update the annual contribution amount based on the assumptions in this NDCTP and using fund balances as of December 31, 2009. At the time of that advice filing, and based on updated fund balances, PG&E also will reallocate the common decommissioning costs to reduce the required contributions to the Diablo Unit 2 trust to zero (this will be done by reallocating some portion of the common costs, which are currently allocated entirely to Diablo Unit 2, to Diablo Unit 1). This will not result in any material change in overall decommissioning contributions, but will help reduce the overall discrepancy between the relative funding levels of the Diablo Unit 2 and Unit 1 trusts (Diablo Unit 2 is now relatively more funded than Diablo Unit 1). This will help avoid the situation, identified by The Utility Reform Network and Division Ratepayer of Advocates, of having required funding to one of the unit trusts, even though funding of the Diablo Canyon trusts overall is adequate.

E. Conclusion

In summary, PG&E requests that the annual decommissioning contribution amount for Diablo Canyon, based on updated studies and assumptions, be adjusted to $10.939 million per year for Diablo Unit 1 and $12.077 million per

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[15] Treas. Reg. § 1.468A-3(h)(2)(vii)(D).

year for Diablo Unit 2 for the years 2010 through 2012, and that such contribution amounts (and the corresponding revenue requirements described in Chapter 8) shall be further adjusted, based on the actual fund balances as of December 31, 2009.

F. Tables

Table 3-1
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Diablo Canyon Nuclear Power Plant
Nuclear Decommissioning Annual Funding

Line No.		Current Expense (through year 2009)	Pro Forma Calculated Expense (for year 2010)	Line No.
1	Diablo Canyon Unit 1	$1,270,000	$10,939,000	1
2	Diablo Canyon Unit 2	$0	$12,077,000	2
3	Total Diablo Canyon	$1,270,000	$23,016,000	3

Table 3-2
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Diablo Canyon Unit 1
Escalation Rates From Base Year 2008

Line No.	Year	PG&E Labor	Materials	Contract Labor	Burial Costs	Other	Compounded Wgt Avg Labor	Compounded Wgt Avg Others	Compounded Burial	Line No.
	weights	0.4895	0.3362	0.5105	1.0000	0.6638				
1	2008	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1
2	2009	1.0375	1.0338	1.0324	1.0750	1.0300	1.0344	1.0312	1.0750	2
3	2010	1.0764	1.0441	1.0619	1.1556	1.0461	1.0676	1.0455	1.1556	3
4	2011	1.1168	1.0569	1.0924	1.2423	1.0661	1.1020	1.0632	1.2423	4
5	2012	1.1587	1.0680	1.1264	1.3355	1.0903	1.1391	1.0833	1.3355	5
6	2013	1.2021	1.0773	1.1604	1.4356	1.1138	1.1769	1.1023	1.4356	6
7	2014	1.2472	1.0847	1.1952	1.5433	1.1364	1.2157	1.1201	1.5433	7
8	2015	1.2939	1.0929	1.2299	1.6590	1.1566	1.2552	1.1365	1.6590	8
9	2016	1.3425	1.1029	1.2659	1.7835	1.1772	1.2962	1.1537	1.7835	9
10	2017	1.3928	1.1123	1.3028	1.9172	1.1973	1.3384	1.1704	1.9172	10
11	2018	1.4450	1.1214	1.3417	2.0610	1.2179	1.3825	1.1874	2.0610	11
12	2019	1.4992	1.1343	1.3818	2.2156	1.2400	1.4282	1.2066	2.2156	12
13	2020	1.5555	1.1449	1.4235	2.3818	1.2639	1.4757	1.2264	2.3818	13
14	2021	1.6138	1.1555	1.4640	2.5604	1.2884	1.5232	1.2465	2.5604	14
15	2022	1.6743	1.1659	1.5054	2.7524	1.3133	1.5722	1.2668	2.7524	15
16	2023	1.7371	1.1761	1.5478	2.9589	1.3395	1.6226	1.2880	2.9589	16
17	2024	1.8022	1.1865	1.5907	3.1808	1.3652	1.6743	1.3088	3.1808	17
18	2025	1.8698	1.1972	1.6344	3.4194	1.3906	1.7275	1.3296	3.4194	18
19	2026	1.9399	1.2082	1.6799	3.6758	1.4163	1.7827	1.3506	3.6758	19
20	2027	2.0127	1.2192	1.7272	3.9515	1.4432	1.8401	1.3725	3.9515	20
21	2028	2.0882	1.2305	1.7756	4.2479	1.4708	1.8992	1.3950	4.2479	21
22	2029	2.1665	1.2420	1.8250	4.5664	1.4987	1.9600	1.4177	4.5664	22
23	2030	2.2477	1.2533	1.8757	4.9089	1.5271	2.0227	1.4407	4.9089	23
24	2031	2.3320	1.2647	1.9277	5.2771	1.5566	2.0875	1.4645	5.2771	24
25	2032	2.4194	1.2761	1.9803	5.6729	1.5861	2.1539	1.4883	5.6729	25
26	2033	2.5102	1.2877	2.0338	6.0983	1.6157	2.2221	1.5122	6.0983	26
27	2034	2.6043	1.3008	2.0923	6.5557	1.6470	2.2947	1.5377	6.5557	27
28	2035	2.7020	1.3141	2.1526	7.0474	1.6789	2.3698	1.5638	7.0474	28
29	2036	2.8033	1.3274	2.2146	7.5759	1.7114	2.4473	1.5903	7.5759	29
30	2037	2.9084	1.3409	2.2784	8.1441	1.7446	2.5274	1.6172	8.1441	30
31	2038	3.0175	1.3546	2.3440	8.7550	1.7784	2.6102	1.6447	8.7550	31
32	2039	3.1306	1.3684	2.4115	9.4116	1.8129	2.6958	1.6726	9.4116	32
33	2040	3.2480	1.3823	2.4810	10.1174	1.8480	2.7842	1.7010	10.1174	33
34	2041	3.3698	1.3964	2.5524	10.8763	1.8838	2.8756	1.7300	10.8763	34
35	2042	3.4962	1.4106	2.6260	11.6920	1.9203	2.9700	1.7595	11.6920	35
36	2043	3.6273	1.4249	2.7016	12.5689	1.9575	3.0675	1.7895	12.5689	36
37	2044	3.7633	1.4394	2.7794	13.5115	1.9954	3.1684	1.8200	13.5115	37
38	2045	3.9045	1.4541	2.8595	14.5249	2.0341	3.2726	1.8511	14.5249	38
39	2046	4.0509	1.4689	2.9418	15.6143	2.0735	3.3802	1.8827	15.6143	39
40	2047	4.2028	1.4838	3.0266	16.7853	2.1137	3.4915	1.9150	16.7853	40
41	2048	4.3604	1.4989	3.1137	18.0442	2.1547	3.6065	1.9478	18.0442	41
42	2049	4.5239	1.5142	3.2034	19.3976	2.1964	3.7254	1.9811	19.3976	42
43	2050	4.6935	1.5296	3.2957	20.8524	2.2390	3.8483	2.0151	20.8524	43
44	2051	4.8695	1.5452	3.3906	22.4163	2.2824	3.9752	2.0498	22.4163	44
45	2052	5.0522	1.5609	3.4883	24.0975	2.3266	4.1065	2.0850	24.0975	45
46	2053	5.2416	1.5768	3.5888	25.9048	2.3717	4.2421	2.1209	25.9048	46
47	2054	5.4382	1.5928	3.6921	27.8477	2.4177	4.3823	2.1574	27.8477	47
48	2055	5.6421	1.6091	3.7985	29.9363	2.4645	4.5273	2.1946	29.9363	48
49	2056	5.8537	1.6254	3.9079	32.1815	2.5123	4.6771	2.2324	32.1815	49
50	2057	6.0732	1.6420	4.0204	34.5951	2.5609	4.8319	2.2710	34.5951	50
51	2058	6.3009	1.6587	4.1362	37.1897	2.6106	4.9919	2.3102	37.1897	51
52	2059	6.5372	1.6756	4.2554	39.9790	2.6612	5.1574	2.3502	39.9790	52
53	2060	6.7824	1.6926	4.3779	42.9774	2.7127	5.3284	2.3908	42.9774	53
54	2061	7.0367	1.7099	4.5040	46.2007	2.7653	5.5052	2.4322	46.2007	54
55	2062	7.3006	1.7273	4.6338	49.6658	2.8189	5.6880	2.4744	49.6658	55
56	2063	7.5744	1.7448	4.7672	53.3907	2.8735	5.8769	2.5174	53.3907	56
57	2064	7.8584	1.7626	4.9045	57.3950	2.9292	6.0722	2.5611	57.3950	57
58	2065	8.1531	1.7805	5.0458	61.6996	2.9860	6.2741	2.6056	61.6996	58
59	2066	8.4588	1.7987	5.1911	66.3271	3.0438	6.4829	2.6509	66.3271	59

Table 3-3

Pacific Gas and Electric Company

2009 Nuclear Decommissioning Cost Triennial Proceeding

Diablo Canyon Unit 1

Cash Flow

Assumes 25% overall contingency

Weighted Average Escalation on Liability, 8.5% pre-tax on equities, 4.1% pre-tax on fixed income

Portfolio turnover for equities is 11.1% per year, Portfolio Ramp Down 5 years prior to start of decom

Line No.	Year	AT ROR Q	DCPP #1 YE Bal Before +/-	Capital Gain Tax from Liquidation	Withdrawal (at YE)	Contrib. (at YE)	Remaining Assets
1	Liquidation Value						
2	12/31/2008		571.6				
3							
4	2009	1.0526	601.7	0.0	0.0	1.2700	602.9
5	2010	1.0519	632.9	0.0	0.0	10.939	643.8
6	2011	1.0514	676.9	0.0	0.0	10.939	687.9
7	2012	1.0509	722.9	0.0	0.0	10.939	733.9
8	2013	1.0506	771.0	0.0	0.0	10.939	781.9
9	2014	1.0503	821.2	0.0	0.0	10.939	832.1
10	2015	1.0500	873.8	0.0	0.0	10.939	884.7
11	2016	1.0498	928.7	0.0	0.0	10.939	939.7
12	2017	1.0496	986.3	0.0	0.0	10.939	997.2
13	2018	1.0494	1046.5	0.0	0.0	10.939	1057.5
14	2019	1.0493	1109.6	0.0	0.0	10.939	1120.5
15	2020	1.0492	1175.6	-5.7	0.0	10.939	1180.9
16	2021	1.0438	1232.6	-5.2	0.0	10.939	1238.3
17	2022	1.0399	1287.8	-7.5	0.0	10.939	1291.3
18	2023	1.0363	1338.1	-10.0	0.0	10.939	1339.1
19	2024	1.0328	1383.0	-12.7	18.4	10.939	1362.9
20	2025	1.0295	1403.1	0.0	134.0	10.027	1279.2
21	2026	1.0295	1316.9	0.0	300.6		1016.3
22	2027	1.0295	1046.3	0.0	331.8		714.5
23	2028	1.0295	735.6	0.0	158.3		577.4
24	2029	1.0295	594.4	0.0	140.9		453.5
25	2030	1.0295	466.9	0.0	19.7		447.2
26	2031	1.0295	460.4	0.0	20.1		440.3
27	2032	1.0295	453.3	0.0	20.5		432.8
28	2033	1.0295	445.6	0.0	20.8		424.7
29	2034	1.0295	437.3	0.0	21.2		416.0
30	2035	1.0295	428.3	0.0	21.7		406.7
31	2036	1.0295	418.7	0.0	22.1		396.5
32	2037	1.0295	408.2	0.0	55.1		353.1
33	2038	1.0295	363.6	0.0	115.1		248.5
34	2039	1.0295	255.8	0.0	47.9		207.9
35	2040	1.0295	214.1	0.0	48.2		165.8
36	2041	1.0295	170.7	0.0	15.0		155.8
37	2042	1.0295	160.4	0.0	12.5		147.9
38	2043	1.0295	152.3	0.0	12.8		139.4
39	2044	1.0295	143.6	0.0	13.2		130.3
40	2045	1.0295	134.2	0.0	13.5		120.7
41	2046	1.0295	124.2	0.0	13.9		110.3
42	2047	1.0295	113.5	0.0	14.3		99.2
43	2048	1.0295	102.2	0.0	14.8		87.4
44	2049	1.0295	90.0	0.0	15.1		74.9
45	2050	1.0295	77.1	0.0	15.6		61.5
46	2051	1.0295	63.3	0.0	39.0		24.4
47	2052	1.0295	25.1	0.0	25.1		0.0
48	2053	1.0295	0.0	0.0	0		0.0
49	2054	1.0295	0.0	0.0	0		0.0
50	2055	1.0295	0.0	0.0	0		0.0
51	Total				1701.143981		

Table 3-4
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Diablo Canyon Nuclear Plant, Unit 1
Nuclear Decommissioning Costs
Proposed Tax Qualifying Portion

Line No.	Types of Assumption	
1	Proposed method of decommissioning	DECON
2	Year in which substantial decommissioning costs first will be incurred	2024
3	Year in which substantial decommissioning will be substantially completed	2052
4	Total Cost of decommissioning (2008$)	$771,147,913
5	Total Cost of decommissioning ($future nominal)	$1,701,143,981
6	For each year between 2 and 3 above, the annual costs of decommissioning ($future nominal)	See Table 3-3
7	After-tax annualized rate of return	2010 - 5.19%
		2011 - 5.14%
		2012 - 5.09%
		2013 - 5.06%
		2014 - 5.03%
		2015 - 5.00%
		2016 - 4.98%
		2017 - 4.96%
		2018 - 4.94%
		2019 - 4.93%
		2020 - 4.92%
		2021 - 4.38%
		2022 - 3.99%
		2023 - 3.63%
		2024 - 3.28%
		2025 - 2.95%
		2026 through 2052 - 2.95%
8	Period over which decommissioning costs will be included in cost of service	January 1, 2009 through September 22, 2025
9	Projected amount to be included in cost of service per year	$10,939,000
10	Date on which plant will no longer be included in rate base	2025
11	Frequency of deposit in external fund	Variable
12	Projected fund balance on January 1, 2010	$601,673,463
13	Fund balance on January 1, 2009	$571,630,000

Table 3-5
Pacific Gas and Electric Company
2005 Nuclear Decommissioning Cost Triennial Proceeding
Diablo Canyon Unit 2
Escalation Rates From Base Year 2008

Line No.	Year	PG&E Labor	Materials	Contract Labor	Burial Costs	Other	Compounded Wgt Avg Labor	Compounded Wgt Avg Others	Compounded Burial	Line No.
	weights	0.4742	0.5117	0.5258	1.0000	0.4883				
1	2008	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1
2	2009	1.0375	1.0338	1.0324	1.0750	1.0300	1.0340	1.0317	1.0750	2
3	2010	1.0764	1.0441	1.0619	1.1556	1.0461	1.0666	1.0452	1.1556	3
4	2011	1.1168	1.0569	1.0924	1.2423	1.0661	1.1004	1.0621	1.2423	4
5	2012	1.1587	1.0680	1.1264	1.3355	1.0903	1.1369	1.0805	1.3355	5
6	2013	1.2021	1.0773	1.1604	1.4356	1.1138	1.1741	1.0978	1.4356	6
7	2014	1.2472	1.0847	1.1952	1.5433	1.1364	1.2122	1.1137	1.5433	7
8	2015	1.2939	1.0929	1.2299	1.6590	1.1566	1.2509	1.1286	1.6590	8
9	2016	1.3425	1.1029	1.2659	1.7835	1.1772	1.2910	1.1446	1.7835	9
10	2017	1.3928	1.1123	1.3028	1.9172	1.1973	1.3323	1.1600	1.9172	10
11	2018	1.4450	1.1214	1.3417	2.0610	1.2179	1.3755	1.1756	2.0610	11
12	2019	1.4992	1.1343	1.3818	2.2156	1.2400	1.4203	1.1937	2.2156	12
13	2020	1.5555	1.1449	1.4235	2.3818	1.2639	1.4667	1.2118	2.3818	13
14	2021	1.6138	1.1555	1.4640	2.5604	1.2884	1.5130	1.2302	2.5604	14
15	2022	1.6743	1.1659	1.5054	2.7524	1.3133	1.5607	1.2487	2.7524	15
16	2023	1.7371	1.1761	1.5478	2.9589	1.3395	1.6098	1.2679	2.9589	16
17	2024	1.8022	1.1865	1.5907	3.1808	1.3652	1.6600	1.2869	3.1808	17
18	2025	1.8698	1.1972	1.6344	3.4194	1.3906	1.7115	1.3058	3.4194	18
19	2026	1.9399	1.2082	1.6799	3.6758	1.4163	1.7650	1.3251	3.6758	19
20	2027	2.0127	1.2192	1.7272	3.9515	1.4432	1.8207	1.3450	3.9515	20
21	2028	2.0882	1.2305	1.7756	4.2479	1.4708	1.8780	1.3655	4.2479	21
22	2029	2.1665	1.2420	1.8250	4.5664	1.4987	1.9368	1.3861	4.5664	22
23	2030	2.2477	1.2533	1.8757	4.9089	1.5271	1.9975	1.4071	4.9089	23
24	2031	2.3320	1.2647	1.9277	5.2771	1.5566	2.0601	1.4287	5.2771	24
25	2032	2.4194	1.2761	1.9803	5.6729	1.5861	2.1241	1.4502	5.6729	25
26	2033	2.5102	1.2877	2.0338	6.0983	1.6157	2.1898	1.4719	6.0983	26
27	2034	2.6043	1.3008	2.0923	6.5557	1.6470	2.2600	1.4952	6.5557	27
28	2035	2.7020	1.3141	2.1526	7.0474	1.6789	2.3325	1.5190	7.0474	28
29	2036	2.8033	1.3274	2.2146	7.5759	1.7114	2.4074	1.5431	7.5759	29
30	2037	2.9084	1.3409	2.2784	8.1441	1.7446	2.4847	1.5677	8.1441	30
31	2038	3.0175	1.3546	2.3440	8.7550	1.7784	2.5646	1.5926	8.7550	31
32	2039	3.1306	1.3684	2.4115	9.4116	1.8129	2.6470	1.6180	9.4116	32
33	2040	3.2480	1.3823	2.4810	10.1174	1.8480	2.7322	1.6439	10.1174	33
34	2041	3.3698	1.3964	2.5524	10.8763	1.8838	2.8201	1.6701	10.8763	34
35	2042	3.4962	1.4106	2.6260	11.6920	1.9203	2.9109	1.6969	11.6920	35
36	2043	3.6273	1.4249	2.7016	12.5689	1.9575	3.0047	1.7241	12.5689	36
37	2044	3.7633	1.4394	2.7794	13.5115	1.9954	3.1016	1.7517	13.5115	37
38	2045	3.9045	1.4541	2.8595	14.5249	2.0341	3.2017	1.7799	14.5249	38
39	2046	4.0509	1.4689	2.9418	15.6143	2.0735	3.3050	1.8085	15.6143	39
40	2047	4.2028	1.4838	3.0266	16.7853	2.1137	3.4118	1.8376	16.7853	40
41	2048	4.3604	1.4989	3.1137	18.0442	2.1547	3.5220	1.8673	18.0442	41
42	2049	4.5239	1.5142	3.2034	19.3976	2.1964	3.6359	1.8974	19.3976	42
43	2050	4.6935	1.5296	3.2957	20.8524	2.2390	3.7535	1.9281	20.8524	43
44	2051	4.8695	1.5452	3.3906	22.4163	2.2824	3.8749	1.9593	22.4163	44
45	2052	5.0522	1.5609	3.4883	24.0975	2.3266	4.0004	1.9910	24.0975	45
46	2053	5.2416	1.5768	3.5888	25.9048	2.3717	4.1300	2.0233	25.9048	46
47	2054	5.4382	1.5928	3.6921	27.8477	2.4177	4.2639	2.0561	27.8477	47
48	2055	5.6421	1.6091	3.7985	29.9363	2.4645	4.4022	2.0895	29.9363	48
49	2056	5.8537	1.6254	3.9079	32.1815	2.5123	4.5451	2.1235	32.1815	49
50	2057	6.0732	1.6420	4.0204	34.5951	2.5609	4.6927	2.1581	34.5951	50
51	2058	6.3009	1.6587	4.1362	37.1897	2.6106	4.8451	2.1933	37.1897	51
52	2059	6.5372	1.6756	4.2554	39.9790	2.6612	5.0026	2.2292	39.9790	52
53	2060	6.7824	1.6926	4.3779	42.9774	2.7127	5.1653	2.2656	42.9774	53
54	2061	7.0367	1.7099	4.5040	46.2007	2.7653	5.3334	2.3027	46.2007	54
55	2062	7.3006	1.7273	4.6338	49.6658	2.8189	5.5071	2.3404	49.6658	55
56	2063	7.5744	1.7448	4.7672	53.3907	2.8735	5.6865	2.3788	53.3907	56
57	2064	7.8584	1.7626	4.9045	57.3950	2.9292	5.8719	2.4179	57.3950	57
58	2065	8.1531	1.7805	5.0458	61.6996	2.9860	6.0634	2.4576	61.6996	58
59	2066	8.4588	1.7987	5.1911	66.3271	3.0438	6.2612	2.4980	66.3271	59

Table 3-6

Pacific Gas and Electric Company

2009 Nuclear Decommissioning Cost Triennial Proceeding

Diablo Canyon Unit 2

Cash Flow

Assumes 25% overall contingency

Weighted Average Escalation on Liability, 8.5% pre-tax on equities, 4.1% pre-tax on fixed income

Portfolio turnover for equities is 11.1% per year, Portfolio Ramp Down 5 years prior to start of decom

Line No.	Year	AT ROR Q	DCPP #2 YE Bal Before +/-	Capital Gain Tax from Liquidation	Withdrawal (at YE)	Contrib. (at YE)	Remaining Assets
1	Liquidation Value						
2	12/31/2008		782.1				
3							
4	2009	1.0526	823.2	0.0	0.0	0.000	823.2
5	2010	1.0519	865.9	0.0	0.0	12.077	878.0
6	2011	1.0514	923.1	0.0	0.0	12.077	935.2
7	2012	1.0509	982.8	0.0	0.0	12.077	994.9
8	2013	1.0506	1045.2	0.0	0.0	12.077	1057.3
9	2014	1.0502	1110.4	0.0	0.0	12.077	1122.5
10	2015	1.0500	1178.6	0.0	0.0	12.077	1190.7
11	2016	1.0498	1249.9	0.0	0.0	12.077	1262.0
12	2017	1.0496	1324.5	0.0	0.0	12.077	1336.6
13	2018	1.0494	1402.7	0.0	0.0	12.077	1414.7
14	2019	1.0493	1484.4	0.0	0.0	12.077	1496.5
15	2020	1.0491	1570.1	-7.7	0.0	12.077	1574.4
16	2021	1.0438	1643.4	-7.1	0.0	12.077	1648.4
17	2022	1.0399	1714.2	-10.0	0.0	12.077	1716.2
18	2023	1.0363	1778.4	-13.3	0.0	12.077	1777.2
19	2024	1.0328	1835.5	-16.9	0.0	12.077	1830.7
20	2025	1.0295	1884.7	0.0	39.6	4.026	1849.2
21	2026	1.0295	1903.8	0.0	152.7		1751.0
22	2027	1.0295	1802.7	0.0	347.2		1455.5
23	2028	1.0295	1498.5	0.0	332.4		1166.1
24	2029	1.0295	1200.5	0.0	205.5		995.0
25	2030	1.0295	1024.4	0.0	155.6		868.8
26	2031	1.0295	894.5	0.0	49.1		845.3
27	2032	1.0295	870.3	0.0	50.5		819.8
28	2033	1.0295	844.0	0.0	51.7		792.3
29	2034	1.0295	815.7	0.0	53.1		762.6
30	2035	1.0295	785.1	0.0	54.5		730.7
31	2036	1.0295	752.2	0.0	56.1		696.1
32	2037	1.0295	716.7	0.0	88.6		628.0
33	2038	1.0295	646.6	0.0	159.6		487.0
34	2039	1.0295	501.4	0.0	167.0		334.4
35	2040	1.0295	344.3	0.0	173.0		171.3
36	2041	1.0295	176.3	0.0	24.5		151.8
37	2042	1.0295	156.3	0.0	12.2		144.1
38	2043	1.0295	148.3	0.0	12.5		135.8
39	2044	1.0295	139.8	0.0	12.9		126.9
40	2045	1.0295	130.7	0.0	13.2		117.4
41	2046	1.0295	120.9	0.0	13.6		107.3
42	2047	1.0295	110.5	0.0	14.0		96.6
43	2048	1.0295	99.4	0.0	14.4		85.0
44	2049	1.0295	87.5	0.0	14.7		72.8
45	2050	1.0295	75.0	0.0	15.1		59.8
46	2051	1.0295	61.6	0.0	37.6		24.0
47	2052	1.0295	24.7	0.0	24.7		0.0
48	2053	1.0295	0.0	0.0	0.0		0.0
49	2054	1.0295	0.0	0	0.0		0.0
50	2055	1.0295	0.0	0.0	0.0		0.0
	Total				2345.6		

Table 3-7
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Diablo Canyon Nuclear Plant, Unit 2
Nuclear Decommissioning Costs
Proposed Tax Qualifying Portion

Line No.	Types of Assumption	
1	Proposed method of decommissioning	DECON
2	Year in which substantial decommissioning costs first will be incurred	2025
3	Year in which substantial decommissioning will be substantially completed	2052
4	Total Cost of decommissioning (2008$)	$1,057,197,611
5	Total Cost of decommissioning ($future nominal)	$2,345,614,276
6	For each year between 2 and 3 above, the annual costs of decommissioning ($future nominal)	See Table 3-6
7	After-tax annualized rate of return	2010 - 5.19%
		2011 - 5.14%
		2012 - 5.09%
		2013 - 5.06%
		2014 - 5.02%
		2015 - 5.00%
		2016 - 4.98%
		2017 - 4.96%
		2018 - 4.94%
		2019 - 4.93%
		2020 - 4.91%
		2021 - 4.38%
		2022 - 3.99%
		2023 - 3.63%
		2024 - 3.28%
		2025 - 2.95%
		2026 - 2.95%
		2027 - 2.95%
		2028 through 2052 - 2.95%
8	Period over which decommissioning costs will be included in cost of service	January 1, 2009 through April 26, 2025
9	Projected amount to be included in cost of service per year	$12,077,000
10	Date on which plant will no longer be included in rate base	2025
11	Frequency of deposit in external fund	Variable
12	Projected fund balance on January 1, 2010	$823,184,196
13	Fund balance on January 1, 2009	$782,080,000

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 4

DIABLO CANYON POWER PLANT

NUCLEAR DECOMMISSIONING COST STUDY

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4
DIABLO CANYON POWER PLANT
NUCLEAR DECOMMISSIONING COST STUDY

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PACIFIC GAS AND ELECTRIC COMPANY
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DIABLO CANYON POWER PLANT
NUCLEAR DECOMMISSIONING COST STUDY

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4
DIABLO CANYON POWER PLANT
NUCLEAR DECOMMISSIONING COST STUDY

A. Introduction

1. Scope and Purpose

The purpose of this chapter is to present the results of the 2009 site-specific nuclear decommissioning cost study prepared by TLG Services, Incorporated (TLG), for the Diablo Canyon Power Plant (Diablo Canyon Units 1 and 2 or Diablo Canyon). This testimony addresses the decommissioning alternatives evaluated, presents the cost and schedule estimates, and discusses current decommissioning regulatory guidance. The purpose of this study is to estimate the cost of decommissioning Diablo Canyon, so that the contributions required to accumulate sufficient funds for decommissioning can be reviewed and determined by the California Public Utilities Commission (CPUC or Commission).

2. Summary of Dollar Request

Decommissioning of the Diablo Canyon Units 1 and 2 are estimated at $1,828.3 million and $1,916.6 million, including an overall project contingency of 25 percent for the DECON and SAFSTOR options, respectively. Costs are stated in 2008 dollars. The estimate is summarized in Table 4-1.

3. Support for Request

TLG previously prepared Diablo Canyon Decommissioning Cost Studies in the 1987, 1990, 1993, 1996 and 1999 General Rate Cases and the 2002 and 2005 Nuclear Decommissioning Cost Triennial Proceedings. The 2009 study presents the latest techniques in decommissioning cost estimation methodologies and is not a simple update of the previous analyses.

4. Organization of the Remainder of This Chapter

The remainder of this chapter is organized as follows:

- Section B – Background;

- Section C – Methodology;
- Section D – Radioactive Waste;
- Section E – Basis for Study;
- Section F – Clean Building Demolition and Site Restoration;
- Section G – Federal Regulations;
- Section H – Selecting a Decommissioning Method;
- Section I – Contingency;
- Section J – Conclusion; and
- Section K – Table.

B. Background

This review is required by California Public Utilities Code Section 8327. The study presented is not a detailed decommissioning engineering plan and does not commit Pacific Gas and Electric Company (PG&E or the Company) to a specific course of action for the plant following ultimate plant shutdown.

C. Methodology

1. General

The methodology used to develop the estimates follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," and the U.S. Department of Energy (DOE) "Decommissioning Handbook." These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) are developed using local labor rates. The activity-dependent costs are estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures rely upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.

The unit factor method provides a demonstrable basis for establishing reliable cost estimates. The detail provided in the unit factors, including activity duration, labor costs (by craft), and equipment and consumable costs, ensures that essential elements have not been omitted. Appendix A presents the detailed development of a typical unit factor. Appendix B provides the values contained within one set of factors developed for this analysis.

This analysis reflects lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells, and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, and San Onofre-1 nuclear units have provided additional insight into the process, the regulatory aspects, and the technical challenges of decommissioning commercial nuclear units.

a. Work Difficulty Factors

TLG has historically applied work difficulty adjustment factors (WDF) to account for the inefficiencies in working in a power plant environment. WDFs are assigned to each unique set of unit factors, commensurate with the inefficiencies associated with working in confined, hazardous environments. The ranges used for the WDFs are as follows:

Access Factor	10- 20 percent
Respiratory Protection Factor	10- 50 percent
Radiation/ALARA Factor	10- 37 percent
Protective Clothing Factor	10- 30 percent
Work Break Factor	8.33 percent

The factors and their associated range of values were developed in conjunction with the AIF/NESP-036 study. The application of the factors is discussed in more detail in that publication.

b. Scheduling Program Durations

The unit factors, adjusted by the WDFs as described above, are applied against the inventory of materials to be removed in the radiologically controlled areas. The resulting man-hours, or crew-hours,

are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities is based upon productivity information available from the "Building Construction Cost Data" publication.

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

2. Recent Methodology Refinements/Changes From Previous Study

The 2009 study reflects the general effects of inflation and cost escalation over the three years since the 2005 study was prepared. The 2009 study benefited from experience gained from fieldwork in actual decommissioning programs and from plant-related decommissioning activities, such as plant outages, retrofits, and change-out programs. The 2009 study uses the most current information available regarding the cost of decommissioning.

The 2009 study also incorporates new cost projections for Class A, B and C Low-Level Radioactive Waste (LLRW) disposal. The EnergySolutions' facility is used as the disposal site for the majority of the radioactive waste (Class A). This waste is disposed of at a rate of $62 per cubic foot for "Bulk" waste, and a rate of $252 per cubic foot for "General" waste. These rates include State of Utah taxes and Southwest Compact fees. There are no currently operating disposal facilities available to PG&E that have a license to dispose of the more highly radioactive waste (Classes B and C), for example, generated in the dismantling of the reactor vessel. As such, waste disposal costs and waste transportation distances were estimated. For purposes of estimating the Class B and C waste transportation costs, it was assumed that this waste was shipped to Andrews County, Texas. The cost for disposal for Class B and C waste is $2,916 per cubic foot. This rate includes

Southwest Compact fees. These disposal costs for LLRW are based on a 2009 LLRW study sponsored by PG&E and Southern California Edison Company (SCE). The 2009 LLRW study was done to reflect the Commission's desire for these owners to conservatively estimate their nuclear decommissioning LLRW disposal rates.

Other changes from the 2005 study:

- The 2009 study considered shutdown dates for Units 1 and 2 of November 2024 and August 2025, respectively. These dates are consistent with the current operating license.
- The 2009 study considered a 10-year delay in spent fuel pickup, and that DOE initiates commercial spent fuel pickup in 2020.
- The 2009 study considered an increased security force to safeguard the spent fuel and associated facilities.
- The 2009 study included recycling the breakwater concrete in lieu of at-sea disposal.

D. Radioactive Waste

All radioactive wastes processed and generated during the decommissioning process are classified as LLRWs. These radioactive wastes are classified in accordance with Title 10 Code of Federal Regulations (CFR) Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste" (10 CFR Part 61). All radioactive wastes, which meet the requirements of 10 CFR Part 61 Class A, will be destined for EnergySolution's disposal site in Clive, Utah. As of July 1, 2008, PG&E does not have access to a 10 CFR Part 61 Class B or Class C waste disposal site. Class B or Class C waste generated as a result of operations must be stored until there is a disposal option. The 2009 study considers that all stored Class B and C waste will be disposed of prior to the permanent cessation of operations, and that there will be Class B and C waste disposal options available to support decommissioning.

Spent fuel, however, is characterized as high-level nuclear waste. In accordance with the Nuclear Waste Policy Act of 1982 (Public Law 94-425), the DOE is required by law to enter into contracts with owners and/or generators of spent fuel, pursuant to which the DOE is contractually responsible for the final disposition of spent fuel as high-level nuclear waste. Therefore, the cost of the

transportation and disposal of spent fuel is accounted for separately and is specifically excluded from the decommissioning cost estimates.

Although this decommissioning study does not address the removal or disposal of spent fuel from the nuclear site, it does consider the constraint that the presence of spent fuel on the site can impose on other decommissioning activities. In particular, the decommissioning scheduling performed in support of the cost study recognizes delays due to the present uncertainties surrounding the disposal of spent fuel in the United States. It is currently anticipated that both of PG&E's nuclear generating sites will need to provide for extended storage and caretaking of their respective spent fuel inventories until such time as off-site disposal becomes an option. Consequently, the estimate for Diablo Canyon presumes that the Independent Spent Fuel Storage Installation (ISFSI) will accommodate the spent fuel residing in the spent fuel storage pools at the time of shutdown, until such time that off-site disposal becomes available. The presence of the spent fuel storage facilities will necessarily delay the final release of the site for alternative/unrestricted use. This delay is reflected in the increased cost of the period-dependent activities. To the extent possible, the decommissioning estimates were structured around the spent fuel areas of the stations and their availability for decontamination, in order to minimize delays in decommissioning other portions of the facility.

The transfer of spent fuel from the two units to DOE's permanent (or interim) storage facility is based upon a 2020 repository startup date and fuel shipments at the acceptance rate proposed in U.S. DOE's Office of Civilian Radioactive Management, September 1998, "Revised Draft Solicitation for Waste Acceptance and Transportation Services." Current expectations are that the high-level waste repository, or an interim storage facility, will accept spent fuel from Diablo Canyon starting in 2028 and for the last spent fuel bundles to remain at the Diablo Canyon site until 2051.

Material which exceeds 10 CFR Part 61 Class C requirements (Greater Than Class C (GTCC)) is assumed to be packaged in dry storage containers and the disposal equivalent to the weight of Pressurized Water Reactor (PWR) fuel bundles. These GTCC packages will be handled and stored with the spent fuel, and shipped for disposal with the spent fuel to the DOE repository. An equivalent transportation and disposal cost in dollars per cubic feet (cf) was

calculated based on the spent fuel disposal fee of 1 mil/kilowatt-hour (kWh). This value was applied to the disposal volume of the GTCC fuel bundle containers. All disposal costs for LLRWs, including GTCC wastes, have been included in the estimates.

E. Basis for Study

The study determined the site-specific costs incurred in the preparation, decontamination and dismantling of the nuclear units in accordance with the alternatives identified and the guidance established by the Nuclear Regulatory Commission (NRC). Estimates of manpower and waste volumes were also derived for the individual scenarios. The study was based upon the current configuration and construction of the PG&E units, a detailed inventory and characterization of equipment and components, a reasonable projection of future operating plans, and demonstrated dismantling techniques. Experience from current decommissioning projects as well as industry experience in decommissioning-related activities provided a basis for the costs. Industry references and/or handbooks were used, as appropriate, to estimate conventional cost components, *e.g.*, materials/consumables, equipment procurement and the demolition and dismantling of non-contaminated structures (in support of facility decontamination). The costs were totaled with the appropriate contingency applied.

This decommissioning study was developed using detailed engineering drawings, together with plant description and inventory documents. These drawings and documents were used to identify the general arrangement of the facilities and to estimate building concrete volumes, steel quantities, the number and size of components, and the degree of site restoration required.

Because decommissioning is labor-intensive, representative labor rates for the geographical region and for each craft or salaried work group are essential for a meaningful site-specific decommissioning cost estimate. Accordingly, typical craft labor rates and utility salary data that were used in the estimate were provided by PG&E.

For purposes of the cost estimates, LLRW disposal costs were based on a 2009 LLRW study sponsored by PG&E and SCE “Establishing an Appropriate Disposal Rate for Low Level Radioactive Waste During Decommissioning.” Class A waste disposal was based on using EnergySolutions as a disposal

facility (with a transportation distance of about 900 miles). Class B and C waste disposal was based on using Waste Controls Specialists, Andrews County, Texas (transportation distance of about 1,300 miles).

F. Clean Building Demolition and Site Restoration

There are additional activities, beyond the removal of contaminated material that will be undertaken in the process of releasing the site for alternative use. This work includes costs for the remaining dismantling and grading operations. The Building Officials and Code Administrators National Building Code, widely adopted by most states, requires that retired structures may not be left in an unsafe condition. Specifically, Section 120.1, "Right to Deem Unsafe," states:

> All buildings or structures that are or hereafter shall become unsafe, unsanitary or deficient in adequate means of egress facilities, or which constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or which involve illegal or improper use, occupancy or maintenance, shall be deemed unsafe buildings or structures. *All unsafe structures shall be taken down and removed or made safe and secure, as the code official deems necessary and as provided for in this section.* A vacant building, unguarded or open at door or window shall be deemed a fire hazard and unsafe within the meaning of this code.

A retired power plant fits this definition of an unsafe structure which must be taken down and removed or made safe and secure. Securing, maintaining and guarding retired power plants indefinitely is costly, requiring either a full-time guard force or intrusion detection devices and alarms monitored by local law enforcement agencies, as well as general building maintenance to keep the structures in a safe condition.

Although reuse of a plant site for use as a future power plant site is feasible, repowering a decontaminated facility is not practical. The designs of new generation power plants are not likely to use the same size and configuration of components, nor require the same type of building enclosures. Optimum facility design will be sized to match the megawatt size of a replacement power plant, if any, either larger or smaller. For example, new combustion turbine-generators are modular, self-contained units that do not need a building enclosure. Combined cycle units may require larger turbine buildings to enclose the waste heat steam generators which supply steam to the turbine. The cost to renovate older buildings and bring them to current safety code standards, combined with the less-than-optimum facility design, makes reuse of the existing buildings an unlikely scenario. Furthermore, the existing components are likely to be of an

obsolete design, more costly to operate and maintain and possibly not compatible with new instrumentation and control systems.

The largest component of the site restoration costs is for dismantling the radiologically decontaminated structures. The second largest component relates to costs incurred to remove certain non-radiologically contaminated systems and components. This work must be accomplished to provide access to all areas of the plant for the radiation surveys required by the NRC prior to license termination and release of the site for another use.

Efficient removal of the radiologically contaminated materials and verification that the radionuclide concentrations are below the stringent NRC limits will require substantial damage to many of the structures. Blasting, core drilling, scarification (surface removal), and the other radiological decontamination work will damage power block structures including the reactor, radwaste and turbine buildings.

Verifying that subsurface radionuclide concentrations meet NRC site release requirements may require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This will be necessary for those facilities and plant areas where historical records indicate the potential of radionuclides having been present in the soil, where inventory losses have been recorded, or where required to confirm that subsurface process and drain lines did not leak over the operating life of the units.

Dismantling is clearly the most appropriate and cost-effective option and should serve as the foundation for the decommissioning cost estimate. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed.

G. Federal Regulations

The NRC provided initial decommissioning requirements in its rule "General Requirements for Decommissioning Nuclear Facilities," issued in June 1988. This rule set forth financial criteria for decommissioning licensed nuclear power facilities. The regulation addressed decommissioning planning needs, timing, funding methods, and environmental review requirements. The intent of the rule was to ensure that decommissioning would be accomplished in a safe and timely manner and that adequate funds would be available for this purpose. Subsequent to the rule, the NRC issued Regulatory Guide 1.159,

"Assuring the Availability of Funds for Decommissioning Nuclear Reactors," which provided additional guidance to the licensees of nuclear facilities on the financial methods acceptable to the NRC staff for complying with the requirements of the rule. The regulatory guide addressed the funding requirements and provided guidance on the content and form of the financial assurance mechanisms indicated in the rule.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR and ENTOMB. The DECON alternative assumes that any contaminated or activated portion of the plant's systems, structures and facilities are removed or decontaminated to levels that permit the site to be released for unrestricted use shortly after the cessation of plant operations. The rule also placed a 60-year limit on the time allowed to complete the decommissioning process. For SAFSTOR, the process is also restricted in overall duration to 60 years, unless it can be shown that a longer duration is necessary to protect public health and safety. The guidelines for ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the unrestricted release limits for license termination.

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative. The resulting feasibility study, based upon an assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some, if not most reactors. However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. The NRC had considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments. However, the NRC's staff has recommended that rulemaking be deferred, based upon several factors, *e.g.*, no licensee has committed to pursuing the entombment option, the unresolved issues associated

with the disposition of GTCC material and the NRC's current priorities, at least until after the additional research studies are complete. The Commission concurred with the staff's recommendation.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants. When the decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the facility's operating licensed life. Since that time, several licensees permanently and prematurely ceased operations. Exemptions from certain operating requirements were required once the reactor was defueled to facilitate the decommissioning. Each case was handled individually, without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The amendments allow for greater public participation and better define the transition process from operations to decommissioning.

Under the revised regulations, licensees will submit written certification to the NRC within 30 days after the decision to cease operations. Submittal of this notice will entitle the licensee to an annual fee reduction and eliminate the obligation to follow certain requirements needed only during operation of the reactor. Certification will also be required once the fuel is permanently removed from the reactor vessel. Within two years of submitting notice of permanent cessation of operations, the licensee is required to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC. The PSDAR describes the planned decommissioning activities, the associated sequence and schedule, and an estimate of expected costs. Prior to completing decommissioning, the licensee is required to submit an application to the NRC to terminate the license and a License Termination Plan (LTP).

The decommissioning cost estimates prepared for the PG&E units fully comply with these regulations.

H. Selecting a Decommissioning Method

It is not necessary to select a decommissioning method at this time. The actual method or combination of methods selected to decommission Diablo Canyon Units 1 and 2 should be based on an economic, engineering, and

environmental evaluation of the alternatives considering the site and surroundings at the time of decommissioning and reflecting the latest experience in the decommissioning of similar nuclear power facilities. Cost estimates were prepared addressing both the DECON and SAFSTOR decommissioning alternatives.

For planning purposes, the decommissioning cost funding should be based upon removal of the Diablo Canyon units, using the DECON alternative. Although PG&E will likely be responsible for storing its spent fuel on-site until DOE takes delivery, the DECON method allows PG&E to promptly remove all other radioactive materials in the interim. This is important because the units cannot terminate their license(s) until they have removed all radioactive material, including spent fuel. By removing non-fuel related radioactive materials, while waiting for DOE to take delivery of spent fuel, this alternative provides the most reasonable means for terminating the license for the site in the shortest possible time. Furthermore, this alternative avoids the long-term costs and commitments associated with the maintenance, surveillance and security requirements of the delayed dismantling alternatives.

The DECON alternative also allows use of the plant's knowledgeable operating staff, a valuable asset to a well-managed, efficient decommissioning program. Much of the equipment needed to support decommissioning operations such as cranes, ventilation systems and radioactive waste processing equipment would be fully operational. In addition, the site would be available for other use in the near term.

1. The Process of Decommissioning a Nuclear Power Reactor Using the DECON Alternative

The conceptual approach that the NRC has identified in its amended 10 CFR Part 2, 50 and 51 regulations divides decommissioning into three phases, only two of which apply to the DECON alternative. The initial phase commences with the effective date of permanent cessation of operations and involves the transition of both plant and licensee from reactor operations, *i.e.*, power production, to facility de-activation and closure. During Phase 1, notification must be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

Within two years of notification to cease reactor operations the licensee is required to provide a PSDAR. This report would provide a description of the licensee's planned decommissioning activities, a corresponding schedule and an estimate of expected costs. The PSDAR would also address whether environmental impacts associated with the proposed decommissioning scenario have already been considered in a previously prepared environmental statement(s). Ninety days following the NRC's receipt of the PSDAR, the licensee may begin to perform major decommissioning activities without specific NRC approval, under a modified 10 CFR 50.59 review process.

Phase 2, as identified by the NRC in its rule, addresses licensee activities during the storage period or during major decommissioning activities, or a combination of the two.

Phase 3 pertains to the activities involved in license termination. The submittal of an application to terminate the license, along with a termination plan, marks the commencement of this phase. The termination plan would contain a detailed site characterization, *i.e.*, location, type and amount of radioactivity, a description of any remaining dismantling activities to be accomplished, detailed plans for a final survey and the planned end use of the site. An updated cost to complete decommissioning would be required along with the reporting of any new or altered environmental consequences.

TLG's cost estimating methodology subdivides the decommissioning project into periods, based upon major milestones in the project. The NRC's initial phase corresponds to TLG's Period 1, with Phases 2 and 3 as subsets of Period 2. TLG's Period 3, Site Restoration, and Post-Period 3, ISFSI Operations and Decommissioning, have no corresponding NRC phases. However, the NRC does require licensees to have a funding and high-level waste management plan under 10 CFR 50.54(bb).

a. Period 1 – Preparations

(1) General

In anticipation of the cessation of plant operations, detailed preparations are undertaken to provide a smooth transition from plant operations to site decommissioning. Through implementation of a staffing transition plan, the organization required to manage the

intended decommissioning activities is assembled from available plant staff and outside resources. Preparations include the planning for permanent defueling of the reactor, revision of technical specifications applicable to the operating conditions and requirements, a characterization of the facility and major components, and the development of the PSDAR.

(2) Engineering and Planning

The PSDAR, required within two years of the notice to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a local hearing to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR 50.59 procedure, *i.e.*, without specific NRC approval. Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment) containing GTCC, as defined by 10 CFR 61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor coolant system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the Section 50.59 process in decommissioning.

The proposed activity must not:

- Foreclose release of the site for possible unrestricted use;
- Significantly increase decommissioning costs;
- Cause any significant environmental impact; or
- Violate the terms of the licensee's existing license.

Existing operational technical specifications are reviewed and modified to reflect plant conditions and the safety concerns associated with permanent cessation of operations. The

environmental impact associated with the planned decommissioning activities is also considered. Typically, a licensee will not be allowed to proceed if the consequences of a particular decommissioning activity are greater than that bounded by previously evaluated environmental assessments or impact statements. In this instance, the licensee would have to submit a license amendment for the specific activity and update the environmental report.

The decommissioning program outlined in the PSDAR will be designed to accomplish the required tasks within the ALARA guidelines (as defined in 10 CFR 20) for protection of personnel from exposure to radiation hazards. It will also address the continued protection of the health and safety of the public and the environment during the dismantling activity. Consequently, with the development of the PSDAR, activity specifications, cost-benefit and safety analyses, work packages and procedures, would be assembled to support the proposed decontamination and dismantling activities.

(3) Site Preparations

Following final plant shutdown, and in preparation for actual decommissioning activities, the following activities are initiated:

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the reactor vessel and its internals), internal piping, and primary shield cores.
- Isolation of the spent fuel storage pools and fuel handling systems, such that decommissioning operations can commence on the balance of the plant. The pools will remain operational for approximately 12 years following the cessation of operations before the inventory resident at shutdown can be transferred to the DOE.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.

- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

b. Period 2 – Pre-Decommissioning and Decommissioning Operations

This period includes the wet spent fuel storage and physical decommissioning activities associated with the removal and disposal of contaminated and activated components and structures, including the successful termination of the 10 CFR 50 operating license. Significant decommissioning activities in this phase include:

- Operations, maintenance, and security associated with storing of spent fuel in the spent fuel storage pools.
- Transferring spent fuel from the storage pools to the ISFSI.
- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on and off site) to facilitate hauling and transport. Modifications may be required to the containment structure to facilitate access of large/heavy equipment. Modifications may also be required to the refueling area of the building to support the segmentation of the reactor vessel internals and component extraction.
- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.

- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages for the disposition of LLRW.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Removal of control rod drive housings and the head service structure from the reactor vessel head. Segmentation of the vessel closure head.
- Removal and segmentation of the upper internals assemblies. Segmentation will maximize the loading of the shielded transport casks, *i.e.*, by weight and activity. The operations are conducted under water using remotely operated tooling and contamination controls.
- Disassembly and segmentation of the remaining reactor internals, including the core shroud and lower core support assembly. Some material is expected to exceed Class C disposal requirements. As such, the segments will be packaged in modified fuel storage canisters for geologic disposal.
- Segmentation of the reactor vessel. A shielded platform is installed for segmentation as cutting operations are performed in-air using remotely operated equipment within a contamination control envelope. The water level is maintained just below the cut to minimize the working area dose rates. Segments are transferred in-air to containers that are stored under water, for example, in an isolated area of the refueling canal.
- Removal of the activated portions of the concrete biological shield and accessible contaminated concrete surfaces. If dictated by the steam generator and pressurizer removal scenarios, those portions of the associated cubicles necessary for access and component extraction are removed.

- Removal of the steam generators and pressurizer for material recovery and controlled disposal. The generators will be moved to an on-site processing center, the steam domes removed and the internal components segregated for recycling. The lower shell and tube bundle will be packaged for direct disposal. These components can serve as their own burial containers provided that all penetrations are properly sealed and the internal contaminants are stabilized, *e.g.*, with grout. Steel shielding will be added, as necessary, to those external areas of the package to meet transportation limits and regulations. The pressurizer is disposed of intact.

At least two years prior to the anticipated date of license termination, an LTP is required. Submitted as a supplement to the Final Safety Analysis Report or its equivalent, the plan must include: a site characterization, description of the remaining dismantling activities, plans for site remediation, procedures for the final radiation survey, designation of the end use of the site, an updated cost estimate to complete the decommissioning, and any associated environmental concerns. The NRC will notice the receipt of the plan, make the plan available for public comment, and schedule a local hearing. LTP approval will be subject to any conditions and limitations as deemed appropriate by the NRC. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (*e.g.*, waste collection and treatment systems, electrical power and ventilation systems).
- Removal of the steel liners from refueling canal, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/ contaminated concrete.
- Surveys of the decontaminated areas of the containment structure.
- Remediation and removal of the contaminated equipment and material from the auxiliary building and any other contaminated

facility. Radiation and contamination controls will be utilized until residual levels indicate that the structures and equipment can be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and components (both clean and contaminated) located within these buildings. This activity facilitates surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.

- Routing of material removed in the decontamination and dismantling to a central processing area. Material certified to be free of contamination is released for unrestricted disposition, *e.g.*, as scrap, recycle, or general disposal. Contaminated material is characterized and segregated for additional off-site processing (disassembly, chemical cleaning, volume reduction, and waste treatment), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)." This document incorporates the statistical approaches to survey design and data interpretation used by the Environmental Protection Agency. It also identifies state-of-the-art, commercially available instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will terminate the operating licenses if it determines that site remediation has been performed in accordance with the LTP, and

that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release.

c. Period 3 – Site Restoration

Following completion of decommissioning operations, site restoration activities will begin. Efficient removal of the contaminated materials and verification that residual radionuclide concentrations are below the NRC limits will result in substantial damage to many of the structures. Although performed in a controlled, safe manner, blasting, coring, drilling, scarification (surface removal), and the other decontamination activities will substantially degrade power block structures including the reactor and auxiliary buildings. Under certain circumstances, verifying that subsurface radionuclide concentrations meet NRC site release requirements will require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This removal activity will be necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

Prompt dismantling of site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized on site is more efficient than if the process were deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public as well as to future workers. Abandonment creates a breeding ground for vermin infestation as well as other biological hazards.

This cost study presumes that non-essential structures and site facilities are dismantled as a continuation of the decommissioning activity. Foundations and exterior walls are removed to a nominal depth of three feet below grade. The three-foot depth allows for the placement of gravel for drainage, as well as topsoil, so that vegetation can be

established for erosion control. Site areas affected by the dismantling activities are restored and the plant area graded as required to prevent ponding and inhibit the refloating of subsurface materials.

Non-contaminated concrete rubble produced by demolition activities is processed to remove reinforcing steel and miscellaneous embedments. The processed material is then used on site to backfill foundation voids. Excess non-contaminated materials are trucked to an off-site area for disposal as construction debris.

I. Contingency

Contingency has been added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude. This type of contingency is consistent with "Contingencies" as defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook," which defines it as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, this cost analysis includes contingencies to cover these types of expenses.

The total amount of contingency that has been included is consistent with the "Technical Position Paper for Establishing an Appropriate Contingency Factor for Inclusion in the Decommissioning Revenue Requirements" provided in workpapers to this chapter. This paper's objective was to identify contingency that would "demonstrate that they [owner's of California nuclear power plants] have made all reasonable efforts to conservatively establish an appropriate contingency factor for inclusion in the decommissioning revenue requirements."

Contingency was estimated on a line item basis consistent with values extracted from the AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates." The composite contingency value for the DECON alternative is approximately 17.9 percent. The value for the SAFSTOR alternative is approximately 17.5 percent. Based on the previously referenced technical position paper, additional contingency was added to reflect an overall project contingency of 25 percent (both

scenarios). This contingency was incorporated on a line item basis, with each line item receiving a pro-rated share of the increase.

J. Conclusion

The cost projected to promptly decommission (DECON) Diablo Canyon based on permanent cessation of operations at the end of currently licensed operations is estimated to be $1,828.3 million (2008 dollars). The cost includes a 25 percent contingency.

The cost projected for deferred decommissioning (SAFSTOR), until spent fuel is removed from the plant, is estimated to be $1,916.6 million (2008 dollars). This cost also includes a 25 percent contingency.

K. Table

TABLE 4-1
PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON UNITS 1 AND 2
COST AND SCHEDULE ESTIMATE SUMMARY

Line No.	Decommissioning Cost	Cost 2008$ (Millions)	Schedule (Years)
1	DECON (Prompt Removal/Dismantling)		
2	Unit 1	771,148	28.0
3	Unit 2 and Common	1,057,198	27.0
4	Station Total	1,828,346(a)	28.0(b)
5	SAFSTOR (Mothball With Delayed Dismantling)		
6	Unit 1		
7	Preparations	93,620	1.5
8	25.6-Year Maintenance	190,210	25.6
9	Delayed Dismantling	476,083	8.7
10	Subtotal	759,912(a)	35.8
11	Unit 2		
12	Preparations	115,644	1.5
13	25.7-Year Maintenance	432,188	25.7
14	Delayed Dismantling	608,823	7.8
15	Subtotal	1,156,654(a)	35.0
16	Station Total	1,916,566(a)	35.8(b)

(a) Columns may not add due to rounding.
(b) Time elapsed from the cessation of operations at Unit 1 to the completion of site restoration.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 5

HUMBOLDT POWER PLANT UNIT 3 – NUCLEAR DECOMMISSIONING EXPENSE

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 5
HUMBOLDT POWER PLANT UNIT 3 – NUCLEAR
DECOMMISSIONING EXPENSE

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 5
HUMBOLDT POWER PLANT UNIT 3 – NUCLEAR DECOMMISSIONING EXPENSE

A. Introduction

1. Scope and Purpose

The purpose of this chapter is to review the adequacy of the contributions[1] to the decommissioning funds for the Humboldt Bay Power Plant (Humboldt Unit 3 or Humboldt) pursuant to California Public Utilities Code (CA Pub. Util. Code) Sections 8321-8330. This review examines the decommissioning costs estimate in order to ensure that the estimate takes into account the changes in the technology and regulation of decommissioning, the operating experience of each nuclear facility, and the changes in the general economy.[2] This requires a comparison of the current level of decommissioning contributions with an updated decommissioning cost study, using, where applicable, updated estimates of decommissioning technology, regulations, contingency factors (engineering and financial), escalation rates and rates of return of the decommissioning funds.

2. Summary of Dollar Request

After review of the expected cost to decommission Humboldt Unit 3, addressed in Chapter 6 of this Application, and the expected value of the decommissioning trust funds at the time of decommissioning in 2010, Pacific Gas and Electric Company (PG&E or the Company) requests the authority to contribute $0 million to the Qualified Fund in 2010 through 2012 and $10.044 million per year to the Non-Qualified Fund in 2010 through 2012.

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[1] PG&E makes contributions to decommissioning funds. The contributions are an expense to PG&E. Thus, “contributions” are sometimes referred to as “decommissioning expense.” However, the term decommissioning expense may also refer to the costs actually incurred when decommissioning activities are underway. In this chapter, the term decommissioning expense refers to the annual contributions to the decommissioning funds.

[2] CA Pub. Util. Code § 8327.

As discussed in Section B.1 below, amounts contributed to the Non-Qualified Fund are not currently tax deductible, therefore the Non-Qualified contribution must be grossed up for the associated Federal and California taxes, as well as franchise fees and uncollectibles, resulting in a revenue requirement of $16.982 million per year for 2010 through 2012. The summary results of this analysis are shown in Table 5-1.

3. Use of Assumptions and Methodology Adopted in Decision 07-01-003

As explained in Section C below, the California Public Utilities Commission (CPUC or Commission) in prior Nuclear Decommissioning Cost Triennial Proceedings (NDCTP) resolved various matters relating to decommissioning funding. Those findings and conclusions generally continue to apply to this NDCTP, although certain matters (*e.g.*, contingency and burial costs) have been addressed again at the Commission's request.

4. Support for Request

As explained in this chapter, the revenue requirement for the 2010 through 2012 Humboldt Unit 3 Qualified and Non-Qualified Funds contributions are derived from an updated decommissioning cost study set forth in Chapter 6, and complies with the Nuclear Decommissioning Act of 1985 (Act) and Commission precedent.

5. Organization of the Remainder of This Chapter

The remainder of this chapter is organized as follows:

- Section B – Background;
- Section C – Estimating Methodology;
- Section D – Internal Revenue Service (IRS) Ruling Amounts;
- Section E – Conclusion; and
- Section F – Tables.

B. Background

In the Act, the California Legislature declared that it is "in the best interests of all citizens of California that the costs of electricity generated by nuclear facilities be fairly distributed among present and future California electric

customers so that customers are charged only for costs that are reasonably and prudently incurred."[3] The Act further declared, "The State of California should establish a comprehensive framework for timely payment of the costs of decommissioning, and provide for allocation of risks and costs among the respective interests."[4] In establishing a statewide policy respecting the economic aspects of decommissioning the Act states that a principal consideration is "assuring that the funds required for decommissioning are available at the time and in the amount required for protection of the public."[5]

1. Tax Matters

PG&E is required by California Pub. Util. Code Section 8325 to establish an "externally managed, segregated fund…which qualifies for a tax deduction pursuant to Section 468A of the United States Internal Revenue Code (IRC)" or "other funds, as appropriate, for payment of decommissioning costs of nuclear facilities." Two types of funds were established for Humboldt Unit 3—a tax "Qualified Fund" and a "Non-Qualified Fund." Both types of funds are described in greater detail below.

IRC Section 468A allows contributions to a Nuclear Decommissioning Reserve Fund (a "Qualified Fund") to be deducted from income in the year the contribution is made, provided a taxpayer receives a Schedule of Ruling Amounts (SRA) from the IRS. Thus, revenues collected to make contributions to these Qualified Funds are not subject to corporate income taxes; however, the Qualified Fund itself is a separate legal entity (see Section 2 below) and taxed on its investment earnings. Currently, the Qualified Fund is taxed at a 20 percent rate which is lower than the maximum corporate federal income tax rate.[6] When distributions are made from a Qualified Fund, assets of the trust must be liquidated and tax paid on the gains. The cash obtained from these sales is then distributed to pay the cost of decommissioning. The amounts distributed from the

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[3] CA Pub. Util. Code § 8322(b).

[4] CA Pub. Util. Code § 8322(e).

[5] CA Pub. Util. Code § 8322(f)(1).

[6] IRC § 468A(e)(2)(B)(i).

Qualified Fund are included in PG&E's taxable income and offset by a corresponding deduction for the nuclear decommissioning costs incurred during the year. The result is that PG&E does not receive a tax benefit in the year cash is distributed from the Qualified Fund. Rather, PG&E's tax benefit is in the year the contribution is made to the Qualified Fund.

In contrast to the tax Qualified Fund, contributions to the Non-Qualified Fund are not deductible. Moreover, the income of the Non-Qualified Fund is taxed at the highest marginal tax rate for federal and California purposes (currently a combined rate of 40.746 percent). However, unlike the tax Qualified Fund, PG&E is allowed a tax deduction when fund assets are used to pay decommissioning expenses. Consequently, it is tax efficient to pay for decommissioning costs from the Non-Qualified Fund first.

In the prior NDCTP, PG&E assumed that it could apply IRC Section 468A as amended by the Energy Policy Act of 2005 (EPAct). The EPAct repealed the limitation that PG&E could only contribute to a Qualified Fund an amount equal to 50 percent of the present value of total nuclear decommissioning costs. As such, the prior NDCTP assumed that contributions to the Qualified Fund would equal 100 percent of the present value of total nuclear decommissioning costs and included the assumption that the current balance of the Non-Qualified Fund would be transferred to the Qualified Fund. This was based on the assumption that California would conform to the EPAct. It has been almost 4 years since the signing of the EPAct into law and California has yet to conform, despite several conformity bills introduced in the legislature.[7] Because it is unclear as to if and when California will conform to the EPAct, this Application applies the rules of IRC Section 468A in effect prior to the changes made by the EPAct. Thus, this Application's funding assumption is based on methodology that contributes to both the Qualified and Non-Qualified Funds based on their 50 percent share of the present value of total nuclear decommissioning costs.

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[7] Assembly Bill 1561 (Calderon), California Legislature, 2007-2008 Regular Session.

2. Types of Trusts

As discussed above, the Qualified Fund is a separate legal entity. The CPUC jurisdictional funds are organized under two "master" trusts:

A. CPUC Qualified Trust:

- Diablo Unit 1;
- Diablo Unit 2; and
- Humboldt Unit 3.

B. CPUC Non-Qualified Trust:

- Humboldt Unit 3.

The Diablo Canyon Unit 1 and Unit 2 decommissioning funds are addressed in Chapter 3.

3. Commission Approval of Humboldt Early Decommissioning

The Commission approved early decommissioning of Humboldt Unit 3 in Decision 03-10-014. The decommissioning cost study presented in Chapter 6 of the Application assumes decommissioning with an Independent Spent Fuel Storage Installation (ISFSI) at Humboldt. With the recent completion of the spent fuel transfer to the ISFSI, the emphasis has shifted to activities associated with the preparation for active decommissioning tasks. Decommissioning of Humboldt Unit 3 is estimated to cost approximately $499.8 million in 2008 dollars (see Table 6-1). In determining the contribution amount in this chapter, PG&E has adjusted the required funding for work completed prior to December 31, 2008, but not yet disbursed from the Nuclear Decommissioning Trust account.[8]

4. Status of Trust Funding

The market value of the Humboldt Unit 3 decommissioning trust funds as of December 31, 2008 was approximately $332.3 million, without

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[8] October Disbursement = $8,395,666;
November Disbursement = $899,839;
December Disbursement = $3,560,731; and
December Invoices not paid by 12/31/08 = $3,271,736.

consideration of the tax benefits associated with the Non-Qualified Fund.[9] The estimated cost in future dollars of decommissioning Humboldt Unit 3 is $515.7 million.[10] These estimated costs of decommissioning for both current and future dollars include the contingencies discussed below. See Tables 5-2 through 5-5.

C. Estimating Methodology

The estimates of Humboldt Unit 3 decommissioning costs prepared by TLG Services, Inc. (TLG) are presented in Chapter 6 of this Application. PG&E has commenced early decommissioning activities at Humboldt Unit 3, consistent with the Commission's adoption of early decommissioning in Decision 03-10-014.

The decommissioning costs are presented in five categories: PG&E labor, equipment and materials, contractor labor, process and burial, and other, where "other" can include: engineering preparatory activities, off-site recycling costs for low level radioactive waste (LLRW), insurance premiums and regulatory fees. Escalation factors are then applied to the costs to derive the forecasted nominal dollar decommissioning costs in the years in which those costs are estimated to occur. The yearly costs are translated into a required fund balance at the end of the funding period. As noted in Section A of this chapter, PG&E seeks additional contributions of $0 million per year for the Qualified Fund and $10.044 million per year for the Non-Qualified Fund for the period 2010 through 2012 to meet the anticipated costs of the decommissioning.

There are five major assumptions used in calculating the cash flow estimates:

- LLRW burial cost;
- Contingency factor;
- Escalation rates;
- Equity turnover percentages; and

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[9] The liquidated value of the Humboldt Qualified Trust was $231.9 million at December 31, 2008. The liquidated value of the Humboldt Non-Qualified Trust was $93.3 million at December 31, 2008.

[10] The estimated decommissioning period for Humboldt Unit 3 begins in 2010 and extends through 2020.

- Estimated rates of return on the invested funds.

1. Low Level Radioactive Waste Burial Rate Assumptions

In Decision 07-01-003, the Commission ordered PG&E, Southern California Edison and San Diego Gas & Electric Company, to conduct a study to conservatively determine LLRW base disposal rates for use in connection with nuclear decommissioning proceedings before the Commission. The 2009 LLRW Cost Study (2009 LLRW Study) is attached as Appendix A.

The 2009 LLRW Study reflects the general effects of inflation and cost escalation over the three years since the 2005 study was prepared. The 2009 LLRW Study benefited from experience gained from field work in actual decommissioning programs and from plant-related decommissioning activities, such as plant outages, retrofits and change-out programs. The 2009 LLRW Study uses the most current information available regarding the cost of decommissioning.

The 2009 LLRW Study also incorporates new cost projections for Class A, B and C LLRW disposal. The EnergySolutions' facility is used as the disposal site for the majority of the radioactive waste (Class A). This waste is disposed of at a rate of $62 per cubic foot for "Bulk" waste, and a rate of $252 per cubic foot for "General" waste. These rates include state of Utah taxes and Southwest Compact fees. There are no currently operating disposal facilities available to PG&E that have a license to dispose of the more highly radioactive waste (Classes B and C), for example, generated in the dismantling of the reactor vessel. As such, waste disposal costs and waste transportation distances were estimated. For purposes of estimating the Class B and C waste transportation costs, it was assumed that this waste was shipped to Andrews County, Texas. The cost for disposal for Class B and C waste is $2,916 per cubic foot. This rate includes Southwest Compact fees. The 2009 LLRW Study was conducted to reflect the Commission's desire to conservatively estimate nuclear decommissioning LLRW disposal rates.

2. Contingency Assumptions

Contingency has been added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude. This type of contingency is consistent with "Contingencies" as defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook," which defines it as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, this cost analysis includes contingencies to cover these types of expenses.

The total amount of contingency that has been included is consistent with the "Technical Position Paper for Establishing an Appropriate Contingency Factor for Inclusion in the Decommissioning Revenue Requirements." This paper's objective was to identify contingency that would "demonstrate that they [owners of California nuclear power plants] have made all reasonable efforts to conservatively establish an appropriate contingency factor for inclusion in the decommissioning revenue requirements," provided in workpapers to Chapter 4.

Contingency was estimated on a line item basis consistent with values extracted from the AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates." The composite contingency is approximately 21.7 percent. Based on the previously referenced technical position paper, additional contingency was added to reflect an overall project contingency of 25 percent. This contingency was incorporated on a line item basis, with each line item receiving a pro-rated share of the increase. Consistent with the contingency explanation defined above, no contingency has been applied to activities that are already complete.

In accordance with practices in prior General Rate Case (GRC) and the prior NDCTP, PG&E has applied a more general, overall, contingency factor that applied to all costs and addressed not only engineering uncertainties,

but also financial, regulatory, and industry uncertainties. In the 2005 NDCTP, the Commission authorized the Settlement Agreement that contained an overall contingency factor of 25 percent.[11] In Decision 03-10-014, the Commission states, "the proposed use of the engineering contingency factors estimated by TLG as the overall contingency factor does not address all of the contingencies the contingency factor is intended to cover."[12] Therefore, the Commission did not limit the overall contingency factor to the engineering contingency factors; rather the Commission adopted a 25 percent contingency factor. Consistent with the Commission's findings, PG&E proposes the continued use of the same level of contingency (25 percent) that was previously adopted by the Commission, in the 2005 NDCTP decision.

With the 25 percent contingency factor, the decommissioning costs for Humboldt Unit 3 stated in 2008 dollars, are approximately $515.7 million.

3. Escalation Assumptions

Escalation factors for the decommissioning period are provided by Global Insight as of September 2008 or developed by PG&E, as described below. Details regarding the data series used in the forecast period are found in Table 5-2. These forecasted escalation rates are used to restate the current estimate of decommissioning costs in 2008 dollars to the future years in which the costs will be incurred.

Consistent with the prior NDCTP, the escalation rate for materials is a composite of the forecasted rates of change for several Producer Price Indices: chemicals and products, machinery and equipment, construction machinery and equipment, general machinery and equipment, electric machinery and equipment, industrial commodities, and transportation equipment. Global Insight provides the forecasts for these series. The rates of change are then averaged to yield the overall escalation rate for materials. Likewise, an escalation rate for contract labor is composite of the forecasted rates of change for several series provided by Global Insight.

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[11] D.07-01-003, Conclusions of Law 3, 4 and 5.

[12] D.03-10-014, p. 24.

The escalation rate for PG&E labor is based on current PG&E union contracts.

The escalation rates for "other" are the forecasted changes in the Consumer Price Index from the Global Insight forecast.

Decision 03-10-014 Conclusion of Law 12 states that, "in determining escalation rates…the Commission should require the use of a weighted average." As such, PG&E calculates a weighed average escalation rate based on the four escalation rates presented above and applies this rate to the decommissioning costs for PG&E labor, equipment and materials, contractor labor and other.

Decision 03-10-014 further states that "except for LLRW burial costs, we will require the use of a weighted average."[13] For this reason, PG&E does not include LLRW process and burial escalation or costs in its weighted average calculation.

In the 1999 GRC and 2002 and 2005 NDCTP decisions, the Commission adopted and therefore deemed reasonable, a LLRW burial escalation rate of 7.5 percent. PG&E proposes the continued use of this rate. It is PG&E's position that this rate is necessary to ensure the necessary funds for the disposal of LLRW. Under U.S. Nuclear Regulatory Commission (NRC) regulations, it is assumed that LLRW generated during plant operations is disposed of using operating funds.[14] Currently, NUREG-1307, Rev. 13 assumes that for plants that have no disposal site available for [LLRW] (*e.g.*, plants not located within the Atlantic and Northwest Compacts), the cost for disposal is the same as that provided for the Atlantic company, for lack of a better alternative.[15] NUREG-1307, Rev. 13 further provides that when new disposal facilities become available, disposal rates will likely be significantly higher, therefore, "licensees may want to set aside additional decommissioning trust funds in order to avoid

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[13] D.03-10-014, p. 27.

[14] United States NRC, Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 13, Abstract, p. iii. November 2008.

[15] United States NRC, Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 13, Abstract, p. iii. November 2008.

significant future shortfalls in funding and potential enforcement actions."[16] Therefore, PG&E believes that the use of a 7.5 percent burial escalation rate is appropriate and necessary to ensure adequate disposal of LLRW.

4. Equity Turnover Percentages

In Decision 07-01-003, the Commission found it reasonable to calculate the annual equity turnover rates by averaging the equity turnover rates from 1999 through 2006. Consistent with the methodology used to calculate the adopted rates in the 2005 NDCTP decision, PG&E again averages recorded equity turnover rates for the qualified trusts. For the qualified trusts, the recorded equity turnover rates for both the Non-United States (U.S.) equity and U.S. equity markets from 2005 through 2008 result in an average equity turnover rate of 11.1 percent, which is lower than the turnover rate of 23.65 percent approved in Decision 07-01-003.

For the Non-Qualified Trust, an average equity turnover rate is not applicable as the non-qualified trust is invested entirely in fixed income.

5. Rate of Return Assumptions

Assets assigned to the decommissioning of Humboldt Unit 3 are included in both the Qualified and Non-Qualified Trusts. Asset allocation is managed for Humboldt Unit 3 as a whole rather than at the individual trust level. The target asset allocation for Humboldt Unit 3 is 12 percent equity and 88 percent fixed income, while the allocation within the qualified trust is adjusted to maintain the total asset allocation for Humboldt Unit 3 close to its target allocation. For this chapter, the asset allocation between stocks and bonds is assumed to be within the investment policy weightings. For the Qualified Trust, the policy weightings are 53 percent equity and 47 percent fixed income in 2009 and the ramping down to 0.0 percent equity and 100 percent bonds by 2013. For this chapter the Non-Qualified Trust asset allocation is 0.0 percent equity and 100 percent fixed income.

The forecast rates of return on the funds' assets in this Application assume an equity return of 8.5 percent and a fixed income return of 4.1 percent, which is consistent with the pre-tax return on equities in

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[16] United States NRC, Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 13, Abstract, p. iii. November 2008.

Decision 07-01-003, and a decrease of 1.7 percent in fixed income returns adopted in Decision 07-01-003. Asset class return assumptions were developed with assistance of PG&E's investment consultant, Russell Investment Group (Russell). Russell publishes return assumptions semi-annually, and the asset class return assumptions used above reflect its December 2008 recommendation for a long-term time horizon of 20 years.

Next, estimated investment management fees and taxes were subtracted to obtain net-of-fee (net) after-tax returns. The assumed investment management fees match recent fee rates. Taxes on bonds were estimated by multiplying the combined state and federal tax rate by annual income. Taxes on equities include tax on both dividend income and capital gains. The estimated capital gains tax is obtained by calculating the capital gains tax rate by the annual capital gain and the turnover rate. The assumed turnover rate is 11.1 percent for the Qualified trust and 0.0 percent for the Non-Qualified trust.

Pursuant to the EPAct of 1992, the federal tax rate effective in 2005 for qualified decommissioning trusts is 20 percent. The California tax rate is 8.84 percent. The Non-Qualified trust is subject to the higher full corporate tax rate and therefore the after-tax rate of returns for this trust is lower.

The resulting net after-tax annual returns are 5.26 percent for the Qualified Trust and 2.95 percent for the Non-Qualified Trust.

D. Internal Revenue Service Ruling Amounts

PG&E is required to obtain a new SRA reflecting the updated funding assumptions approved by the Commission in this NDCTP, to the extent it will be making contributions to the qualified trust. Treasury Regulations require that the SRA for contributions beginning in 2010 be calculated based on fund balances as of December 31, 2009.[17] Given the current fund balances, the assumptions discussed in this chapter, and the 50 percent funding limitation described in this chapter's Section B.1 – Tax Matters, PG&E currently projects that it will not be eligible for qualified trust funding. However, to maximize any eligible qualified trust funding, and to more accurately fund the non-qualified trust, PG&E will file an advice filing early next year with the Commission to

[17] Treas. Reg. §1.468A-3(h)(2)(vii)(D).

update the annual contribution amount (and corresponding revenue requirements developed in Chapter 8) based on the assumptions approved in this NDCTP and using fund balances as of December 31, 2009. PG&E has adjusted in this Application (and will adjust in its future advice filing) the amount required to be contributed to the non-qualified fund to reflect any excess amounts in the qualified fund.

E. Conclusion

In summary, PG&E requests that the annual decommissioning contribution amount for Humboldt Unit 3, based on updated studies and assumptions, be adjusted to $0 million per year for the Qualified Fund and $10.044 million per year for the Non-Qualified Fund for years 2010 through 2012, and that such amounts (and corresponding revenue requirements) shall be further adjusted by advice filing, based on the assumptions approved in this NDCTP and using fund balances as of December 31, 2009.

F. Tables

TABLE 5-1
PACIFIC GAS AND ELECTRIC COMPANY
2009 NUCLEAR DECOMMISSIONING COST TRIENNIAL PROCEEDING
HUMBOLDT POWER PLANT
NUCLEAR DECOMMISSIONING ANNUAL FUNDING

Line No.		Current Expense (Through Year 2009)	Pro Forma Calculated Expense (For Year 2010)	Percentage Change
1	Humboldt Unit 3	$10,843,000.00	$10,044,000.00	-7.37%

Table 5-2
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Nuclear Decommissioning Expense
Escalation Rates From Base Year 2008

Line No.	Year	PG&E Labor	Materials	Contract Labor	Burial Costs	Other	Compounded Wgt Avg Labor	Compounded Wgt Avg Others	Compounded Burial	Line No.
1	weights	0.2571	0.3840	0.7429	1.0000	0.6160				1
2	2008	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2
3	2009	1.0375	1.0338	1.0324	1.0750	1.0300	1.0337	1.0315	1.0750	3
4	2010	1.0764	1.0441	1.0619	1.1556	1.0461	1.0656	1.0453	1.1556	4
5	2011	1.1168	1.0569	1.0924	1.2423	1.0661	1.0986	1.0626	1.2423	5
6	2012	1.1587	1.0680	1.1264	1.3355	1.0903	1.1347	1.0818	1.3355	6
7	2013	1.2021	1.0773	1.1604	1.4356	1.1138	1.1711	1.0998	1.4356	7
8	2014	1.2472	1.0847	1.1952	1.5433	1.1364	1.2085	1.1165	1.5433	8
9	2015	1.2939	1.0929	1.2299	1.6590	1.1566	1.2464	1.1321	1.6590	9
10	2016	1.3425	1.1029	1.2659	1.7835	1.1772	1.2856	1.1486	1.7835	10
11	2017	1.3928	1.1123	1.3028	1.9172	1.1973	1.3260	1.1646	1.9172	11
12	2018	1.4450	1.1214	1.3417	2.0610	1.2179	1.3682	1.1808	2.0610	12
13	2019	1.4992	1.1343	1.3818	2.2156	1.2400	1.4120	1.1994	2.2156	13
14	2020	1.5555	1.1449	1.4235	2.3818	1.2639	1.4574	1.2182	2.3818	14
15	2021	1.6138	1.1555	1.4640	2.5604	1.2884	1.5025	1.2374	2.5604	15
16	2022	1.6743	1.1659	1.5054	2.7524	1.3133	1.5489	1.2567	2.7524	16
17	2023	1.7371	1.1761	1.5478	2.9589	1.3395	1.5964	1.2768	2.9589	17
18	2024	1.8022	1.1865	1.5907	3.1808	1.3652	1.6451	1.2966	3.1808	18
19	2025	1.8698	1.1972	1.6344	3.4194	1.3906	1.6949	1.3163	3.4194	19
20	2026	1.9399	1.2082	1.6799	3.6758	1.4163	1.7467	1.3364	3.6758	20
21	2027	2.0127	1.2192	1.7272	3.9515	1.4432	1.8006	1.3572	3.9515	21
22	2028	2.0882	1.2305	1.7756	4.2479	1.4708	1.8560	1.3785	4.2479	22
23	2029	2.1665	1.2420	1.8250	4.5664	1.4987	1.9128	1.4001	4.5664	23
24	2030	2.2477	1.2533	1.8757	4.9089	1.5271	1.9713	1.4219	4.9089	24
25	2031	2.3320	1.2647	1.9277	5.2771	1.5566	2.0317	1.4445	5.2771	25
26	2032	2.4194	1.2761	1.9803	5.6729	1.5861	2.0932	1.4671	5.6729	26
27	2033	2.5102	1.2877	2.0338	6.0983	1.6157	2.1562	1.4897	6.0983	27
28	2034	2.6043	1.3008	2.0923	6.5557	1.6470	2.2240	1.5140	6.5557	28
29	2035	2.7020	1.3141	2.1526	7.0474	1.6789	2.2938	1.5388	7.0474	29
30	2036	2.8033	1.3274	2.2146	7.5759	1.7114	2.3659	1.5640	7.5759	30
31	2037	2.9084	1.3409	2.2784	8.1441	1.7446	2.4404	1.5896	8.1441	31
32	2038	3.0175	1.3546	2.3440	8.7550	1.7784	2.5171	1.6156	8.7550	32
33	2039	3.1306	1.3684	2.4115	9.4116	1.8129	2.5964	1.6422	9.4116	33
34	2040	3.2480	1.3823	2.4810	10.1174	1.8480	2.6782	1.6691	10.1174	34
35	2041	3.3698	1.3964	2.5524	10.8763	1.8838	2.7626	1.6966	10.8763	35
36	2042	3.4962	1.4106	2.6260	11.6920	1.9203	2.8497	1.7246	11.6920	36
37	2043	3.6273	1.4249	2.7016	12.5689	1.9575	2.9396	1.7530	12.5689	37
38	2044	3.7633	1.4394	2.7794	13.5115	1.9954	3.0324	1.7819	13.5115	38
39	2045	3.9045	1.4541	2.8595	14.5249	2.0341	3.1281	1.8114	14.5249	39
40	2046	4.0509	1.4689	2.9418	15.6143	2.0735	3.2269	1.8413	15.6143	40
41	2047	4.2028	1.4838	3.0266	16.7853	2.1137	3.3289	1.8718	16.7853	41
42	2048	4.3604	1.4989	3.1137	18.0442	2.1547	3.4342	1.9029	18.0442	42
43	2049	4.5239	1.5142	3.2034	19.3976	2.1964	3.5429	1.9344	19.3976	43
44	2050	4.6935	1.5296	3.2957	20.8524	2.2390	3.6551	1.9666	20.8524	44
45	2051	4.8695	1.5452	3.3906	22.4163	2.2824	3.7708	1.9993	22.4163	45
46	2052	5.0522	1.5609	3.4883	24.0975	2.3266	3.8903	2.0326	24.0975	46

Table 5-3
Humboldt Bay Unit 3
TLG Contingency of 25%
(2008 dollars)

Line No.	Year	PG&E Labor	Equipment & Materials	Contractor Labor	Burial	Other	Yearly Total	Line No.
1	2005	0	0	0	0	0	0	1
2	2006	0	0	0	0	0	0	2
3	2007	0	0	0	0	0	0	3
4	2008	0	0	0	0	0	0	4
5	2009	7,023,419	10,371,326	20,392,392	5,780,197	31,437,477	75,004,811	5
6	2010	7,350,077	4,383,488	19,965,664	7,513,972	6,288,253	45,501,455	6
7	2011	7,688,580	10,291,274	19,872,488	11,223,756	6,224,855	55,300,953	7
8	2012	7,857,601	11,277,864	21,963,821	19,916,710	7,400,131	68,416,126	8
9	2013	7,605,030	7,058,896	24,273,571	34,548,951	9,646,603	83,133,051	9
10	2014	6,594,303	3,271,426	13,083,941	12,515,421	5,981,384	41,446,475	10
11	2015	6,127,490	2,432,470	14,093,041	8,382,724	6,079,411	37,115,135	11
12	2016	697,119	158	3,829,607	1,849,549	2,005,831	8,382,265	12
13	2017	370,051	0	3,470,762	0	524,567	4,365,380	13
14	2018	370,051	0	3,470,762	0	524,567	4,365,380	14
15	2019	370,051	0	3,470,762	0	524,567	4,365,380	15
16	2020	362,954	257,953	3,586,720	425,559	2,506,128	7,139,314	16
17	2021	0	0	0	0	0	0	17
18	2022	0	0	0	0	0	0	18
19	2023	0	0	0	0	0	0	19
20	Total	52,416,725	49,344,854	151,473,531	102,156,840	79,143,774	434,535,724	20

Table 5-4
Humboltd Bay Unit #3
2009 DECON

Line No.	Year	PG&E Labor	Equipment & Materials	Contractor Labor	Burial	Other	Yearly Total	Line No.
1	2005	-	-	-	-	-	-	1
2	2006	-	-	-	-	-	-	2
3	2007	-	-	-	-	-	-	3
4	2008	-	-	-	-	-	-	4
5	2009	7,260,002	10,697,886	21,079,308	6,213,712	32,427,345	77,678,254	5
6	2010	7,832,280	4,582,228	21,275,515	8,683,334	6,573,353	48,946,711	6
7	2011	8,446,923	10,935,194	21,832,560	13,943,237	6,614,342	61,772,255	7
8	2012	8,915,783	12,199,914	24,921,685	26,598,151	8,005,148	80,640,681	8
9	2013	8,906,403	7,763,041	28,427,264	49,599,488	10,608,878	105,305,074	9
10	2014	7,969,538	3,652,650	15,812,584	19,315,068	6,678,403	53,428,243	10
11	2015	7,637,304	2,753,804	17,565,568	13,907,352	6,882,514	48,746,542	11
12	2016	896,208	181	4,923,294	3,298,630	2,303,956	11,422,269	12
13	2017	490,669	-	4,602,060	-	610,924	5,703,654	13
14	2018	506,320	-	4,748,850	-	619,414	5,874,584	14
15	2019	522,520	-	4,900,794	-	629,172	6,052,486	15
16	2020	528,984	314,246	5,227,437	1,013,587	3,053,038	10,137,292	16
17	2021	-	-	-	-	-	-	17
18	2022	-	-	-	-	-	-	18
19	2023	-	-	-	-	-	-	19
20	2024	-	-	-	-	-	-	20
21	2025	-	-	-	-	-	-	21
22	2026	-	-	-	-	-	-	22
23	2027	-	-	-	-	-	-	23
24	2028	-	-	-	-	-	-	24
25	2029	-	-	-	-	-	-	25
26	2030	-	-	-	-	-	-	26
27	2031	-	-	-	-	-	-	27
28	2032	-	-	-	-	-	-	28
29	2033	-	-	-	-	-	-	29
30	2034	-	-	-	-	-	-	30
31	2035	-	-	-	-	-	-	31
32	2036	-	-	-	-	-	-	32
33	2037	-	-	-	-	-	-	33
34	2038	-	-	-	-	-	-	34
35	2039	-	-	-	-	-	-	35
36	2040	-	-	-	-	-	-	36
37	2041	-	-	-	-	-	-	37
38	2042	-	-	-	-	-	-	38
39	2043	-	-	-	-	-	-	39
40	2044	-	-	-	-	-	-	40
41	**Total**	59,912,934	52,899,145	175,316,920	142,572,559	85,006,486	515,708,044	41

Table 5-5
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Humboldt Bay Power Plant, Unit 3
Nuclear Decommissioning Costs

Line No.				
1	Proposed method of decommissioning			SAFSTOR 2009
2	Year in which substantial decommissioning costs first will be incurred			2009
3	Year in which substantial decommissioning will be substantially complete			2020
4	Total Cost of decommissioning ($2008)			$434,535,724
5	Total cost of decommissioning ($future nominal)			$515,708,044
6	For each year between 2 and 3 above, the annual cost of decommissioning ($future nominal)			See Table 5-4
			Qualified Trust	Non-Qualified
7	After-tax annualized rate of return	2010	4.62%	2.95%
		2011	3.76%	2.95%
		2012	3.34%	2.95%
		2013	2.95%	2.95%
		2014 through 2020	2.95%	2.95%
8	Period over which decommissioning costs will be included in cost of service			2013
9	Projected annual amount to be included in cost of service - Non-Qualified			$10,044,000
10	Projected annual amount to be included in cost of service - Qualified			$0
11	Date on which plant will no longer be included in rate base			N/A
12	Frequency of deposit in external fund			Variable
13	Projected Qualified fund balance on January 1, 2010 - This amount will be updated for actual amounts prior to filing the IRS SRA			$244.18 million
14	Projected Non-Qualified fund balance on January 1, 2010 - This amount will be updated for actual amounts prior to filing the IRS SRA			$106.40 million

Table 5-6
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Humboldt Bay Power Plant, Unit 3
Nuclear Decommissioning Costs
Non-Qualified Funding

Analysis of Funding Status

	Investments					Withdrawals					Cash Out		Contributions					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		Next year		Next year												***NQ Trust First***		
		Forecast		Forecast	Q + NQ			Funds fr.		Corporate	Liquidation	Liquidation						
Year	**Qual Fund**	**Growth rate**	**Non-Qual**	**Growth rate**	**YE Value**	**Cashflows**	**Qualified**	**NQ & Tax**	**Non-Qual**	**Tax**	**Cap Gain**	**Cap Gain**	**Contrib.**	**Qualified**	**Non-Qual**	**Remaining**	**Remaining**	**Remaining**
	YE Bal	**Q**	**YE Bal**	**NQ**	**of Assets**	**(at YE)**	**W/drawal**	**Savings**	**W/drawal**	**Savings**	**Qual**	**NonQual**	**(at YE)**	**Contrib.**	**Contrib.**	**Q Assets**	**NQ Assets**	**Assets**
	Before +/-		**Before +/-**		**Before +/-**	**w/25% cont**												
Liq Val at				Cash needed each year for work												**0**	**0**	**0**
12/31/2008	0.00		93.29													*Excess/ (Shortfall) :*		*0.0*
																1.80%		*0.0*
																inflation rate		
2009	0.00	1.0526	106.40	1.1406	106.4	38.8	0.0	38.84	23.0	15.8	0.0	0.0	3.84	0.000	3.839	0.0	87.3	87.3
2010	0.00	1.0462	89.83	0.0295	89.8	24.5	0.0	24.5	14.5	10.0	0.0	0.0	10.04	0.000	10.044	0.0	85.4	85.4
2011	0.00	1.0376	87.90	0.0295	87.9	30.9	0.0	30.9	18.3	12.6	0.0	0.0	10.04	0.000	10.044	0.0	79.7	79.7
2012	0.00	1.0334	82.01	0.0295	82.0	40.3	0.0	40.3	23.9	16.5	0.0	0.0	10.04	0.000	10.044	0.0	68.2	68.2
2013	0.00	1.0295	70.20	0.0295	70.2	52.7	0.0	52.7	31.2	21.5	0.0	0.0	0.00			0.0	39.0	39.0
2014	0.00	1.0295	40.18	0.0295	40.2	26.7	0.0	26.7	15.8	10.9	0.0	0.0	0.00			0.0	24.4	24.4
2015	0.00	1.0295	25.09	0.0295	25.1	24.4	0.0	24.4	14.4	9.9	0.0	0.0	0.00			0.0	10.7	10.7
2016	0.00	1.0295	10.97	0.0295	11.0	5.7	0.0	5.7	3.4	2.3	0.0	0.0	0.00			0.0	7.6	7.6
2017	0.00	1.0295	7.82	0.0295	7.8	2.9	0.0	2.9	1.7	1.2	0.0	0.0	0.00			0.0	6.1	6.1
2018	0.00	1.0295	6.31	0.0295	6.3	2.9	0.0	2.9	1.7	1.2	0.0	0.0	0.00			0.0	4.6	4.6
2019	0.00	1.0295	4.71	0.0295	4.7	3.0	0.0	3.0	1.8	1.2	0.0	0.0	0.00			0.0	2.9	2.9
2020	0.00	0.0295	3.00	0.0295	3.0	5.1	0.0	5.1	3.0	2.1	0.0	0.0	0.00			0.0	0.0	0.0
2021	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2022	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2023	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2024	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2025	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2026	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2027	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2028	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2029	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2030	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2031	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2032	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2033	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2034	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2035	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2036	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2037	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2038	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2039	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2040	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2041	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2042	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2043	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2044	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
Total						257.9												

Note: It is assumed that the after-tax overfunding of the Qualified is contributed to the Non-Qualified in 2009 for funding purposes

Table 5-7
Pacific Gas and Electric Company
2009 Nuclear Decommissioning Cost Triennial Proceeding
Humboldt Bay Power Plant, Unit 3
Nuclear Decommissioning Costs
Qualified Funding

Analysis of Funding Status

	Investments					Withdrawals					Cash Out		Contributions					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
																NQ Trust First		
Year	**Qual Fund YE Bal Before +/-**	**Next year Forecast Growth rate Q**	**Non-Qual YE Bal Before +/-**	**Next year Forecast Growth rate NQ**	**Q + NQ YE Value of Assets Before +/-**	**Cashflows (at YE) w/25% cont**	**Qualified W/drawal**	**Funds fr. NQ & Tax Savings**	**Non-Qual W/drawal**	**Corporate Tax Savings**	**Liquidation Cap Gain Qual**	**Liquidation Cap Gain NonQual**	**Contrib. (at YE)**	**Qualified Contrib.**	**Non-Qual Contrib.**	**Remaining Q Assets**	**Remaining NQ Assets**	**Remaining Assets**
Liq Val at						Cash needed each year for work										**0**	**0**	**0**
12/31/2008	231.98		0.00													*Excess/(Shortfall):*		*0.0*
																1.80% inflation rate		*0.0*
2009	244.18	1.0526	0.00	1.0295	244.2	38.8	38.8	0.00	0.0	0.0	-0.4	0.0	4.36	4.364	0.000	209.3	0.0	209.3
2010	218.99	1.0462	0.00	0.0295	219.0	24.5	24.5	0.0	0.0	0.0	-1.0	0.0	-17.49	-17.488	0.000	176.0	0.0	176.0
2011	182.61	1.0376	0.00	0.0295	182.6	30.9	30.9	0.0	0.0	0.0	-0.6	0.0	0.00	0.000	0.000	151.1	0.0	151.1
2012	156.15	1.0334	0.00	0.0295	156.2	40.3	40.3	0.0	0.0	0.0	-0.7	0.0	0.00	0.000	0.000	115.2	0.0	115.2
2013	118.58	1.0295	0.00	0.0295	118.6	52.7	52.7	0.0	0.0	0.0	0.0	0.0	0.00			65.9	0.0	65.9
2014	67.88	1.0295	0.00	0.0295	67.9	26.7	26.7	0.0	0.0	0.0	0.0	0.0	0.00			41.2	0.0	41.2
2015	42.38	1.0295	0.00	0.0295	42.4	24.4	24.4	0.0	0.0	0.0	0.0	0.0	0.00			18.0	0.0	18.0
2016	18.54	1.0295	0.00	0.0295	18.5	5.7	5.7	0.0	0.0	0.0	0.0	0.0	0.00			12.8	0.0	12.8
2017	13.21	1.0295	0.00	0.0295	13.2	2.9	2.9	0.0	0.0	0.0	0.0	0.0	0.00			10.4	0.0	10.4
2018	10.66	1.0295	0.00	0.0295	10.7	2.9	2.9	0.0	0.0	0.0	0.0	0.0	0.00			7.7	0.0	7.7
2019	7.95	1.0295	0.00	0.0295	7.9	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.00			4.9	0.0	4.9
2020	5.07	0.0295	0.00	0.0295	5.1	5.1	5.1	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2021	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2022	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2023	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2024	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2025	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2026	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2027	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2028	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2029	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2030	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2031	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2032	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2033	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2034	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2035	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2036	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2037	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2038	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2039	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2040	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2041	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2042	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2043	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
2044	0.00	0.0295	0.00	0.0295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00			0.0	0.0	0.0
Total						257.9												

Note: It is assumed that the after-tax overfunding of the Qualified is contributed to the Non-Qualified in 2009 for funding purposes

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 6

HUMBOLDT BAY POWER PLANT NUCLEAR DECOMMISSIONING COST STUDY

PACIFIC GAS AND ELECTRIC COMPANY
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DECOMMISSIONING COST STUDY

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 6
HUMBOLDT BAY POWER PLANT NUCLEAR DECOMMISSIONING COST STUDY

A. Introduction

The purpose of this chapter is to present the results of the 2009 site-specific nuclear decommissioning cost study prepared by TLG Services, Inc. (TLG), for the Humboldt Bay Power Plant Unit 3 (Humboldt Unit 3 or Humboldt). This testimony addresses the 2010 SAFSTOR decommissioning alternative evaluated, presents the cost and schedule estimates, and discusses current decommissioning regulatory guidance. The purpose of the study is to estimate the cost of decommissioning Humboldt, so that the contributions required to accumulate sufficient funds for decommissioning can be reviewed and determined by the California Public Utilities Commission (CPUC or Commission).

1. Summary of Dollar Request

Decommissioning of Humboldt Unit 3 is estimated to cost approximately $499.8 million, including an overall project contingency of 25 percent and CPUC disallowances, in 2008 dollars (see Table 6-1). Excluding CPUC disallowances, the decommissioning cost is approximately $499.4 million.

2. Support for Request

TLG previously prepared Humboldt Unit 3 Decommissioning Cost Studies in the 1987, 1990, 1993, 1996 and 1999 General Rate Cases (GRC) and the 2002 and 2005 Nuclear Decommissioning Cost Triennial Proceedings (NDCTP). The 2009 study reflects current plans which have been developed from engineering studies, and is not a simple update of the previous analyses.

3. Organization of the Remainder of This Chapter

The remainder of this chapter is organized as follows:

- Section B – Background;
- Section C – Methodology;

- Section D – Radioactive Waste;
- Section E – Basis for Study;
- Section F – Clean Building Demolition and Site Restoration;
- Section G – Federal Regulations;
- Section H – Selecting a Decommissioning Method;
- Section I – Contingency;
- Section J – Conclusion; and
- Section K – Table.

B. Background

This review is required by Public Utilities Code Section 8327. The study presented is not a detailed decommissioning engineering plan and does not commit Pacific Gas and Electric Company (PG&E or the Company) to a specific course of action for the plant. Humboldt Unit 3 is currently in SAFSTOR, a condition of monitored safe storage in which the unit is maintained in a safe condition (with the fuel either in the spent fuel pool or the ISFSI), until the dismantlement of the facility can be performed. The transfer of the spent fuel from the spent fuel pool to the Independent Spent Fuel Storage Installation (ISFSI) was recently completed. For the 2009 NDCTP, PG&E asked TLG to prepare an updated nuclear decommissioning cost estimate based on the Department of Energy (DOE) completing spent fuel pickup in 2020 (2010 SAFSTOR) and its current decommissioning schedule. Currently, PG&E is in the process of completing preparatory work for decommissioning and enabling work space so that full decommissioning of the reactor and other components can commence in 2010.

This chapter presents the cost study results.

C. Methodology

1. General

The methodology used to develop the estimates follows the basic approach originally presented in the AIF/NESP-036 study report, “Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,” and the DOE “Decommissioning Handbook.” These documents

present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.

This analysis reflects lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells, and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, and San Onofre-1 nuclear units have provided additional insight into the process, the regulatory aspects, and the technical challenges of decommissioning commercial nuclear units. This estimate incorporates the site specific decommissioning tasks and detailed plans which have been identified as a result of the ongoing detailed planning effort.

The unit factor method provides a demonstrable basis for establishing reliable cost estimates. The details available in the unit cost factors for activity time, labor (by craft), and equipment and consumable costs provide assurance that cost elements have not been omitted. These detailed unit cost factors, coupled with the plant-specific inventory of piping, components, and structures provide a high degree of confidence in the reliability of the cost estimates.

a. Work Difficulty Factors

Work Difficulty Factors (WDF) were assigned to each area, commensurate with the inefficiencies associated with working in confined hazardous environments. The ranges used for the WDFs are as follows:

- Access Factor 0% - 75%
- Respirator Protection Factor 0% - 100%

- Radiation/ALARA Factor 0% - 100%
- Protective Clothing Factor 0% - 100%
- Work Break Factor 8.33%
- Alpha Adjustment Factor 0% - 200%

These factors and their associated range of values were developed in conjunction with the Atomic Industrial Forum's guideline. The factors (and their suggested application) are discussed in more detail in that publication. The WDF assigned to each work area is delineated in Appendix A.

b. Scheduling Program Durations

PG&E established the work sequence and duration based upon ongoing planning efforts. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting cost estimate.

2. Recent Methodology Refinements and Changes From Previous Study

The following are the major changes made to this estimate from the previous estimate:

- PG&E and contractor staffing levels were revised based upon an in-depth PG&E review of their staffing needs during the project.
- The unit cost factors for mechanical cutting of components with internal contamination were revised to incorporate stabilization of internal contamination prior to cutting the component. This change was made based upon actual component cutting experience at Humboldt over the past year.
- Changes were made to the WDFs for systems and structures removal based upon PG&E's detailed review of radiological conditions and recent Humboldt work experience.

- Costs for additional work activities were added based upon detailed engineering reviews and planning. For example, cost elements were added for the complete removal of the spent fuel pool concrete walls (3), and costs were added for the stabilization and bulk removal of the yard pipe tunnel.
- Increased radioactive waste shipping and disposal costs. Changes occurred in both the quantity of contaminated material and the low level radioactive waste disposal rates.

D. Radioactive Waste

All radioactive wastes, which meet the requirements of 10 Code of Federal Regulations (CFR) Part 61 Class A, will be destined for the Energy Solutions' disposal site in Clive, Utah. As of July 1, 2008, PG&E does not have access to a 10 CFR Part 61 Class B or Class C waste disposal site. Consequently, Class B and Class C waste must be stored on site until a licensed facility becomes available. The 2010 SAFSTOR study considers that there will be a Class B and Class C waste disposal option available to support decommissioning.

Spent fuel is characterized as high-level nuclear waste. In accordance with the Nuclear Waste Policy Act of 1982 (Public Law 94-425), the DOE is required by law to enter into contracts with owners and/or generators of spent fuel, pursuant to which the DOE is contractually responsible for final disposition of spent fuel as high-level nuclear waste. Therefore, the cost of transportation and disposal of spent fuel is accounted for separately and is specifically excluded from the decommissioning cost estimates.

Although the decommissioning study does not address the removal or disposal of spent fuel from the nuclear sites, it does consider the constraint that the presence of spent fuel on the site can impose on other decommissioning activities. In particular, the decommissioning scheduling performed in support of the cost study recognizes delays due to the present uncertainties surrounding the disposal of spent fuel in the United States. It is currently anticipated that both of PG&E's nuclear generating sites will need to provide for extended storage and caretaking of their respective spent fuel inventories until such time as off-site disposal becomes an option. The 2010 SAFSTOR decommissioning

study reflects the construction and presumed continued operation of an ISFSI to accommodate the spent fuel residing in the spent fuel storage pool until such time that off-site disposal becomes available. The presence of the ISFSI will necessarily delay the final release of the site for alternative and/or unrestricted use, and results in additional spent fuel related costs while the spent fuel is stored in the ISFSI until the spent fuel is transferred to the DOE.

The transfer of spent fuel to the government's permanent (or interim) storage facility is based upon a 2020 repository startup date and fuel shipments at the acceptance rate proposed in U.S. DOE's Office of Civilian Radioactive Management, September 1998, Revised Draft Solicitation for Waste Acceptance and Transportation Services. The current study assumes that all spent fuel bundles will be transferred from the Humboldt site to the DOE in 2020.

Material which exceeds 10 CFR 61 Class C requirements, Greater Than Class C (GTCC), is assumed to be packaged in dry storage canisters and disposed of at a cost equivalent to the disposal cost for fuel bundles. These GTCC packages will be handled and stored with the spent fuel, and shipped for disposal with the spent fuel to the DOE repository. An equivalent transportation and disposal cost in dollars per cubic foot (cf) was calculated based on the spent fuel disposal fee of 1 mil/kilowatt-hour (kWh). This value was applied to the disposal volume of the GTCC fuel bundle containers. All disposal costs for LLRWs, including GTCC wastes, have been included in the estimates.

E. Basis for Study

The study determined the site-specific costs incurred in the preparation, decontamination and dismantling of the nuclear unit in accordance with the alternatives identified and the guidance established by the Nuclear Regulatory Commission (NRC). Estimates of labor man-hours and waste volumes were also derived for the individual scenarios. The study was based upon the current configuration and construction of the PG&E unit, site specific tasks which have been identified as a result of ongoing planning efforts, a detailed inventory and characterization of equipment and components, plant history and demonstrated dismantling techniques. Experience from current decommissioning projects as well as industry experience in decommissioning-related activities provided a basis for the costs. Industry references and/or handbooks were used, as appropriate, to estimate conventional cost components, e.g., materials and

consumables, equipment procurement and the demolition and dismantling of non-contaminated structures (in support of facility decontamination). The costs were totaled with the appropriate overall contingency applied.

The decommissioning study was developed using detailed engineering drawings, together with plant description and inventory documents and plant walkdowns. These drawings and documents were used to identify the general arrangement of the facilities and to estimate building concrete volumes, steel quantities, the numbers and size of components, and the degree of site restoration required. Based upon the walkdowns and actual plant condition and experience, factors were estimated for work difficulty that were incorporated into the site-specific unit cost factors.

Because decommissioning is labor-intensive, representative labor rates for the geographical region craft and salaried worker are essential for a meaningful site-specific decommissioning cost estimate. Accordingly, current cost of craft labor was provided by PG&E. Utility salary data used in the estimate was also provided by PG&E.

For purposes of the cost estimates, LLRW disposal costs were based on a 2009 LLRW study sponsored by PG&E and SCE "Establishing an Appropriate Disposal Rate for Low Level Radioactive Waste During Decommissioning." Class A waste disposal was based on using EnergySolutions as a disposal facility (with a transportation distance of about 800 miles). Class B and C waste disposal was based on using Waste Controls Specialists, Andrews County, Texas (transportation distance of about 1,700 miles).

F. Clean Building Demolition and Site Restoration

There are additional activities, beyond the removal of contaminated material that will be undertaken in the process of releasing the site for alternative use. This work includes costs for the remaining dismantling and grading operations. The Building Officials and Code Administrators National Building Code, widely adopted by most states, requires that retired structures may not be left in an unsafe condition. Specifically, Section 120.1, "Right to Deem Unsafe," states:

> All buildings or structures that are or hereafter shall become unsafe, unsanitary or deficient in adequate means of egress facilities, or which constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or which involve illegal or improper use, occupancy or maintenance, shall be deemed unsafe buildings or structures. All unsafe structures shall be taken down and removed or made safe and secure, as

> the code official deems necessary and as provided for in this section. A vacant building, unguarded or open at door or window shall be deemed a fire hazard and unsafe within the meaning of this code.

A retired power plant fits this definition of an unsafe structure which must be taken down and removed or made safe and secure. Securing, maintaining and guarding retired power plants indefinitely is costly, requiring either a full-time guard force or intrusion detection devices and alarms monitored by local law enforcement agencies, as well as general building maintenance to keep the structures in a safe condition.

Although reuse of a plant site for use as a future power plant site is feasible, repowering a decontaminated facility is not practical. The designs of new generation power plants are not likely to use the same size and configuration of components, nor require the same type of building enclosures. Optimum facility design will be sized to match the megawatt size of a replacement power plant, if any, either larger or smaller. For example, new combustion turbine-generators are modular, self-contained units that do not need a building enclosure. Combined cycle units may require larger turbine buildings to enclose the waste heat steam generators which supply steam to the turbine. The cost to renovate older buildings and bring them to current safety code standards, combined with the less-than-optimum facility design, makes reuse of the existing buildings an unlikely scenario. Furthermore, the existing components are likely to be of an obsolete design, more costly to operate and maintain and possibly not compatible with new instrumentation and control systems.

All contaminated systems and structures and the majority of clean systems and structures must be substantially removed in order to perform the radiological surveys required to release the site. As a result, this study assumes the demolition of all structures to at least three feet below grade.

Verifying that subsurface radionuclide concentrations meet NRC site release requirements may require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This will be necessary for those facilities and plant areas where historical records indicate the potential of radionuclides having been present in the soil, where inventory losses have been recorded, or where required to confirm that subsurface process and drain lines did not leak over the operating life of the unit.

Dismantling is clearly the most appropriate and cost-effective option and should serve as the foundation for the decommissioning cost estimate. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed.

G. Federal Regulations

The NRC provided initial decommissioning requirements in its rule "General Requirements for Decommissioning Nuclear Facilities" issued in the Federal Register of June 27, 1988, (53 FR 24018). This rule set forth financial criteria to decommission licensed nuclear power facilities. The regulations addressed decommissioning planning needs, timing, funding methods and environmental review requirements. The intent of the rule was to ensure that decommissioning would be accomplished in a safe and timely manner and that adequate funds would be available for this purpose. Subsequent to the rule, the NRC issued Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," which provided additional guidance to the licensees of nuclear facilities on the financial methods acceptable to the NRC staff for complying with the requirements of the rule. The regulatory guide addressed the funding requirements and provided guidance on the content and form of the financial assurance mechanisms indicated in the rule.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR and ENTOMB.

The DECON alternative assumes that any contaminated or activated portion of the plant's systems, structures, and facilities are removed or decontaminated to levels that permit the site to be released for unrestricted use shortly after the cessation of plant operations. The rule also places limits on the time allowed to complete the decommissioning process. For SAFSTOR, the process is restricted in overall duration to 60 years, unless it can be shown that a longer duration is necessary to protect public health and safety. The guidelines for the ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the unrestricted release limits for license termination.

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative. The resulting feasibility study, based upon an assessment by the Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some, if not most, reactors. However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. The NRC had considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments. However, the NRC staff has recommended that rulemaking be deferred, based upon several factors, e.g., no licensee has committed to pursuing the entombment option, the unresolved issues associated with the disposition of GTCC material, and the NRC's current priorities, at least until after the additional research studies are complete. The Commission concurred with the staff's recommendation.

The NRC published revisions to the general requirements for decommissioning nuclear power plants in 1996. When the regulations were originally adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the facility's operating licensed life. Since that time, several licensees permanently and prematurely ceased operations. Exemptions from certain operating requirements were required once the reactor was defueled to facilitate the decommissioning. Each case was handled individually, without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The new amendments allow for greater public participation and better define the transition process from operations to decommissioning.

Under the revised regulations, licensees will submit written certification to the NRC within 30 days after the decision to cease operations. Certification will also be required once the fuel is permanently removed from the reactor vessel. Submittal of these notices will entitle the licensee to a fee reduction and eliminate the obligation to follow certain requirements needed only during

operation of the reactor. Within two years of submitting notice of permanent cessation of operations, the licensee is required to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC. The PSDAR describes the planned decommissioning activities, the associated sequence and schedule, and an estimate of expected costs. Prior to completing decommissioning, the licensee is required to submit an application to the NRC to terminate the license, which will include a License Termination Plan (LTP).

TLG's site-specific cost estimates and decommissioning alternatives are formulated within the framework of the NRC's rule.

H. Selecting a Decommissioning Method

SAFSTOR was selected as the preferred alternative for the decommissioning of Humboldt Unit 3 following shutdown in 1976. Earlier decommissioning studies considered delaying DECON until the fuel had been removed from the site by DOE. Now that the spent fuel has been relocated from the storage pool to the on-site ISFSI, the unit will be available for the decontamination and dismantling. Decommissioning coordinated with spent fuel management minimizes further commitments associated with the maintenance, surveillance and security of the unit. It also allows use of the plant's remaining knowledgeable staff, a valuable asset to a well-managed, efficient decommissioning program.

Although PG&E will likely be responsible for storing its spent fuel on-site until DOE takes delivery, the coordination of decommissioning with spent fuel management allows PG&E to remove all other radioactive materials in the interim. This is important because the unit cannot terminate the license(s) until all radioactive material is removed, including spent fuel. By removing non-fuel related radioactive materials, while waiting for DOE to take delivery of spent fuel, this provides a reasonable means for terminating the license for the site in the shortest possible time. Furthermore, this reduces the long-term costs and commitments associated with the maintenance, surveillance and security requirements of the conventional delayed dismantling alternative.

1. The Process of Decommissioning a Nuclear Power Reactor Using the DECON Alternative

This option is not applicable to Humboldt Unit 3 since the unit has been in a SAFSTOR configuration for many years.

2. SAFSTOR, Pre-Decommissioning, and Decommissioning

The process of taking a unit out of SAFSTOR and completing decommissioning will require the following activities. The activities are organized by the general sequence of work, with the period designations consistent with the cost estimate.

a. Period 2 – Safe Storage and Decommissioning Preparations

With the recent completion of spent fuel transfer to the ISFSI, the emphasis has shifted to activities associated with preparation for active decommissioning tasks. Site activities include: preventive and corrective maintenance on essential systems, general building maintenance, Operations and Maintenance (O&M) of heating and ventilation equipment, routine radiological inspections of contaminated structures, maintenance of structural integrity, and monitoring of environmental and radiation conditions.

The estimate includes some specific decommissioning preparation line items based upon the in-depth planning activities which have occurred prior to and including 2008.

The following additional preparatory activities have occurred or are scheduled to occur prior to the start of formal decommissioning: abatement of remaining asbestos, performance of a vessel and internals activation analysis, performance of a radiological characterization survey of work areas, major components, and structures (including the drywell), sampling of internal piping and primary shield cores, development of cost and work control program, development of detailed work plans and schedules, development of a radioactive waste processing and disposal plan, and the development of the engineering decommissioning licensing basis.

b. Period 3 – Site Preparations

In anticipation of decommissioning, preparations are undertaken to provide a smooth transition from safe storage. The organization required to plan and manage the intended decommissioning activities is assumed to be assembled from available utility staff and outside resources, as required. For purposes of this study, a combination of utility and outside contracted resources is utilized to manage the decommissioning and to manage and perform the physical decommissioning activities and associated management functions. A combination of utility staff and outside contracted resources will be employed to manage the processing and disposal of decommissioning waste, including the disposition of equipment, components, and material and the disposal of all decommissioning waste, including concrete and steel structural debris, contaminated soil, and associated hazardous and mixed waste.

Significant technical and engineering planning and evaluation must be performed in preparation for physical decommissioning activities. Technical requirements documents are prepared for systems, components, and structures during each phase of the decommissioning (many of these requirements documents are already complete). These engineering requirements are then transferred into specific documents for the preparation of material and services contracts and for the preparation of detailed work plans and work authorization documents. Also, regulations require the preparation of an LTP. The plan is required at least two years prior to the anticipated date of license termination. The plan includes a site characterization, description of the remaining dismantling activities, plans for site remediation, procedures for the final radiation survey, designation of any reuse of the site, an updated cost estimate to complete the decommissioning, and resolution of environmental concerns. The NRC will make the plan available for public comment. Plan approval will be subject to conditions and limitations as deemed appropriate by the NRC. Much of the information needed in preparing this submittal will have been used to develop the

detailed engineering plans and procedures needed to support Period 4 activities.

Other engineering and planning work activities performed during Period 3 include: evaluating alternatives for the removal of highly radioactive reactor vessel components, identifying specialty contractors, selecting the methodology and requirements for systems and structures decontamination, preparing procedures for radioactive material disposal, and designing and procuring specialty tooling.

In preparation for the actual decommissioning, the following physical tasks are performed and included in the cost estimate:

- The design and licensing of the ISFSI facility (completed).
- Constructing and modifying site support and storage facilities, as required (in progress).
- Processing and disposal of residual liquid, solid, and mixed waste inventories (in progress).
- Procuring waste containers, including specialty containers for the disposition of highly activated and hazardous materials. The types of containers needed to support decommissioning operations include strong-tight steel boxes and drums, shielded transport casks, dry fuel storage liners, high integrity containers, intermodal containers, and shipping transportation trailers.
- Developing procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste including dry active waste, resins, filter media, metallic and non-metallic components generated in decommissioning, site security and emergency programs, hazardous waste identification and processing, and industrial safety.

c. Period 4 – Decommissioning Operations and License Termination

The decommissioning cost estimate has divided this period into sub-periods to assist in the development of cost elements and to better understand the work sequence and its impact on the overall duration of the work phase.

(1) System Removal

This phase includes: construction of temporary facilities and shielding, modification of existing storage facilities to support the dismantling activities, decontamination of selected systems and components, procurement of specialty tooling, and modifications to systems and structures to support handling of the waste from reactor vessel and spent fuel pool removal.

The following is the planned chronological list of the system and component removal activities performed during this sub-period.

- Removal of major turbine components, e.g., generator, turbine and condenser;
- Removal of components and systems in the Turbine Building, including piping, pumps, heat exchangers and associated mechanical and electrical components;
- Removal of electrical control boards, distribution buses, and transformers;
- Provide equipment handling capability and personnel access to equipment and components within the Refuel Building;
- Remove equipment and components in the Refuel Building; and
- Removal of Hot Machine Shop equipment and piping.

(2) Reactor Vessel Removal

The following is a list of the major system and component removal activities performed during this sub-period:

- Removal of the reactor vessel closure head. For estimating purposes, the reactor closure head is assumed to be disposed of as low-level radioactive waste. Segmentation of the head may be desirable to increase packaging efficiency and minimize its disposal volume.
- Removal and segmenting of the steam dryer, core spray piping, feedwater sparger and chimney, as required, for transport. Component segmentation may be performed in the reactor vessel; however, relocation to the spent fuel pool would allow

greater control with respect to water clarity and provide greater flexibility in packaging, i.e., homogenization of the waste forms. Material meeting 10 CFR 61 Class C criteria or less may be routed for off-site disposal at a commercial shallow-land waste disposal facility.

- Disassembly/segmentation of remaining reactor internals, including the core shroud, core support assembly, control rod guide tube and other miscellaneous components. These operations will probably be confined to the reactor vessel due to the higher activation levels of the components.
- Segmentation/sectioning of the reactor vessel, placing segments into shielded containers. The operation is performed remotely, in-air, using a shielded work platform and a contamination control envelope. Sections are placed in liners and stored in the spent fuel pool. The liners are loaded into shielded transport casks for disposal at a commercial shallow-land waste disposal facility.
- Removal of control rod drive housings from reactor vessel bottom head and packaging for controlled disposal. The bottom head may be highly contaminated from the swarf generated from in-vessel segmentation activities. It may be advantageous to relocate the head to the spent fuel pool for additional processing and preparation for disposal. This will also significantly lower the working radiation levels within the drywell and allow disassembly work to proceed.
- Removal of systems and associated components as they become non-essential to the vessel removal operation, related decommissioning activities, or worker health and safety (e.g., waste collection and processing systems, electrical and ventilation systems, etc.).
- Removal and decontamination of the steel vent pipes connecting the drywell to the suppression chamber.

- Decontamination and removal of the suppression chamber steel, disposition of the waste as appropriate.
- Removal of contaminated equipment and material from the Radwaste Treatment and Refueling Buildings.
- Decontamination of selected areas within contaminated site buildings and facilities that are accessible after removal of structures, systems and components. Package and dispose of all remaining low-level radioactive waste, and any remaining hazardous and toxic materials.
- Removal of remaining components, equipment, and plant services in support of the area release survey(s).

Components removed in the decontamination and dismantling of Humboldt Unit 3 will be routed to an on-site central packaging and processing area. Contaminated material will be characterized and packaged for disposal at the designated low-level radioactive waste disposal facility. Material that has been surveyed and found to be free of contamination will be released as scrap.

(3) Preparing Buildings for Demolition

Buildings in the Restricted Area (RA) will be decontaminated as necessary to allow conventional demolition. Structures will be removed down to three feet below grade.

Removal and decontamination of steel drywell liner. Contaminated surfaces can be designated for decontamination while activated portions are packaged for direct disposal. This work would also include the removal of activated concrete from behind the drywell steel and the concrete floor slab at the bottom of caisson, and packaging the material for direct disposal.

Decontaminate the remainder of Reactor Building, Turbine and Radwaste Treatment Building structures, e.g., scarifying concrete surfaces until residual levels of contamination are acceptable for demolition.

Remaining systems will be removed, surveyed and either released or disposed of as radioactive waste.

Building decontamination debris and waste soil will be shipped using intermodal containers via truck to EnergySolutions.

The spent fuel pool walls (the 3 exterior walls) and tremie floor beneath the pool will be removed and disposed of as radioactive waste. Removal of the walls and tremie requires special engineering controls due to the depth of the structures and soil conditions. A combination of ground freezing and sheet pile is expected to be utilized to provide access to this area.

(4) Building Demolition, Yard Work, Soil Remediation

Buildings in the RA will be demolished using conventional demolition. Most structures (including the Refuel Building and Turbine Building) will be removed down to three feet below grade. Buildings entirely at grade will be completely removed. The Radwaste Building will also be removed in its entirety.

The internally contaminated pipe tunnel between the Radwaste Building and Turbine Building is expected to be filled with concrete, the soil surrounding the tunnel excavated, and the tunnel will be segmented into blocks and shipped to and disposed of at EnergySolutions.

Contaminated soil will be excavated, and processed as needed to remove excess moisture.

Removal of contaminated soil and contaminated drain and catch basins. Remediation of the intake and discharge canals.

Building demolition debris and contaminated soil will be packaged in intermodal containers and transferred via highway transport to EnergySolutions.

(5) Final Site Survey – License Termination

At least two years prior to the anticipated date of license termination, an LTP is required. Submitted as a supplement to the Final Safety Analysis Report or its equivalent, the plan must include: a site characterization, description of the remaining dismantling activities, plans for site remediation, procedures for the final radiation survey, designation of the end use of the site, an updated cost estimate to complete the decommissioning, and any associated

environmental concerns. The NRC will notice the receipt of the plan, make the plan available for public comment, and schedule a local hearing. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)." This document incorporates the statistical approaches to survey design and data interpretation used by the Environmental Protection Agency. It also identifies state-of-the-art, commercially available instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will terminate the operating license if it determines that site remediation has been performed in accordance with the LTP, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release.

d. Period 5 – Site Restoration

Excavated areas will be backfilled to grade using clean fill. The existing intake and discharge canals will also be backfilled.

Site areas affected by the dismantling activities are cleaned and the plant area graded as required to prevent ponding and inhibit the refloating of subsurface materials.

The remaining Class B and C radioactive waste will be shipped and disposed of at a yet to be approved licensed Class B/C disposal facility (assumed for purposes of the estimate to be Andrews County, Texas).

e. Post Period 5 – ISFSI Operations and Demolition

The ISFSI will operate under a separate and independent license (10 CFR §72) following the termination of the Section 50 operating license. The ISFSI will continue to operate until all spent fuel and GTCC material has been transferred to the DOE. This study assumes that the DOE will transfer all spent fuel from Humboldt Unit 3 in the year 2020.

At the conclusion of the transfer process, the ISFSI will be decommissioned. The storage modules are not assumed to be activated from the storage of fuel, due to the age of the fuel when placed in the modules and the relatively short residence time. Consequently, this estimate does not include the cost of any significant decontamination of the ISFSI facility. Confirmation of the radiological status will be obtained through surveys and sampling of the modules.

The Commission will terminate the ISFSI 10 CFR 72 license when it determines that site remediation has been performed in accordance with an LTP and the terminal radiation survey and associated documentation demonstrate that the structure is suitable for release. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

The assumed design for the ISFSI is based upon the use of a multi-purpose canister installed in a steel-lined below grade engineered concrete vault. For purposes of this cost analysis, it is assumed that once the inner canisters containing the spent fuel assemblies have been removed, required decontamination performed, and the license for the facility terminated, the concrete vault can be dismantled using conventional techniques for the demolition of reinforced concrete. After removal of the concrete vault and loading ramps, the area will be graded and landscaped to conform to the surrounding environment.

I. Contingency

Contingency has been added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude. This type of contingency is consistent with “Contingencies” as defined in the American Association of Cost Engineers “Project and Cost Engineers’ Handbook,” which defines it as

"specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, this cost analysis includes contingencies to cover these types of expenses.

The total amount of contingency that has been included is consistent with the "Technical Position Paper for Establishing an Appropriate Contingency Factor for Inclusion in the Decommissioning Revenue Requirements." This paper's objective was to identify contingency that would "demonstrate that they [owners of California nuclear power plants] have made all reasonable efforts to conservatively establish an appropriate contingency factor for inclusion in the decommissioning revenue requirements," provided in workpapers to Chapter 4.

Contingency was estimated on a line item basis consistent with values extracted from the AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates." The composite contingency is approximately 21.7 percent. Based on the previously referenced technical position paper, additional contingency was added to reflect an overall project contingency of 25 percent. This contingency was incorporated on a line item basis, with each line item receiving a pro-rated share of the increase. Consistent with the contingency explanation defined above, no contingency has been applied to activities that are already complete.

J. Conclusion

The cost projected to decommission (SAFSTOR 2010) Humboldt Bay Unit 3 is $499.4 million in 2008 dollars. This total excludes $385,520 that has been classified as CPUC disallowances, but includes $82.3 million in costs incurred or projected to be incurred through 2009. Costs expected to be incurred after 2008 include a 25 percent contingency.

K. Table

TABLE 6-1
PACIFIC GAS AND ELECTRIC COMPANY
HUMBOLDT UNIT 3
COST AND SCHEDULE ESTIMATE SUMMARY
DECOMMISSIONING STARTING IN 2010
(THOUSANDS OF 2008 DOLLARS)

Line No.	DECON	NRC Lic Term & Site Restore	Spent Fuel Mgmt.	Schedule (Months)
1	Unit 3 (minus disallowed costs)	$422,726	$76,647	81
2	CPUC Disallowed Scope	386		N/A
3	Unit 3 Total	$423,112	$76,647	

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 7

HUMBOLDT BAY POWER PLANT UNIT 3 – PRE-DECOMMISSIONING ACTIVITIES

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 7
HUMBOLDT BAY POWER PLANT UNIT 3 –
PRE- DECOMMISSIONING ACTIVITIES

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 7
HUMBOLDT BAY POWER PLANT UNIT 3 – PRE-DECOMMISSIONING ACTIVITIES

A. Introduction

1. Scope and Purpose

The purpose of this chapter is to demonstrate the reasonableness and prudence of early decommissioning projects at Humboldt Bay Power Plant Unit 3 (Humboldt Unit 3 or Humboldt) that have been substantially completed as of the date of this Application. This chapter also discusses the status of other authorized preparatory decommissioning projects that are currently in process.

2. Organization of the Remainder of This Chapter

The remainder of this chapter is organized as follows:

- Section B – Background;
- Section C – Reasonableness of Completed Projects;
- Section D – Projects in Process;
- Section E – Litigation Associated with Humboldt Nuclear Activities;
- Section F – Application for Interim Disbursements in 2009; and
- Section G – Conclusion.

B. Background

Humboldt Unit 3 is a 65-megawatt (MW) nuclear reactor that began commercial operation in 1963. The plant was taken off-line in 1976 to refuel and to make seismic modifications. However, in 1979, prior to the completion and acceptance of the seismic modifications, the nuclear incident at Three-Mile Island occurred. As a result, the Nuclear Regulatory Commission (NRC) mandated a comprehensive series of other modifications that would have required additional investment. These additional investments, however,

rendered restarting the plant as uneconomic; as a result, the plant was never returned to service.[1]

Over a period of years a number of preparatory decommissioning activities have been authorized by the California Public Utilities Commission (CPUC or Commission), primarily involving or otherwise relating to the licensing, design, fabrication and construction of an Independent Spent Fuel Storage Installation (ISFSI). These projects have now been completed by Pacific Gas and Electric Company (PG&E or the Company) and, as required, PG&E submits these completed projects for reasonableness review. Other projects unrelated to the ISFSI are ongoing and are updated for the Commission's information.

1. Licensing, Design, Fabrication, and Construction of the Independent Spent Fuel Storage Installation and Loading of Spent Fuel (Project Completed and Subject to Reasonableness Review)

In 1997, PG&E updated the cost estimate for the decommissioning of Humboldt Unit 3 as part of its 1999 General Rate Case (GRC). In that proceeding, PG&E informed the CPUC that early decommissioning of Humboldt Unit 3 could yield economic benefit, but as a prerequisite to performance of early decommissioning, the spent nuclear fuel would have to be moved to an on-site dry cask storage facility, also known as an ISFSI.[2]

While ISFSI construction has been proceeding at many facilities around the United States, Humboldt faced unique design and licensing challenges because of seismic issues. PG&E requested in the 1999 GRC a disbursement of funds from the Humboldt Nuclear Decommissioning Trusts for the initial design and licensing of an ISFSI.

In the 1999 GRC Decision 00-02-046, the CPUC approved PG&E's request for authorization to disburse funds from the Humboldt Nuclear

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[1] Pacific Gas and Electric Company 1999 General Rate Case Exhibit (PG&E-14), Funding for Preliminary Humboldt Decommissioning Activities, p. 1.

[2] The only commercial fuel storage facility (in Illinois) is full and will not accept additional spent fuel; however, Private Fuel Storage, a joint effort funded by eight nuclear utilities, is pursuing a private dry cask storage facility in Utah. The NRC issued its Safety Evaluation Report on the project, finding that there are no safety or environmental concerns.

Decommissioning Trusts for the purpose of securing the NRC licenses needed for PG&E's proposed ISFSI.[3] The CPUC held that it was reasonable for PG&E to seek authorization for an on-site dry cask storage facility as a significant step towards the early decommissioning of Humboldt Unit 3.[4] Additionally, the CPUC acknowledged that while "PG&E has an idea of what the costs of obtaining the license and constructing the dry cask storage will be…it does not know for sure."[5]

On December 15, 2003, PG&E filed an application with the NRC for a license for a dry storage facility at Humboldt. During the licensing and design phase, PG&E successfully addressed many challenging seismic issues and received a license on November 17, 2005, within the 2-year time frame normally taken for applications of this type. In total, $12.0 million was authorized and $12.2 million was spent on design and licensing activities.

While licensing was proceeding, PG&E also requested and obtained authorization for withdrawal of funds to proceed with fabrication and construction of the ISFSI and the related loading of fuel. Approximately three years after receiving its license, PG&E successfully loaded the last cask containing fuel assemblies into storage vaults. In total, 390 fuel assemblies have been stored. The total amount expended for all these activities was $54.4 million.

2. Pre-Decommissioning Activities Related to the Independent Spent Fuel Storage Installation (Projects Completed and Subject to Reasonableness Review)

The Commission also approved a series of activities related to the construction and loading of the ISFSI.

First, the spent fuel pool contained solid material other than the spent fuel itself. Radioactive hardware within the pool (such as highly radioactive reactor parts) and residue from 25 years of pool storage were categorized as Class B and Class C waste. In the last Nuclear Decommissioning Cost Triennial Proceeding (NDCTP), intervenors argued for, and the Humboldt

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[3] Decision 00-02-046, Conclusion of Law 38.

[4] Decision 00-02-046, Finding of Fact 275.

[5] Decision 00-02-046, p. 385.

community sought, disposal of Class B and Class C waste, to the extent practicable, before the closure of the Barnwell Facility (the only facility that was accepting waste of this type). PG&E diligently pursued the opportunistic shipment and burial of relatively high radiation content materials and it received Commission approval for this shipment and burial in Resolution E-4025. In total, $9.5 million was authorized for these activities which were completed for $7.5 million in June 2008.

Second, in order to efficiently implement the ISFSI project, PG&E was required to remove certain abandoned equipment and materials (*e.g.*, tools, hoses, and similar items) that otherwise would have interfered with efficient loading and transport of the spent nuclear fuel. Rather than continuing to store such materials on site, PG&E recommended and obtained approval for disposing of these materials and certain other opportunistic items. PG&E had received a quote for burial of these low-level waste items that was far below the waste costs estimated in the last NDCTP. This activity was authorized for $1.3 million and completed for $1.5 million in November 2007.

3. Other Pre-Decommissioning Projects (Ongoing: Information Only)

a. Resolution E-3737 (October 10, 2001)

Resolution E-3737 authorized $3.85 million for other preparatory decommissioning activities, subject to reasonableness and prudence review. PG&E planned to do these projects during the ISFSI licensing period and completed two of them before 2005 at $1.508 million, which were deemed prudent and reasonable in the last NDCTP. The remaining projects, which have not been completed as of this NDCTP, are the following:

- Activation Analysis of the Reactor Vessel, Reactor Internals and Surrounding Structures; and
- Miscellaneous Decommissioning Planning Activities.

b. Resolution E-4025 (October 5, 2006)

Resolution E-4025 approved $1,035,000 for a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) study, which is currently in process.

c. Advice Filing 3147-E – Approved as a Tier 2 Advice Filing on November 1, 2007

Advice Filing 3147-E requested approval to disburse up to $31.9 million for a series of listed projects, of which the disposal of Class A, B, and C Low-Level Radiological Waste (LLRW) have been completed as of the date of this filing as described in Section C. The remaining projects have not been completed as of the date of this filing. The status of these remaining projects are described further in Section D.

4. Standard for Review

At the request of an intervenor in the last NDCTP, the Commission was asked to impose an independent committee on PG&E to oversee its decommissioning activities. The Commission rejected this request, finding that it would interfere with the utility's managerial functions. The Commission, then further defined what a utility must do to show it acted in a "reasonable and prudent manner" with regard to its decommissioning activities and defined how it would evaluate the reasonableness of the utilities' activities:

> To properly manage the decommissioning process, to be reasonable and prudent, by using good utility practices, as required by this Commission, a utility must show (in this narrow instance) that it sought and used personnel who possessed the available and necessary skills, experience and knowledge to perform the task. So to reasonably undertake decommissioning a nuclear generating plant, PG&E (as well as Edison and SDG&E) must employ properly trained experts who have experience relevant to decommissioning a nuclear plant to plan and perform the decommissioning. People with this skill set and experience may or may not be on the typical electric utility's staff. Therefore, we expect PG&E to demonstrate in all subsequent decommissioning-related proceedings that throughout the decommissioning of Humboldt (and later for Diablo) it sought out and acquired the services of well-trained and experienced personnel appropriate to the tasks. We expect PG&E to identify, and aggressively pursue employing, the right people for the job. We need not care whether these people are employees of PG&E or contractors: that is an operating decision best resolved by the utility.[6]

[6] Decision 07-01-003, mimeo pp. 23-24 (footnote omitted).

In the next section, PG&E will address compliance with this standard and demonstrate that it retained personnel that were the right people for the job.

C. Reasonableness of Completed Projects

PG&E hereby requests reasonableness review of the following completed activities:

- Licensing, design, fabrication, and construction of the ISFSI and loading of spent fuel ($54.4 million);
- Activities related to placement of spent fuel into the ISFSI, including shipment and burial of irradiated and contaminated hardware within the spent fuel pool and the shipment and burial of associated pool resins ($7.5 million); and
- Disposal of work items associated with ISFSI loading (*e.g.*, tools, hoses, and other abandoned equipment) and of associated soils and asphalt and other specified items ($1.5 million).

The final costs of these projects and the funds authorized for withdrawal from the trusts are shown in Table 7-1 below:

TABLE 7-1
PACIFIC GAS AND ELECTRIC COMPANY
AUTHORIZED VS. TOTAL COSTS

Line No.	Activity	Authorized Funding	Total Cost	Variance	Percent
1	Licensing, Design, Fabrication, and Construction of the ISFSI and Loading of Spent Fuel	$47,700,000	$54,361,875	$6,661,875	14.0
2	Shipment and Burial of the Spent Fuel Pool Irradiated Hardware, Contaminated Hardware, Resin	9,524,100	7,497,699	(2,026,402)	(21.3)
3	Removal and Disposal of Abandoned Equipment, Soils, Asphalt, Tools, Hoses	1,330,000	1,501,981	171,981	12.9
4	Total	$58,554,100	$63,361,555	$4,807,455	8.2

As shown in this table, these projects were performed with an overall variance that was within 8.2 percent of authorized amounts. Each project was performed and managed by personnel experienced in nuclear fuel handling and

in the design, construction and implementation of an ISFSI. No recordable injuries or non-routine radiation exposures occurred during these projects.

In each instance, project progress was monitored daily by an afternoon meeting involving the project management team, including PG&E's project manager (Loren Sharp) and Holtec International. That team satisfied the prudency criteria for training and experience set forth by the Commission in Decision 07-01-003.

The resume of PG&E's project manager, Loren Sharp, is attached as Appendix A. As is indicated by his resume, Mr. Sharp has had extensive project management experience, including extensive experience in managing and disposing of toxic hazardous waste. In addition, he was a licensed nuclear engineer with substantial experience in managing plant operations. PG&E hired Mr. Sharp specifically with the goal of managing various nuclear power plant projects, including matters involving waste disposal and decommissioning. He was selected by management after an extensive executive search to find "the right person for this job."

The selection of the lead contractor for the ISFSI project also involved a competitive process. In May 2000, PG&E received bids from five vendors to design, license, fabricate, and deliver a dry cask storage system per specifications provided in PG&E's request for Proposal. After six weeks of review by commercial and technical review teams Holtec was selected in July 2000 based on Holtec's design features that met seismic requirements at the site and reasonable costs. Specifically, Holtec International had extensive experience in contracting, installing and implementing ISFSIs at over 20 nuclear generating facilities, including those at American Electric Power (D.C. Cook), Energy Northwest (Columbia), Entergy (Indian Point, Vermont Yankee), Exelon (Dresden, LaSalle), First Energy (Perry), Portland General Electric (Trojan), and Southern Company (Farley, Hatch). In addition to manufacturing the casks and designing the ISFSI itself, Holtec employed experienced cask processors for all cask processing activities. Holtec's experience in these endeavors is documented in their company's description, attached as Appendix B.

From an accounting standpoint, each project was monitored monthly and forecast expenses were compared to actual expenditures, broken down by contracts, materials, and PG&E labor. In the case of the ISFSI projects, PG&E

maintained 20 separate work scopes to monitor costs. The cost deviations which did occur were those typical of a project of this type, where construction issues and timing can be resolved only after the project is underway and pertinent construction information uncovered (*e.g.*, the information that can only be obtained/discovered after partial project implementation).

1. Licensing, Design, Fabrication and Construction of the Independent Spent Fuel Storage Installation and Loading of Spent Fuel (Project Completed—Reasonableness Review Requested)

This project has been successfully completed close to the approved budget. A pictorial summary of various stages of the project, including fuel loading and construction of the ISFSI, is attached as Appendix C. This pictorial summary attests to the complexity of the job and demonstrates PG&E's achievement in successfully completing this project. In total, 390 fuel assemblies were placed into five dry casks within the spent fuel pool; the 160,000-pound dry casks were then lifted out of the pool, decontaminated, welded shut and successfully transported to the onsite ISFSI.

The fuel loading into casks was particularly challenging. The Fuel Handlers, who were required to move these relatively fragile fuel assemblies from the spent fuel racks into specific storage slots within the casks, were highly trained in doing work of this type and successfully loaded all assemblies without incident. PG&E utilized a specially designed Davit crane operating in a confined space to lift the cask into the pool and then remove the cask with fuel. This cask weighed 160,000 pounds and contained 80 fuel assemblies. After the cask was removed from the spent fuel pool it was decontaminated, welded shut, dried internally and backfilled with helium. Once the cask processing was completed, the cask was removed from the refueling building on a rail dolly, then lifted by a transporter and moved to the on-site ISFSI.

The main reason for modest cost overruns in this phase of the project were new additional NRC requirements which triggered delay and increased cost escalation, as well as special design issues associated with the Davit crane and cask decontamination procedures because of the confined

work space within the spent fuel pool. All of these deviations are similar to those that routinely arise during complex construction projects, when certain impediments cannot be fully evaluated (and related "fixes" identified) until the complex work is actually being undertaken.

2. Shipment and Burial of the Spent Fuel Pool Irradiated Hardware, Contaminated Hardware, Resin

To facilitate removal and loading of spent fuel from the spent fuel pool, PG&E sought and obtained approval from the Commission for removal of irradiated hardware (fuel channels, poison curtains, stellite balls, and other miscellaneous materials) within the pool, and also the disposal of other Class B and C LLRW, such as resins. The irradiated hardware occupied a significant portion of the pool and without removing this hardware first, removal of the spent fuel and lifting the fuel racks would not have been possible. In addition, removal and burial of this material was expedited because of its relatively high radiation classification (Class B and C) which could only be shipped to the burial facility at Barnwell, South Carolina. This burial facility is now closed to PG&E and other Non-Atlantic Compact utilities as of June 30, 2008.

PG&E successfully completed this project more than 20 percent under budget. The principal reason for the favorable variance was the processing (volume reduction) of the resin prior to disposal at Barnwell. The personnel managing this project were the same as the managers for the ISFSI construction and conducted the loading with additional principal contractors familiar with LLRW disposal. Again, they were highly experienced in managing the disposal and shipment of waste of this type, as is shown in Appendix D.

3. Removal and Disposal of Abandoned Equipment, Soils, Asphalt, Tools, Hoses (Completed—Reasonableness Review Requested)

This work was required to dispose of radioactive waste associated with the ISFSI project. This waste was composed of contaminated soils/asphalt from the Humboldt Unit 3 yard and other contaminated items (used tools, hoses, and similar items). Since these materials would eventually have to

be removed anyway, it was advantageous to do so before the cask processing activities.

As part of this work, PG&E removed, packaged, and disposed of abandoned equipment such as the control rod drive hydraulic pumps and related piping; the reactor water cleanup heat exchanger resin tank and related piping and controls; the spent fuel energy absorber; and the service cooling water heat exchangers and related piping and controls that were authorized in Commission Resolution E-4025 dated October 5, 2006. All Class A waste was disposed using Energy Solutions (Clive, Utah), which provided a price significantly less than the pricing that was used in the 2005 NDCTP.

The additional $170,000 variance above budget largely occurred because more quantities of waste were shipped as part of this project than originally anticipated. This in no way diminishes the successful effort of PG&E in efficiently removing this waste in conjunction with the ISFSI project.

D. Projects in Process

PG&E is currently developing a detailed decommissioning plan for Humboldt and has a number of other authorized preliminary decommissioning projects that are in process. To facilitate future reasonableness review, PG&E is providing an updated status report on these projects. It is our expectation that any Commission objections to the processes, procedures and timing deployed by PG&E should be raised in this 2009 NDCTP proceeding to avoid acting in a manner inconsistent with expectations.

Currently, PG&E's principal pre-decommissioning activity involves developing detailed work plans and integrated schedules for full Humboldt decommissioning. Developing an accurate schedule is time consuming and requires carefully defining the scope of work and rigorous planning. PG&E decided to allocate sufficient planning time to revise and update the plans such that all the major projects could integrate their plans and schedules. The overall planning revision effort for Humboldt Unit 3 decommissioning is scheduled to be completed June 2009. The effort was initiated in July 2008.

The planning structure for Humboldt Unit 3 decommissioning employs a hierarchical system of plans and supporting analyses. The Decommissioning Project Execution Plan is the upper tier document for the planning structure and

is supported by subordinate plans that are appended to the Project Execution Plan. The supporting plans define blocks of related tasks to be performed during the decommissioning. For example, the Transportation Plan evaluates how materials are to be transported off-site including the logistics of staging waste containers on site. The Waste Management Disposal Plan evaluates the methods and costs associated with handling and disposal of radioactive wastes.

PG&E sought the help of highly experienced contract staff to assist with planning the Humboldt Unit 3 decommissioning and author the plans. Four major companies supplied personnel with experience in decommissioning at 12 sites throughout the United States. The plan authors have drawn upon their many years of personal decommissioning experience as well as collective lessons learned by others at the many commercial nuclear and U.S. Department of Energy (DOE)/Department of Defense (DOD) facilities that have undergone decommissioning.

The plans also integrate the expertise of industry subject matter experts (SME) on a range of specialized topics including radiation protection, radioactive waste, engineering, environmental issues, and financial matters

Finally, PG&E engaged field personnel to obtain the hands-on perspective to add balance to the plans. Numerous walk downs were conducted by several independent teams (*i.e.*, Conceptual Planning, Projects, Work Control, etc.). Field personnel add realism and provide critical feedback on methods, schedules, equipment needed, and the risks associated with plan implementation.

Consistent with the Commission's expectations expressed in Decision 07-01-003, a listing is attached as Appendix D of various work responsibilities associated with decommissioning planning, and the experience of applicable members of the planning team.

PG&E has established separate work orders to track spending authorized through the advice filing process. The budgets and authorized preliminary decommissioning activities, many of which are being incorporated into the various studies referred to above, include:

- Activation Analysis of the Reactor Vessel, Reactor Internals and Surrounding Structures: $100,000;

- Multi-Agency Radiation Survey and Site Investigation Manual Study: $1,035,000;
- Decommission Areas for Packaging Waste Material in Preparation for Shipment: $13,100,000;
- Operation and Maintenance of ISFSI: $4,000,000;
- Purchase of a Greater Than Class C (GTCC) Radiological Waste Cask: $1,100,000;
- Cross Contamination Plan: $900,000;
- Replacement of the Rad Protection Access Software System: $600,000;
- Employee Emergency Notification System: $400,000;
- Emergency Condenser Asbestos Removal: $400,000; and
- Infrastructure for Facility Modifications: $900,000.

1. Activation Analysis of the Reactor Vessel, Reactor Internals and Surrounding Structures

Minor effort has been put into this project to date. PG&E has been able to determine enveloping estimates of the type and potential volume of the waste that the reactor vessel will generate when it is ultimately removed for disposal. The reactor vessel is the largest component that has the potential to contain waste that will be required to be classified as Greater Than Class C (GTCC). GTCC is a level of radioactive waste that cannot be disposed of at a licensed LLRW facility and must be stored onsite until it is taken and disposed of by the DOE. There is still a need to understand the radiological conditions of the reactor vessel to assist in the determination of the best method of disposal of the vessel.

A complete activation analysis will require the removal of the reactor vessel head utilizing a 75-ton overhead crane. PG&E's 75-ton crane has been laid up since the early 1980s and will require refurbishment prior to use.

For planning purposes, the enveloping estimates used to determine the type and potential volume of waste should be adequate to estimate volumes of GTCC and reactor vessel disposal options. However, a complete

analysis of the reactor vessel will still be required to finalize the disposition of the reactor vessel. The crane refurbishment requirements will be factored into the scope of the project funding allocated.

2. Multi-Agency Radiation Survey and Site Investigation Manual Study

This survey and study is an assessment of the final radiological characterization of the decommissioned plant site required prior to the start of decommissioning, with specific focus on the final status surveys that are carried out to demonstrate compliance with cleanup regulations. This document incorporates the statistical approaches to survey design and data interpretation issued by the Environmental Protection Agency (EPA). This work effort takes approximately two years to complete due to negotiations with the NRC and the State of California. A significant amount of work has been completed on this work scope identifying the Derived Concentration Guideline's (DCGL) is currently under review by PG&E prior to submittal to the NRC for their review and approval.

3. Decommission Areas for Packaging Waste Material in Preparation for Shipment

Four areas have been identified to provide indoor locations for packaging waste material in preparation for shipment. These areas include the Reactor Feed Pump Room, Turbine Generator/Condenser, Hot Machine Shop, and the Condenser Pipe Tunnel. These areas contain many items that are contaminated that can be disposed of at Energy Solution's Clive, Utah disposal site. Removal of the equipment associated with the areas mentioned above to prepare the remaining areas as radwaste packaging and staging areas is considered a prudent and effective project. Removal and disposal of this equipment and the reuse of the remaining areas is the most cost effective method for establishing the enclosed, shielded, airborne-monitored and ventilated area required for radwaste packaging. No new structures will be built on site for shipping waste, and radioactive components and equipment in current areas will be removed and disposed of at a licensed radioactive waste disposal site. The remaining area will meet and/or exceed the requirements for the safe packaging of radioactive

waste. Work packages are currently being prepared to perform the work scope related to the removal of the Turbine Generator/Condenser.

4. Ongoing Costs of Independent Spent Fuel Storage Installation

The used spent fuel at Humboldt Unit 3 has been moved from the spent fuel pool to the ISFSI, with the fifth cask being lowered into the vault on December 11, 2008. The ongoing costs for the ISFSI include security, NRC fees, NRC inspections, and maintenance of the ISFSI facility. This scope of work is now implemented, with minor costs incurred to date.

5. Purchase of Greater than Class C Radiological Waste Cask

The need for a GTCC cask for the disposal of this type of radioactive waste has been confirmed through analysis of the reactor vessel and other areas of Humboldt. There is approximately a 2-year lead time for the fabrication and delivery of this type of cask, which was included in the original dry cask system proposal from Holtec International as an option. The cask has been ordered and initial drawings are currently under review by PG&E.

6. Cross Contamination Plan

Long-term goals at the Humboldt site include decommissioning to support the termination of the Humboldt Unit 3 NRC license and long-term operation of the new generation plant. Previous characterization studies established that the surface and subsurface footprints of the new generation facility and the ISFSI sites are minimally impacted by historical site radiological activities, and therefore there is minimal risk of later discovering radiological contamination in these areas. To ensure that the underlying soils and the structures and equipment associated with these two facilities remain free of cross-contamination during the site decommissioning process, a study has been initiated to define cross-contamination control measures. These measures include environmental air samplers, tritium monitoring wells, and standard administrative practices to increase the level of assurance and provide documentation to prove the site activities are being conducted in a manner that will allow the release of the NRC license. For environmental air sampling, the addition of environmental sampling stations for detection of an airborne release of radiological material would

provide independent monitoring against airborne contamination and an indication of the direction and concentration of any significant release in order to determine appropriate remediation. The sampling system would be an enclosed sampling system designed to work under severe environmental conditions and provide continuous sampling with minimal maintenance. Humboldt has installed additional monitoring wells to provide a method to identify contaminants in the groundwater and the potential to mitigate these sources. In addition to tritium, samples will be analyzed for Sr-90, Cs-137, and Co-60. These wells are located around Humboldt Unit 3 and range in depth from 30-60 feet, depending on the geologic strata associated with the specific well location. Work has started on this scope and will be completed in 2009.

7. Replacement of Rad Protection Access Software System

The current Rad Protection Access system (ProRad) is no longer being updated and has limited support from the vendor (PTI). ProRad is satisfactory for the current workload in Humboldt Unit 3. However, this system will not support the needs of the increased workforce for decommissioning Humboldt Unit 3. With an upgrade completed in the near future, the system will be fully operable once significant decommissioning activities begin.

8. Employee Emergency Notification System

The existing Employee Emergency Notification System has limited capability for notification, *e.g.*, a siren for attention followed by a series of code calls to identify the emergency and required employee actions. For a small set of employees with a fixed task of running the power plants, this system is adequate. However, with the increased activities of ISFSI, site demolition, and construction of new power plants, and the final decommissioning of Units 1, 2 and 3, large numbers of diversified personnel with a variety of activities will require an emergency notification with greater capabilities and sophistication. The new system will be a public address-based system with capabilities to provide both pre-recorded voice announcements and specific instructions for employees. This enhancement

will eliminate the possibility of confusing code calls. This project is in the early design phase.

9. Emergency Condenser Asbestos Removal

The asbestos could not be removed from the Emergency Condenser during the asbestos removal project in 2002 due to the proximity over the spent fuel pool. With the fuel now removed and in storage at the ISFSI, there is an opportunity to remove the remaining asbestos as recommended in the "Humboldt Bay Power Plant Unit No. 3 Decommissioning Preparatory Activities Report" prepared by Duke Engineering and Services, which concluded that asbestos removal is a high value activity for preparing for decommissioning.

10. Infrastructure for Facility Modifications

As Humboldt moves forward with site decommissioning activities, the site staffing requirements will increase significantly. Regulators from the NRC and various other California state agencies will need office space when overseeing key activities, and certain decommissioning activities will require additional subcontractor site support. Temporary office trailers can be rented or purchased for a relatively low cost when compared to new facility construction. A new 6-foot wide trailer has been purchased to provide office space for approximately 20 engineering utility employees and contractors during the decommissioning of Humboldt Unit 3. Acquisition of additional trailers to house other agencies and decommissioning activities is ongoing.

E. Litigation Associated With Humboldt Nuclear Activities (Costs Associated With the Government's Failure to Accept Spent Nucear Fuel)

In litigation against the DOE, PG&E is alleging that the DOE breached its contract to accept delivery of, and take title to the spent nuclear fuel from PG&E's Diablo Canyon and Humboldt nuclear power plants beginning on January 31, 1998. In relation to Humboldt, PG&E has asserted, among other things, that its ISFSI project and related activities were required as a result of the failure of DOE to take the spent fuel on time and that the cost of designing, constructing and operating these facilities as well as other damages should be recoverable from the DOE. The Commission has approved a balancing account

mechanism to track litigation costs and recoveries, and to credit any net proceeds back to customers.[7]

In October 2006, the U.S. Court of Federal Claims found that the DOE had indeed breached its contract and awarded the Utility approximately $42.8 million of the $92 million incurred by the Utility through 2004 to construct on-site storage at Diablo Canyon and Humboldt Unit 3, of which approximately $55.3 million was attributable to Humboldt. Following PG&E's appeal of the award, the U.S. Court of Appeals for the Federal Circuit reversed the lower court on issues relating to the calculation of damages and ordered the lower court to re-calculate the award. Although various motions by the DOE for reconsideration are still pending, the judge in the lower court conducted a status conference on January 15, 2009 and has scheduled another conference for July 9, 2009. The Utility expects that the final awarded compensation will result in recovery of most or all of its ISFSI project costs (as described in Section C.1., above).

F. Application for Interim Disbursements in 2009

Section 2.01(7) of the decommissioning trusts provides that, one year prior to the time decommissioning is estimated to begin, PG&E shall apply for CPUC approval of the estimated cost and schedule for decommissioning Humboldt Unit 3, and that, upon approval, the CPUC shall authorize Interim Disbursements from the applicable fund.

Full decommissioning of Humboldt Unit 3 is scheduled to commence in June 2010. On March 27, 2009, in compliance with Section 2.01(7), PG&E filed Advice Letter 3444-E to submit the updated schedule for completing the decommissioning of Humboldt Unit 3 and requests approval to commence Interim Disbursements. Interim Disbursements may be made of up to 90 percent of the CPUC-approved forecasted decommissioning costs. PG&E proposes that the decommissioning cost estimates established in this NDCTP provide the basis for determining the permissible amount of Interim Disbursements. The Advice Letter also requests approval of a procedure for reviewing and determining the reasonableness of Humboldt Unit 3 decommissioning expenditures.

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[7] Resolution E-3941, October 27, 2005.

G. Conclusion

In summary, the CPUC should affirm the reasonableness and prudence of the completed projects associated with the ISFSI, as described in this chapter.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 8

NUCLEAR DECOMMISSIONING REVENUE REQUIREMENT REQUEST

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 8
NUCLEAR DECOMMISSIONING REVENUE REQUIREMENT REQUEST

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 8
NUCLEAR DECOMMISSIONING REVENUE REQUIREMENT REQUEST

A. Introduction

1. Purpose and Scope of Chapter

The purpose of this chapter is to present the expense and capital revenue requirements needed to support Pacific Gas and Electric Company's (PG&E or the Company) Nuclear Decommissioning (ND) and Humboldt Bay Power Plant Unit 3 (Humboldt Unit 3 or Humboldt) Safe Storage (SAFSTOR) services[1] during the test period 2010 through 2012. These revenue requirements are based on costs presented in Chapters 2, 3 and 5 of this Application. This chapter supports the cost basis on which the ND rates are calculated.

2. Summary of Proposal

In general, PG&E's cost of service as expressed in revenue requirements is calculated based on PG&E's planned capital and expense expenditures over the test period. Specifically, PG&E is seeking recovery of a California Public Utilities Commission (CPUC or Commission) jurisdictional revenue requirement of $49.528 million in 2010 for ND and SAFSTOR expenses. To meet anticipated expense and capital requirements through 2012, the SAFSTOR portion of that revenue requirement needs to be increased by $204,000 in 2011 and by an additional $209,000 in 2012 to cover cost increases in this primarily expense-related revenue requirement. The ND portion of the revenue requirement is forecast to remain constant over the test period.

As presented in detail in Table 8-1, the $49.528 million in 2010 is broken down into three revenue requirement components as summarized below:

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[1] Humboldt is currently in SAFSTOR mode following its shutdown in 1976. SAFSTOR is a decommissioning alternative in which the nuclear facility is placed and maintained in a condition that allows it to be safely stored and subsequently decontaminated to levels that permit release of the property for unrestricted use.

TABLE 8-1
PACIFIC GAS AND ELECTRIC COMPANY
2010 NUCLEAR DECOMMISSIONING AND SAFSTOR REVENUE REQUIREMENT

Line No.		Amount in Millions
1	Diablo Canyon Nuclear Decommissioning	$23.329
2	Humboldt Nuclear Decommissioning	16.982
3	Humboldt SAFSTOR	9.218
4	Total	$49.528

This $49.528 million 2010 revenue requirement represents an increase from the current authorized CPUC-jurisdictional revenue requirement for ND of $25.697 million. Table 8-2 presents a summary of the total ND and SAFSTOR revenue requirements for 2010 through 2012. For those elements of the revenue requirement calculation that are determined in the General Rate Case (GRC), PG&E proposes an update to the revenue requirement calculations for 2011 and 2012, the attrition years, once a 2011 GRC decision is issued. The current schedule anticipates a 2011 GRC decision in late 2010.

3. Organization of the Remainder of This Chapter

The remaining sections of this chapter are organized as follows:

- Section B – Current Cost Structure;
- Section C – Cost Recovery Proposal;
- Section D – Operations and Maintenance (O&M) Expenses;
- Section E – Diablo Canyon and Humboldt Nuclear Decommissioning Trust Contributions;
- Section F – Taxes Other Than Income;
- Section G – Administrative and General (A&G) Expenses;
- Section H – Capital-Related Inputs; and
- Section I – Results of Operations.

B. Current Cost Structure

Currently, PG&E recovers authorized revenue requirements for ND services including Humboldt SAFSTOR through the ND rate component in electric rates.

The revenue requirements used to set these rates were last authorized in PG&E's 2005 Nuclear Decommissioning Cost Triennial Proceeding (NDCTP). In that decision, the CPUC adopted annual revenue requirements of $1.827 million for decommissioning Diablo Canyon Nuclear Power Plant Unit 1, $11.915 million for decommissioning Humboldt power plant, and $13.234 million for SAFSTOR expense for 2007. No revenue requirement was authorized for decommissioning Diablo Canyon Nuclear Power Plant Unit 2. In the 2005 NDCTP, the CPUC also adopted PG&E's attrition request for its SAFSTOR expenses in the amounts of $155,000 for 2008 and $16,000 for 2009.[2]

As instructed by the 2005 NDCTP decision[3] and the settlement, PG&E later adjusted the revenue requirements with updated trust fund balances as of September 30, 2006 and December 31, 2006 in Advice Letter 2972-E and 3011-E, respectively. The final forecasted revenue requirements as reported in Advice Letter 3011-E were $1.297 million for decommissioning Diablo Canyon Nuclear Power Plant Unit 1, $10.995 million for decommissioning Humboldt Power Plant, and $13.234 million for SAFSTOR expense for 2007. The SAFSTOR attrition was also included for 2008 and 2009 using the identical amounts from the decision.

C. Cost Recovery Proposal

PG&E proposes that the revenue requirement associated with ND trust contributions and Humboldt Unit 3 SAFSTOR O&M costs continue to be collected through a non-bypassable charge as specified in Public Utilities Code (Pub. Util. Code) section 379. The Nuclear Decommissioning Adjustment Mechanism (NDAM), as authorized in Decision 99-10-057, will be used to record each separated revenue requirement and the associated billed revenues.

Because A&G expense, common and general plant, certain rate base elements and related taxes are general in nature and benefit the entire utility, these inputs are first estimated in total and then allocated among PG&E's lines of business. Typically, the GRC is the forum in which PG&E presents its total company amounts for these inputs and where allocations to unbundled cost

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[2] 2005 PG&E NDCTP Settlement Agreement, page 2, adopted by Decision 07-01-003.

[3] Decision 07-01-003, Ordering Paragraph (OP) 5.

categories are litigated. Litigating these amounts in one regulatory proceeding avoids duplicative and costly efforts and potential conflicting case records and decisions. The Commission agreed with this approach and adopted it in PG&E's last two NDCTP and GRC decisions.[4] PG&E proposes that this regulatory approach be continued here. For 2010, the A&G amounts adopted in the 2007 GRC decision will be included in the SAFSTOR revenue requirement adjusted on a *pro rata* basis for labor decreases. The appropriate A&G amounts for Humboldt SAFSTOR in the 2011 and 2012 will be determined in PG&E's 2011 GRC. The CPUC is not expected to issue a decision on PG&E's 2011 GRC until late 2010; PG&E has used the amounts from the 2007 GRC adjusted for labor escalation as placeholders. These amounts are placeholders only, subject to update with the results of the GRC. Once a 2011 GRC decision determines the allocations of A&G expense, common plant and related taxes, the Humboldt SAFSTOR revenue requirement will be updated with those GRC adopted amounts. The updated revenue requirements will be submitted by advice letter for approval based on the assumptions adopted/authorized in this proceeding. Subsequent rate changes will be implemented through the Annual Electric True-Up (AET) filing or other appropriate rate change proceedings.

This cost recovery approach protects both customers and shareholders because the ND revenue requirement will ultimately reflect the Commission determined fair share of common and general plant. With this mechanism, PG&E would neither double recover common expense and plant nor strand costs between regulatory decisions. In the event that the 2011 GRC decision is not available in time to reflect the GRC amounts in ND rates for 2011, PG&E proposes a true-up once the 2011 GRC decision is issued and any over-or under-collections of revenue requirements be recovered through the ND rate component.

The revenue requirement for ND and SAFSTOR will be recorded monthly in the NDAM. Interest will be calculated in the account on a monthly basis, based on 3-month commercial paper interest rates. The annual amount PG&E proposes to recover in rates will consist of the test year revenue requirement and the NDAM account balance as of the end of the prior year. Cost recovery

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[4] Decision 07-03-044, 2007 GRC Settlement Agreement, Section 3.1.4 and Decision 04-05-055, 2003 GRC Settlement Agreement, Section 3.1.4.

will occur through the NDAM and will be consolidated with the AET on January 1, 2010, or the next available electric rate change after the effective date of the decision in this proceeding. PG&E proposes to continue using the revenue allocation and rate design methodology approved in the last NDCTP Proceeding by Decision 07-01-003.

D. O&M Expenses

The only O&M expenses included in this Application are those associated with Humboldt SAFSTOR. As described in Chapter 2, the SAFSTOR expenses include labor, materials, supplies, contracts and other related expenses for maintaining the Humboldt nuclear generating unit in accordance with the terms of its license and applicable Nuclear Regulatory Commission (NRC) requirements. These O&M expenses for 2010 through 2012 are estimated, using the nominal Federal Energy Regulatory Commission (FERC) dollars set forth in Chapter 2, as identified in Table 2-2. To the extent escalation rates were needed to make the nominal-dollar estimates, escalation has been included using escalation rates summarized in Table 8-3 to reflect the expenses in the period in which they will be incurred.[5] PG&E uses individual price indices drawn from Global Insight's Utility Cost Information Services. For purposes of calculating a revenue requirement, the $5.698 million of O&M expense estimated in Chapter 2, page 1, as stated in SAP dollars (i.e., including payroll taxes and benefits), has been reduced by $803,000 to remove labor burden amounts for payroll taxes and benefits (i.e., to convert the SAP dollars back to FERC dollars). The revenue requirement model calculates these amounts separately as shown on Table 8-1.

E. Diablo Canyon and Humboldt Nuclear Decommissioning Trust Contributions

The ND revenue requirement also includes the expected costs to decommission Diablo Canyon and Humboldt power plants. As described in Chapter 3, the appropriate level of contributions to the Diablo Canyon qualified trust funds is $10.939 million for Unit 1 and $12.077 million for Unit 2. As described in Chapter 5, the appropriate level of contributions to the Humboldt Unit 3 qualified trust fund and the non-qualified is $10.044 million, a total

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[5] Escalation rates in the 2011 GRC NOI, planned to be filed on August 1, 2009.

contribution of $33.060 million. PG&E will make these contributions to the trust funds each year for 2010 through 2012.

F. Taxes Other Than Income

Taxes other than income include property taxes, payroll taxes, business taxes and other taxes. All of these taxes are only associated with Humboldt SAFSTOR operations. The factors and methods used to calculate these taxes are from the 2007 GRC and are adjusted on a pro rata basis. The appropriate tax amounts for Humboldt SAFSTOR in the 2011 and 2012 will be determined in PG&E's 2011 GRC. The CPUC is not expected to issue a decision on PG&E's 2011 GRC until late 2010; PG&E has used the amounts from the 2007 GRC adjusted for labor escalation as placeholders. These amounts are placeholders only, subject to update with the results of the GRC. Once a 2011 GRC decision determines the allocations of common plant and related taxes, the Humboldt SAFSTOR revenue requirement will be updated with those GRC adopted amounts.

1. Property Taxes

Property taxes estimated in this Application are only those associated with the allocated common and general plant assigned to Humboldt SAFSTOR. Decommissioning costs are not subject to property taxation.

2. Payroll Taxes

Payroll taxes consist of federal and state unemployment insurance, Federal Insurance Contribution Act (FICA or social security) payments, and San Francisco payroll expense tax payments. FICA or social security payments are further divided between Old Age, Survivors and Disability Insurance (OASDI) and hospital (Medicare) insurance. Payroll taxes estimated in this Application are only those associated with Humboldt SAFSTOR activities.

Payroll taxes are calculated as a function of company payroll, applicable tax rates and the appropriate taxable base per employee. The payroll tax estimate is calculated using the methods and factors from PG&E's 2007 GRC. The factors and allocations are based on recorded 2004 data. These methods and factors are applied to the Humboldt SAFSTOR labor estimates.

3. Business and Other Taxes

Operating expenses also include business and other taxes. Business taxes are imposed by various cities within PG&E's service territory. Other taxes include the state and federal highway use taxes. These taxes are assigned to the Humboldt SAFSTOR Unbundled Cost Category (UCC) based on labor expenses and are from PG&E's 2007 GRC.

G. A&G Expenses

Because the expenses in A&G accounts are general in nature, and not chargeable to any specific function, A&G expenses are first estimated in total and then allocated among PG&E's lines of business. A&G expenses include the salaries and expenses of General Office (GO) personnel not engaged in directly supporting specific utility functions and such items as insurance, Workers Compensation (WC) payments, consultant fees and employee benefits.

As discussed in the Cost Recovery Proposal section, the amount of A&G expense allocated to Humboldt SAFSTOR in year 2011 and 2012 uses the amounts calculated in the 2007 GRC assigned to the Humboldt SAFSTOR revenue requirement as a placeholder, subject to update with the results of the 2011 GRC decision. These A&G expenses are shown in nominal dollars. To estimate A&G expense for 2012, escalation was applied as appropriate using the escalation rates shown in Table 8-3. A&G expenses are grouped into three categories: labor and wage-related costs are escalated at the labor rate; material and supplies and medical costs are escalated at the non-labor rate; and finally, other costs that are already in current year dollars and require no escalation are included in an "other" category and are not escalated.

H. Capital-Related Inputs

The primary capital-related inputs to the cost of service calculation are plant, depreciation, rate base, tax depreciation and deferred taxes. In this Application, with the exception of working cash, these inputs are related to common and general plant assigned to SAFSTOR.

As described in the Cost Recovery Proposal section, the capital-related inputs allocated to SAFSTOR for 2011 use as placeholders the common capital costs from PG&E's 2007 GRC, assigned to the ND (Humboldt SAFSTOR) UCC. PG&E proposes to replace these capital inputs when the 2011 GRC decision is

issued in December 2010. Common plant for 2010 was determined in the 2007 GRC.

1. Decommissioning Working Cash Requirements

Working cash requirements are included in the calculation of the rate base on which PG&E earns a return. To calculate working cash estimates for both the Humboldt SAFSTOR and ND cost categories, PG&E applied the factors and methods tendered in the 2007 GRC to the capital and expense estimates presented in this Application. Whereas Humboldt SAFSTOR requires a full working cash calculation, the primary working cash item that pertains to Diablo and Humboldt ND is the lead-lag study. Specifically, this is the working cash capital requirement that results from the lag in payments to the decommissioning trust.

2. Rate Base

The elements of rate base specifically allocated to Humboldt SAFSTOR are: utility plant in service plus working capital; plus tax adjustments; less deferred taxes; and less depreciation reserve. Utility plant in service consists of the accumulated original undepreciated investment in plant and equipment that is used and useful in rendering the ND services. In developing the rate base associated with that plant, certain adjustments are made. These adjustments are taken from PG&E's 2007 GRC for 2010, and are used as placeholders for 2011 and 2012.

First, an addition is made for working capital. This includes the cost of materials in inventory, prepayments and other working cash.

Second, an adjustment is made for specific requirements under the Tax Reform Act of 1986 (TRA 86). These requirements include deferred capitalized interest and deferred vacation pay.

Third, a deduction is made for the accumulated deferred taxes associated with these assets resulting from Accelerated Cost Recovery System (ACRS) and Modified Accelerated Cost Recovery System (MACRS) tax depreciation for federal income taxes. These are taxes that have been paid for by the customer, but PG&E has not yet paid to the Internal Revenue Service (IRS).

Fourth, plant is reduced by the amount of book depreciation reserve, which represents the accumulated amount of book depreciation already taken as an expense in prior years.

For each of the three ND cost categories, PG&E has developed an associated rate base. These amounts are summarized on Table 8-4.

I. Results of Operations

In this section, the capital costs and operating expenses described above are combined with the 2009 authorized cost of capital[6] into a regulatory financial structure to determine the amount of revenue needed from customers to recover the costs of providing the ND and SAFSTOR services. This amount of revenue is known as the revenue requirement.

For capital costs, revenue requirements are calculated to recover investment through depreciation, the return on investment through the Application of the cost of capital (rate of return) to the rate base, income taxes associated with the return on equity and with the difference in timing of costs between book and tax calculations, and property taxes on the unrecovered investment (net plant).

The expense revenue requirement consists of O&M, A&G, and payroll tax, business and other taxes described in the sections above. Franchise fees and uncollectible expenses are added to the combined capital-related and expense-related revenue requirements. For this proceeding, PG&E will apply the franchise fees and uncollectible factors adopted in the 2007 GRC decision. Changes that may occur in the 2011 GRC will be included in an update for the attrition years, 2011 and 2012.

1. Revenue Requirements Summary for 2010

Table 8-1 presents a summary of the revenue requirement calculations for 2010 by each UCC that makes up the ND services. The associated rate base summary is presented in Table 8-4. Federal and state income taxes are shown on Tables 8-5.

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[6] Decision 07-12-049, 2008 Cost of Capital (COC) amounts which remain unchanged for 2009 since an adjustment was not triggered as per the adjustment mechanism adopted in Decision 08-05-035.

2. Revenue Requirements for 2011-2012

As described in Chapter 1, Introduction and Policy, PG&E is seeking to recover in this filing the 2010 capital and expense revenue requirements for ND and SAFSTOR services, as well as going-forward revenue requirements through 2012. Because the ND expenses are proposed to be constant and not subject to inflation adjustments beyond the test year 2010, PG&E only requests an attrition adjustment for the Humboldt SAFSTOR revenue requirement. Under the current estimate from Global Insight (proposed 2011 GRC NOI escalation rates), the escalation results in a cost increase of $204,000 in 2011 and an additional increase of $209,000 in 2012. PG&E is proposing that the Humboldt SAFSTOR portion of the ND rates increase annually by these amounts.

J. Tables

TABLE 8 - 1
Pacific Gas and Electric Company
Electric Department (CPUC Jurisdiction)
Results of Operations at Proposed Rates
Nuclear Decommissioning Cost Triennial Proceeding (NDCTP)
Test Year 2010
(Thousands of Dollars)

Line No.	Description	Diablo Canyon Unit 1 Decommissioning	Diablo Canyon Unit 2 Decommissioning	Humboldt Nuclear Decommissioning	Humboldt Nuclear SAFSTOR	Total	Line No.
		(A)	(B)	(C)	(D)	(E)	
	REVENUE:						
1	Revenue at Effective Rates	11,088	12,241	16,982	9,218	49,528	1
2	Less Non-General Revenue	-	-	-	-	-	2
3	NDCTP Revenue	**11,088**	**12,241**	**16,982**	**9,218**	**49,528**	3
	OPERATING EXPENSES:						
4	Energy Costs	-	-	-	-	-	4
5	Other Production	-	-	-	4,895	4,895	5
6	Storage	-	-	-	-	-	6
7	Transmission	-	-	-	-	-	7
8	Distribution	-	-	-	-	-	8
9	Customer Accounts	-	-	-	-	-	9
10	Uncollectibles	29	32	44	24	128	10
11	Customer Services	-	-	-	-	-	11
12	Administrative and General	-	-	-	2,857	2,857	12
13	Franchise Requirements	84	92	128	70	374	13
14	Project Amortization	-	-	-	-	-	14
15	Wage Change Impacts	-	-	-	-	-	15
16	Other Price Change Impacts	-	-	-	-	-	16
17	Other Adjustments	-	-	-	-	-	17
18	Subtotal Expenses:	112	124	172	7,845	8,254	18
	TAXES:						
19	Superfund	-	-	-	-	-	19
20	Property	-	-	-	24	24	20
21	Payroll	-	-	-	327	327	21
22	Business	-	-	-	4	4	22
23	Other	-	-	-	-	-	23
24	State Corporation Franchise	3	3	1,489	43	1,537	24
25	Federal Income	9	10	5,373	289	5,681	25
26	Total Taxes	12	13	6,862	688	7,574	26
27	Depreciation	-	-	-	274	274	27
28	Fossil Decommissioning	-	-	-	-	-	28
29	Nuclear Decommissioning Funding	10,939	12,077	10,044	-	33,059	29
30	Total Operating Expenses	11,063	12,214	17,078	8,807	49,161	30
31	Net for Return	25	28	(96)	410	367	31
32	Rate Base	284	314	(1,091)	4,669	4,175	32
	RATE OF RETURN:						
33	On Rate Base	**8.79%**	**8.79%**	**8.79%**	**8.79%**	**8.79%**	33
34	On Equity	**11.35%**	**11.35%**	**11.35%**	**11.35%**	**11.35%**	34

TABLE 8 - 2
Pacific Gas and Electric Company
Electric Department (CPUC Jurisdiction)
Cost of Service
Nuclear Decommissioning Cost Triennial Proceeding (NDCTP)
2010 - 2012
(Thousands of Dollars)

Line No.		2010	2011	2012	Line No.
1	Adopted Revenues	25,697	49,528	49,732	1
2	Plus Difference	23,831	204	210	2
3	Requested Revenue	**49,528**	**49,732**	**49,942**	3
	OPERATING EXPENSES:				
4	Energy Costs	-	-	-	4
5	Other Production	4,895	5,046	5,201	5
6	Storage	-	-	-	6
7	Transmission	-	-	-	7
8	Distribution	-	-	-	8
9	Customer Accounts	-	-	-	9
10	Uncollectibles	128	128	129	10
11	Customer Services	-	-	-	11
12	Administrative and General	2,857	2,897	2,939	12
13	Franchise Requirements	374	376	377	13
14	Project Amortization	-	-	-	14
15	Wage Change Impacts	-	-	-	15
16	Other Price Change Impacts	-	-	-	16
17	Other Adjustments	-	-	-	17
18	Subtotal Expenses:	8,254	8,447	8,646	18
	TAXES:				
19	Superfund	-	-	-	19
20	Property	24	24	24	20
21	Payroll	327	338	348	21
22	Business	4	4	4	22
23	Other	-	-	-	23
24	State Corporation Franchise	1,537	1,537	1,537	24
25	Federal Income	5,681	5,681	5,681	25
26	Total Taxes	7,574	7,585	7,595	26
27	Depreciation	274	274	274	27
28	Fossil Decommissioning	-	-	-	28
29	Nuclear Decommissioning	33,059	33,059	33,059	29
30	Total Operating Expenses	49,161	49,365	49,575	30
31	Net for Return	367	367	367	31
32	Rate Base	4,175	4,175	4,175	32
	RATE OF RETURN:				
33	On Rate Base	**8.79%**	**8.79%**	**8.79%**	33
34	On Equity	**11.35%**	**11.35%**	**11.35%**	34

TABLE 8 - 3
Pacific Gas and Electric Company
Escalation Rates
Nuclear Decommissioning Cost Triennial Proceeding (NDCTP)
2010 - 2012

Line No.	Year	Labor	Materials and Services
1	2008	3.75%	4.42%
2	2009	3.75%	2.47%
3	2010	3.75%	0.89%
4	2011	3.75%	1.13%
5	2012	3.75%	1.37%

TABLE 8 - 4
Pacific Gas and Electric Company
Electric Department (CPUC Jurisdiction)
Rate Base
Nuclear Decommissioning Cost Triennial Proceeding (NDCTP)
Test Year 2010
(Thousands of Dollars)

Line No.	Description	Diablo Canyon Unit 1 Decommissioning	Diablo Canyon Unit 2 Decommissioning	Humboldt Nuclear Decommissioning	Humboldt Nuclear SAFSTOR	Total	Line No.
		(A)	(B)	(C)	(D)	(E)	
	WEIGHTED AVERAGE PLANT:						
1	Plant	-	-	-	-	-	1
2	Plant Held for Future Use	-	-	-	-	-	2
3	Common Plant - Allocation	-	-	-	4,610	4,610	3
4	Common Plant Held for Future Use	-	-	-	-	-	4
5	Total Weighted Average Plant	-	-	-	4,610	4,610	5
	WORKING CAPITAL:						
6	Material and Supplies - Fuel	-	-	-	-	-	6
7	Material and Supplies - Other	-	-	-	-	-	7
8	Working Cash	284	314	(1,091)	1,177	684	8
9	Total Working Capital	284	314	(1,091)	1,177	684	9
	ADJUSTMENTS FOR TAX REFORM ACT:						
10	Deferred Capitalized Interest	-	-	-	9	9	10
11	Deferred Vacation	-	-	-	21	21	11
12	Deferred CIAC Tax Effects	-	-	-	-	-	12
13	Total Adjustments	-	-	-	31	31	13
	LESS DEDUCTIONS:						
14	Customer Advances	-	-	-	-	-	14
15	Accumulated Deferred Taxes - Reg Asset	-	-	-	(10)	(10)	15
16	Accumulated Deferred Taxes - ACRS	-	-	-	319	319	16
17	Accumulated Deferred Taxes - Other	-	-	-	-	-	17
18	Deferred ITC	-	-	-	31	31	18
19	Deferred Tax - Other	-	-	-	-	-	19
20	Total Deductions	-	-	-	340	340	20
21	DEPRECIATION RESERVE	-	-	-	809	809	21
22	TOTAL RATE BASE	284	314	(1,091)	4,669	4,175	22

TABLE 8 - 5
Pacific Gas and Electric Company
Electric Department (CPUC Jurisdiction)
California State Income Tax
Nuclear Decommissioning Cost Triennial Proceeding (NDCTP)
Test Year 2010
(Thousands of Dollars)

Line No.	Description	Diablo Canyon Unit 1 Decommissioning	Diablo Canyon Unit 2 Decommissioning	Humboldt Nuclear Decommissioning	Humboldt Nuclear SAFSTOR	Total	Line No.
		(A)	(B)	(C)	(D)	(E)	
1	Revenues	11,088	12,241	16,982	9,218	49,528	1
2	O&M Expenses	112	124	172	7,845	8,254	2
3	Nuclear Decommissioning Expense	10,939	12,077	-	-	23,015	3
4	Superfund Tax	-	-	-	-	-	4
5	Taxes Other Than Income	-	-	-	356	356	5
6	Subtotal	37	41	16,810	1,016	17,903	6
	DEDUCTIONS FROM TAXABLE INCOME:						
7	Interest Charges	8	9	(30)	130	116	7
8	Fiscal/Calendar Adjustment	-	-	-	3	3	8
9	Operating Expense Adjustments	-	-	-	(183)	(183)	9
10	Capitalized Interest Adjustment	-	-	-	-	-	10
11	Capitalized Inventory Adjustment	-	-	-	-	-	11
12	Vacation Accrual Reduction	-	-	-	(1)	(1)	12
13	Capitalized Other	-	-	-	-	-	13
14	Subtotal Deductions	8	9	(30)	(51)	(64)	14
	CCFT TAXES:						
15	State Operating Expense Adjustment	-	-	-	1	1	15
16	State Tax Depreciation - Declining Balance	-	-	-	-	-	16
17	State Tax Depreciation - Fixed Assets	-	-	-	577	577	17
18	State Tax Depreciation - Other	-	-	-	-	-	18
19	Removal Costs	-	-	-	9	9	19
20	Repair Allowance	-	-	-	-	-	20
21	Subtotal Deductions	8	9	(30)	537	523	21
22	Taxable Income for CCFT	29	32	16,840	479	17,380	22
23	CCFT	3	3	1,489	42	1,536	23
24	State Tax Adjustment	-	-	-	-	-	24
25	Current CCFT	3	3	1,489	42	1,536	25
26	Deferred Taxes - Reg Asset	-	-	-	0	0	26
27	Deferred Taxes - Interest	-	-	-	0	0	27
28	Deferred Taxes - Vacation	-	-	-	(0)	(0)	28
29	Deferred Taxes - Other	-	-	-	-	-	29
30	Deferred Taxes - Fixed Assets	-	-	-	0	0	30
31	Total CCFT	3	3	1,489	43	1,537	31

TABLE 8 - 5
Pacific Gas and Electric Company
Electric Department (CPUC Jurisdiction)
Federal Income Tax
Nuclear Decommissioning Cost Triennial Proceeding (NDCTP)
Test Year 2010
(Thousands of Dollars)

Line No.	Description	Diablo Canyon Unit 1 Decommissioning	Diablo Canyon Unit 2 Decommissioning	Humboldt Nuclear Decommissioning	Humboldt Nuclear SAFSTOR	Total	Line No.
		(A)		(B)	(C)	(D)	
1	Revenues	11,088	12,241	16,982	9,218	49,528	1
2	O&M Expenses	112	124	172	7,845	8,254	2
3	Nuclear Decommissioning Expense	10,939	12,077	0	0	23,015	3
4	Superfund Tax	0	0	0	0	0	4
5	Taxes Other Than Income	0	0	0	356	356	5
6	Subtotal	37	41	16,810	1,016	17,903	6
	DEDUCTIONS FROM TAXABLE INCOME:						
7	Interest Charges	8	9	(30)	130	116	7
8	Fiscal/Calendar Adjustment	0	0	0	3	3	8
9	Operating Expense Adjustments	0	0	0	(183)	(183)	9
10	Capitalized Interest Adjustment	0	0	0	0	0	10
11	Capitalized Inventory Adjustment	0	0	0	0	0	11
12	Vacation Accrual Reduction	0	0	0	(1)	(1)	12
13	Capitalized Other	0	0	0	0	0	13
14	Subtotal Deductions	8	9	(30)	(51)	(64)	14
	FEDERAL TAXES:						
15	CCFT - Prior Year	3	3	1,489	(182)	1,312	15
16	Federal Operating Expense Adjustment	0	0	0	1	1	16
17	Fed. Tax Depreciation - Declining Balance	0	0	0	0	0	17
18	Federal Tax Depreciation - SLRL	0	0	0	0	0	18
19	Federal Tax Depreciation - Fixed Assets	0	0	0	605	605	19
20	Federal Tax Depreciation - Other	0	0	0	0	0	20
21	Removal Costs	0	0	0	9	9	21
22	Repair Allowance	0	0	0	0	0	22
23	Preferred Dividend Credit	0	0	0	0	0	23
24	Subtotal Deductions	10	12	1,458	383	1,927	24
25	Taxable Income for FIT	26	29	15,351	633	15,976	25
26	Federal Income Tax	9	10	5,373	222	5,614	26
27	Deferred Taxes - Reg Asset	0	0	0	1	1	27
28	Flowback of Excess Deferred Taxes	0	0	0	0	0	28
29	Deferred Taxes - Interest	0	0	0	0	0	29
30	Deferred Taxes - Vacation	0	0	0	(0)	(0)	30
31	Deferred Taxes - Other	0	0	0	0	0	31
32	Deferred Taxes - Fixed Assets	0	0	0	66	66	32
33	Total Federal Income Tax	9	10	5,373	289	5,681	33

PACIFIC GAS AND ELECTRIC COMPANY

APPENDIX A

RESUME OF LOREN D. SHARP

RESUME OF LOREN D. SHARP

EDUCATION:

1972 BS in Nuclear Engineering, Idaho State University, Pocatello, Idaho
1974 MS in Nuclear Engineering, Idaho State University, Pocatello, Idaho
1975 Engineer Officer's Basic Course, Corp of Engineers, Fort Belvoir, Virginia
1981 PE in Mechanical Engineering, State of Washington
1993 WNP-2 Senior Reactor Operator Certification Course

EXPERIENCE:

Pacific Gas and Electric

Diablo Canyon Power Plant

12/08-Present **Senior Director Engineering Services**

Duties include leadership and management of engineering and projects organization at an operating dual unit nuclear power plant to ensure compliance with nuclear safety standards, regulatory requirements, and environmental requirements. Lead the organization to clearly communicate site vision, direction, priorities and culture to enable DCPP to become the leading nuclear site in the nation. Responsibilities include planning and execution of all engineering activities during on-line, forced outages, refuel outages and unplanned power reductions to ensure the safe, reliable and economic operation of the two units at Diablo Canyon Nuclear Power Generating Station; which generate 29% of PG&E's owned generation. Duties also include oversight of site capital projects, nuclear fuels strategy/contracting, and all corporate Geo-sciences expertise. Duties include assignment as the company representative for EPRI, Nuclear Power Council, American Nuclear Society, and STARS Engineering VP.

Humboldt Bay Power Plant-Nuclear

05/07-12/08 **Director/Plant Manager**

Responsible for oversight of one nuclear unit, which has been in SAFSTOR since 1988, construction and loading of an onsite used fuel storage project (ISFSI); and planning and implementation of decommissioning of the nuclear unit. Responsibilities include activities associated with Unit 3 Decommissioning and removal of spent fuel from the fuel pool. Provide leadership to nuclear organization to ensure compliance with nuclear safety standards and regulatory requirements, and the development of an industry standard nuclear culture at HBPP. Director is responsible for development of a strategic plan for the decommissioning of HBPP Unit 3, creation of a decommissioning project team, and implementation of decommissioning activities. Responsibilities also include implementing a regulatory strategy for the transition of the nuclear unit from SAFSTOR into decommissioning. Interface with the Nuclear Regulatory Commission staff on nuclear issues and with the California Public Utilities Commission on decommissioning funding issues. Oversee ISFSI construction, related plant modifications and ISFSI fuel loading.

Washington Group International/Defense Business Unit

11/06-5/07 **Director Strategic Operations (Domestic and International)**

Responsibilities include ACWA Project General Manager for both Pueblo and Blue Grass projects as well as oversight of international Albania chemical

demilitarization project. My duties include oversight for day-to-day production in the first Pueblo Chemical Agent Pilot Plant (PCAPP), Blue Grass Chemical Agent Pilot Plant stockpile neutralization facility and international portable incineration project in Albania. For Albania project WDC has overall project oversight while ACWA primary scope is Systemization, Operations, Maintenance, and Closure of both Pueblo and Blue Grass related activities. WDC scope also includes support to and other team members in areas of design, construction, system design, procurement, environmental permitting as required to construct operate, and close the facilities through all phases of the contract. My duties also include tracking and working with the Defense management team to assess potential new work.

06/02-11/06 **Washington Group International**
ACWA Project General Manager/Pueblo and Blue Grass
Responsibilities include ACWA Project General Manager for both projects as well as Pueblo Plant Manager supporting the Pueblo team contract award for Pueblo ($1.3 billion job). My duties include oversight for day-to-day production in the first Pueblo Chemical Agent Pilot Plant (PCAPP) and Blue Grass Chemical Agent Pilot Plant stockpile neutralization facility. WDC primary scope is Systemization, Operations, Maintenance, and Decommissioning of both projects related activities. In addition WDC scope also includes support to and other team members in areas of design, construction, system design, procurement, environmental permitting as required to construct operate, and decommission both facilities through all phases of the contract. As a key individual in the Pueblo team identified pilot plant systems and prepared rough design necessary prior to our orals presentation and technical submittal resulting in contract award.

08/99-06/02: **Washington Demilitarization Company, UMCDF**
Vice President and Project General Manager
As project general manager, successfully completed the construction of Umatilla Chemical Demilitarization Facility, UMCDF—eight days ahead of schedule, with an excellent safety record. Completed the $400 million fixed-price construction of the UMCDF, with a peak of 1,200 personnel and started systemization activities. UMCDF duties also included the $400 million cost-plus O&M contract portion, which included staffing, training and systemizing the facility for operations. Accountable for day-to-day production while systemizing a chemical stockpile demilitarization facility at UMCDF. UMCDF completed 6.4 million man hours without receiving any notice of violations, NOVs, in a state with a strong environmental stance. Duties include managing Operations, Maintenance, Laboratory, Engineering and Technical Support personnel in the safe and environmentally compliant manner. Chemical munitions demilitarization complex consists of a deactivation furnace with rotary kiln, heated discharge conveyor, metal parts furnace, liquid incinerator with the associated pollution abatement and utility systems.

Raytheon Engineers & Constructors, JACADS

10/97-08/99 **Raytheon Engineers & Constructors, JACADS**

Vice President/Plant General Manager/Acting Program Director/

Managed plant staff in operations, maintenance, engineering, technical support, and laboratory personnel while ensuring a safe and environmentally compliant operation. As plant general manager responsible for 450 personnel while managing an annual budget of $67 million. Chemical munitions demilitarization complex consists of a deactivation furnace with rotary kiln, heated discharge conveyor, metal parts furnace, liquid incinerator with the associated pollution abatement and utility systems. Noted as a strong safety record while plant manager, which included achieving 3.2 million man hours at Johnston Atoll Chemical Agent Demilitarization Site, JACADS, in 1997, without a lost-time injury. Function as Acting Program Director (JACADS) for twelve weeks a year. As Acting Program Director/Deputy Project Manager managed over 500 personnel that support all activities associated with successful operation and completion of the demil facilities. Promoted to Vice President and transferred to Umatilla Project in Oregon to oversee construction.

5/96-10/97 **Raytheon Engineers & Constructors, JACADS**

Chief Systems Engineer/Acting Engineering Manager.

Managed plant system engineers, demilitarization Engineers and associated activities required to modify, repair, and operate the first chemical stockpile demilitarization facility. Duties included project schedules, engineering design changes, drawing updates, material requisitions, optimize equipment processing rates, trend system operation, support programmatic lessons learned workshops. As acting Engineering manager for 12 weeks a year also responsible for document control department, materials procurement, materials supply, engineering designers, design engineers, system engineers, and demil engineers.

Washington Public Power Supply System

Washington Nuclear Project #2 (WNP-2), Richland, Washington

7/95-5/96 **Assistant Engineering Director.** Duties included interfacing with plant operations and communicating all emerging plant issues with engineering staff of 200. Responsible for identifying and managing engineering resources as necessary to resolve emerging plant issues that impact operability. Duties also included assessing the technical adequacy of solutions to ensure timely resolution and compliance with regulatory requirements and commitments. Held engineering manager role during forced outages, refueling outages, daily plant status meetings, NRC inspections, INPO reviews, and periodic management oversight tasks.

5/92-7/95 **Engineering Supervisor**. Supervised a group of diverse multi-discipline engineers engaged in resolving emerging complex issues associated with WNP-2 plant and Boiling Water Reactor (BWR) Owner's Group. Duties include managing and assessing the adequacy of solutions to ensure timely resolution as well as appropriate compliance with technical and regulatory requirements. At WNP-2 developed a capable, effective team that prevented numerous unplanned plant outages, saving up to an estimated $30 million of lost revenue a year. A major portion of group work expertise is analytical analysis related to resolving emerging plant problems to avert a potential plant shutdown. Analytical code expertise includes source term analysis (ORIGEN2), shielding analysis, (QAD-CG/MS), Offsite dose analysis (PADD & CDOSE), control room habitability (PADD & CDOSE), containment analysis (CONTEMPT-LT28, COMPARE, GOTHIC) water

and steam hammer analysis (RELAP5, R5FORCE, GOTHIC) compartment pressurization (RELAP5 & GOTHIC), High energy line breaks (HELB) blowdown and environmental profiles (RELAP5, CONTEMPT-LT28, & GOTHIC), heat transfer analysis (HEATING6), and negative containment pressurization (CONTEMPT-LT28 & COMPARE). Also functioned as mentor for young staff engineers to develop analytical code expertise to increase Engineering staff capability.

7/81-8/93 **BWROG Emergency Procedures Vice Chairman**. Elected by 23 peer Boiling Water Reactor Owner's Group (BWROG) utilities on Emergency Procedure Guideline (EPG) issues. Position required significant participation with member utilities, EPG committee, NRC management, NRC contractors, and BWROG contractors. Successfully resolved reactor fuel instability concern, Reactor Pressure Vessel water level indication non-condensable gas issue, and developing strategy for Severe Accident guideline. Briefed committee position to NRC and BWR utilities on above BWR issues.

2/84-6/92 **Principal Nuclear/Mechanical Engineer**. Cognizant engineer responsible for WNP-2 shielding analysis, heat transfer analysis, thermal hydraulic analysis, containment analysis, HELB blowdown and resulting environmental profiles, water and steam hammer analysis, secondary containment drawdown analysis, post accident hydrogen analysis, and WNP-2 licensing support. Also issued design changes on assigned plant systems. Recognized as design and licensing expert to evaluate and prepare design changes and specialty analysis for WNP-2 plant changes. The following codes were used while solving site issues: QAD-CG/MS, ORIGEN2, RELAP5, R5FORCE, FORCE, HEATING6, GOTHIC, CONTEMPT-LT28, COMPARE, & GASPAR. I authored a code for offsite dose and control room habitability consequences, PADD, due to the lack of an acceptable commercial code to evaluate dose consequence while resolving plant operability issues.

7/81-2/84 **Burns and Roe Inc, Richland, Washington**
Senior Nuclear/Mechanical Engineer.
Responsibilities included providing technical design support for startup operations, applicable system modifications, technical WNP-2 licensing support, HELB blowdown analysis, room pressurization analysis, environmental profiles, control system failure analysis, post accident radiation dose analysis.

Westinghouse Hanford Company

3/77-7/81 **Westinghouse Hanford Company, Richland, Washington**
Lead Nuclear Engineer.
Duties included overall program direction of test activities, fabrication of test hardware related to the transient testing of mixed-oxide fuel elements, preparation of the required documentation for the testing programs, directing hot cell activities at hot fuel examination facility, HFEF (INEL Site), directing the irradiation at the TREAT Reactor (INEL Site), and performing post test transient analysis. Lead engineer responsibilities included supervision of engineers and technicians, a yearly budget of two million dollars, and all work activities required to support TREAT testing dates. FFTF and CRBR fuel pin designs were evaluated based on the fuel pin performance, cladding interaction, and fuel damage observed nondestructively and destructively from transient tests.

U.S. ARMY

2/75-2/77 **U.S. ARMY, White Sands Missile Range, New Mexico**
Nuclear Engineer/Analysis Officer, First Lieutenant.
Responsible for effectiveness evaluation of the U.S. Army Safeguard Ballistic Missile System, technical evaluation of new proposed Army communication systems, identification of all NATO communication systems that are vulnerable to an electromagnetic pulse environment.

Sandia Laboratories

1/74-1/75 **Sandia Laboratories, Albuquerque, New Mexico**
Nuclear Engineer.
Responsibilities included designing, building, and testing an adiabatic calorimeter for Sandia's Annular core Pulse Reactor ACPR) to more accurately calibrate, measure fission energy deposition of various ACPR power levels. Work was completed in conjunction with a US Atomic Energy Commission (AEC) Lab-Graduate Fellowship at Sandia Laboratories.

PACIFIC GAS AND ELECTRIC COMPANY

APPENDIX B

EXPERIENCE OF HOLTEC INTERNATIONAL

Experience of Holtec International

Holtec International, headquartered in Marlton, NJ (USA), is a global turnkey supplier of equipment and systems for the Nuclear, Solar and Fossil Power Generation sectors of the energy industry. The company is recognized as the world leader in the technologies to manage used Nuclear Fuel discharged from nuclear reactors, and as a provider of capital equipment to commercial power plants.

Holtec's engineering expertise includes ISFSI pad design in various degrees, including soil-structure interaction. Holtec performs analysis, design, and licensing all with in-house capability to support our dry storage licensing program and our clients' needs. To perform engineering and licensing requirements for internal and external clients, Holtec's Nuclear Power Division maintains a highly trained cadre of project managers and technical discipline experts. The following professional disciplines comprise our company's areas of core competence in dry (and wet) storage technologies.

- Project Management
- Structural Mechanics including soil mechanics, inelastic dynamics, wave propagation and visco-elastic phenomena
- Applied Fluid Mechanics and Heat Transfer
- Nuclear Physics including shielding, radiological, and criticality analysis
- Mechanical Design
- Reinforced concrete design and analysis
- Site procedure and training plans
- Site construction including concrete placement services

Holtec's national "dry storage" clients and projects include:

- American Electric Power (D.C. Cook 1 & 2)
- DTE Energy (Fermi)
- Energy Northwest (Columbia)
- Entergy (ANO 1 & 2; Grand Gulf; Indian Point 1, 2, and 3; J.A. FitzPatrick; Pilgrim; River Bend; Vermont Yankee; Waterford 3)
- Exelon (Braidwood; Byron; Dresden 1, 2, and 3; LaSalle; Quad Cities 1 & 2)
- First Energy (Perry)
- Portland General Electric (Trojan)
- PSEG Nuclear (Hope Creek & Salem)
- Southern Company (Farley 1 & 2, Hatch 1 & 2)
- Tennessee Valley Authority (Brown's Ferry 1, 2, and 3; Sequoyah 1 & 2)

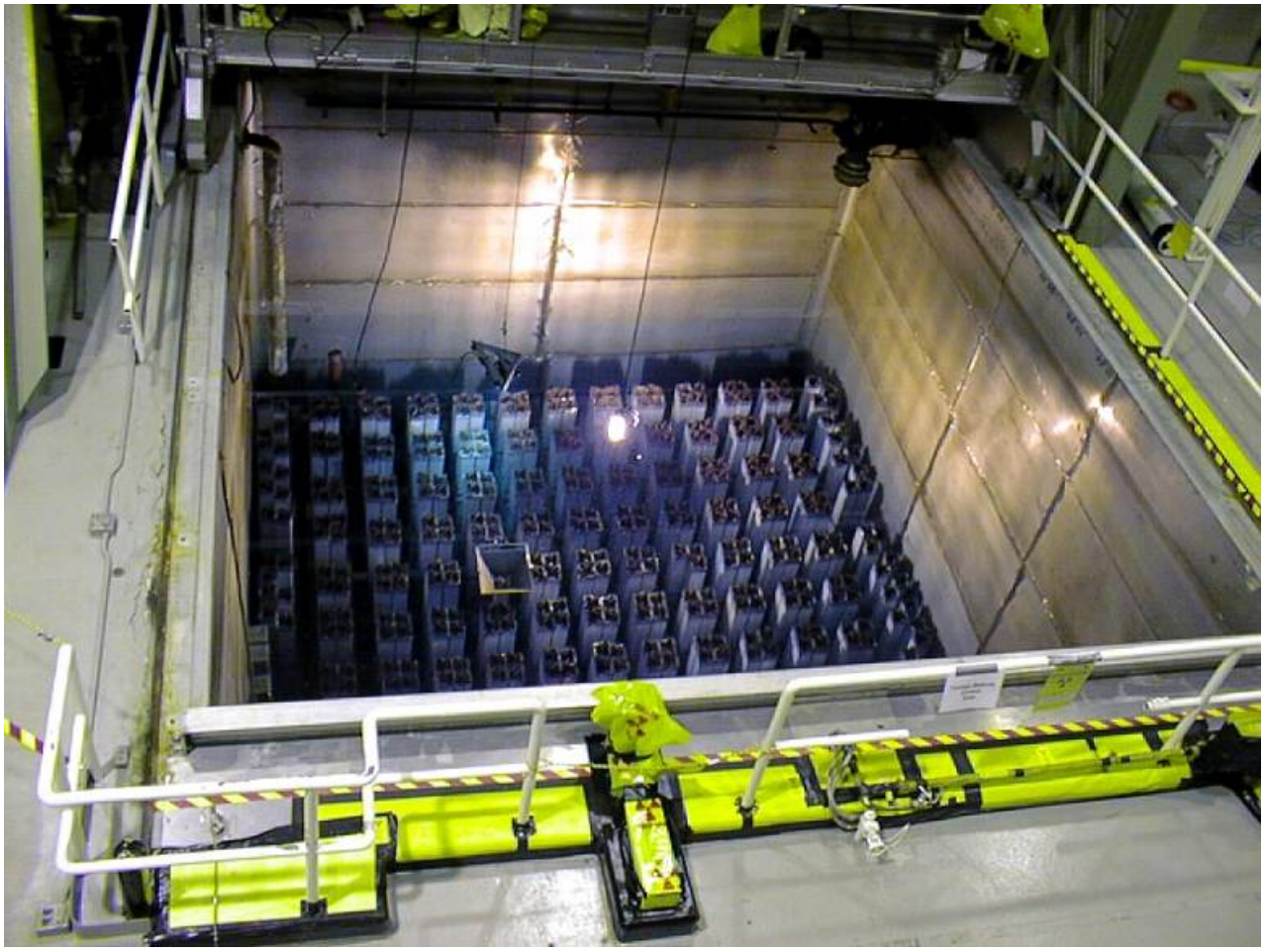
PACIFIC GAS AND ELECTRIC COMPANY

APPENDIX C

PICTORIAL SUMMARY OF HUMBOLDT BAY POWER PLANT ISFSI

Humboldt Bay Power Plant ISFSI
(Independent Spent Fuel Storage Installation)
Pictorial Summary

This is how it all starts: Down in the bottom of this pool are 390 spent fuel assemblies from when the nuclear plant operated. Back in 1985, it was decided the fuel should remain here until 2015, when the plant would be dismantled. As long as the fuel is here, we're still required to maintain our license and all the necessary administrative controls, including a Radiation Protection program.



PG&E decided not to wait until 2015 to decommission the plant site. So, for the time being, we moved the spent fuel to a simpler and safer mode of storage, called dry casking. You start with six casks. These casks are designed to shield people from the radiation produced by the spent fuel. They're made of thick steel – and weigh no less than eighty tons each.

Next, you have to have a method of moving the casks around the site. This “crawler” will pick up the heavy casks, and move them from the refueling building where the fuel is currently stored to the vaults (the ISFSI) up on the hill.

Before any fuel can be loaded into a cask, however, the ISFSI must be built. The chosen location is the bluff on the northwest corner of the Plant site. The structure will be underground, and will consist of six silos.

The process starts with an excavation.

The foundation is reinforced and formed…

…poured…

…and allowed to cure.

Steel liners are now set on the foundation –

-- and the lids are placed on the liners.

The lower section of the walls is reinforced and formed…

…and poured.

The excavation is filled as construction progresses.

The upper section is reinforced…

…formed…

…and poured.

The excavation can now be backfilled.

A haul path from the Refueling Building to the ISFSI is constructed…

…and the ISFSI is finished with fencing, lighting, and security infrastructure.

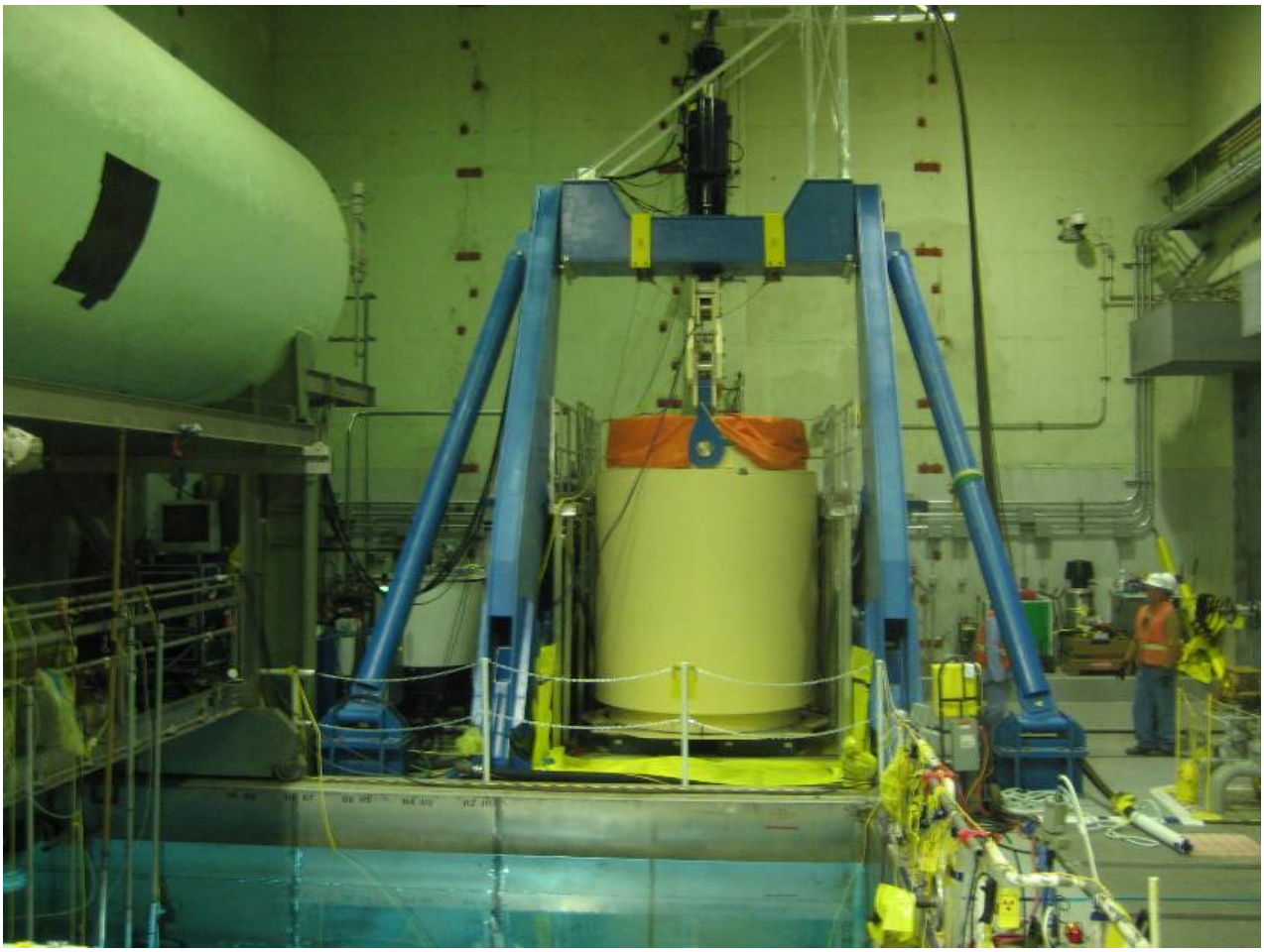
The fuel loading process now begins. The crawler picks up a cask…

Carries it into the yard outside the RFB (Refueling Building)…

Sets it on a rail dolly…

…and it is moved into the building (with the help of an aircraft tug!).

Inside, a davit crane is waiting to lift the cask up and over into the pool, where the fuel will be loaded into cells in the cask liner (called the Multi Purpose Canister, or MPC).

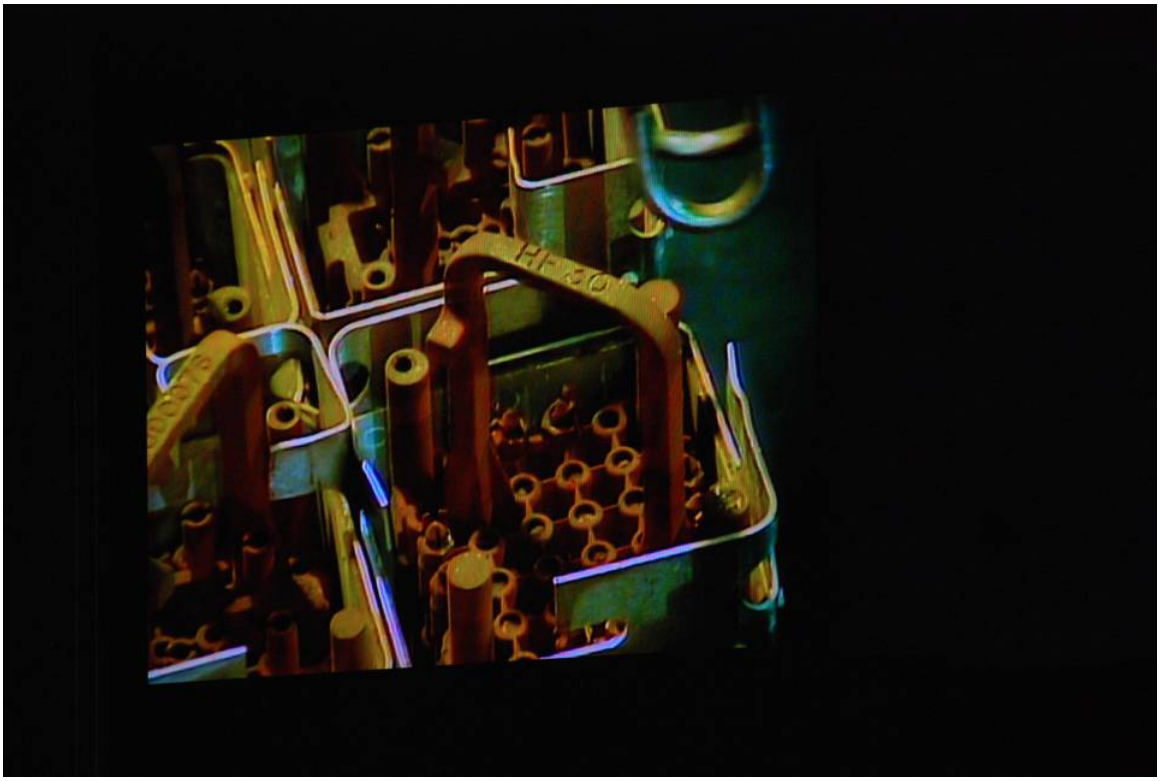


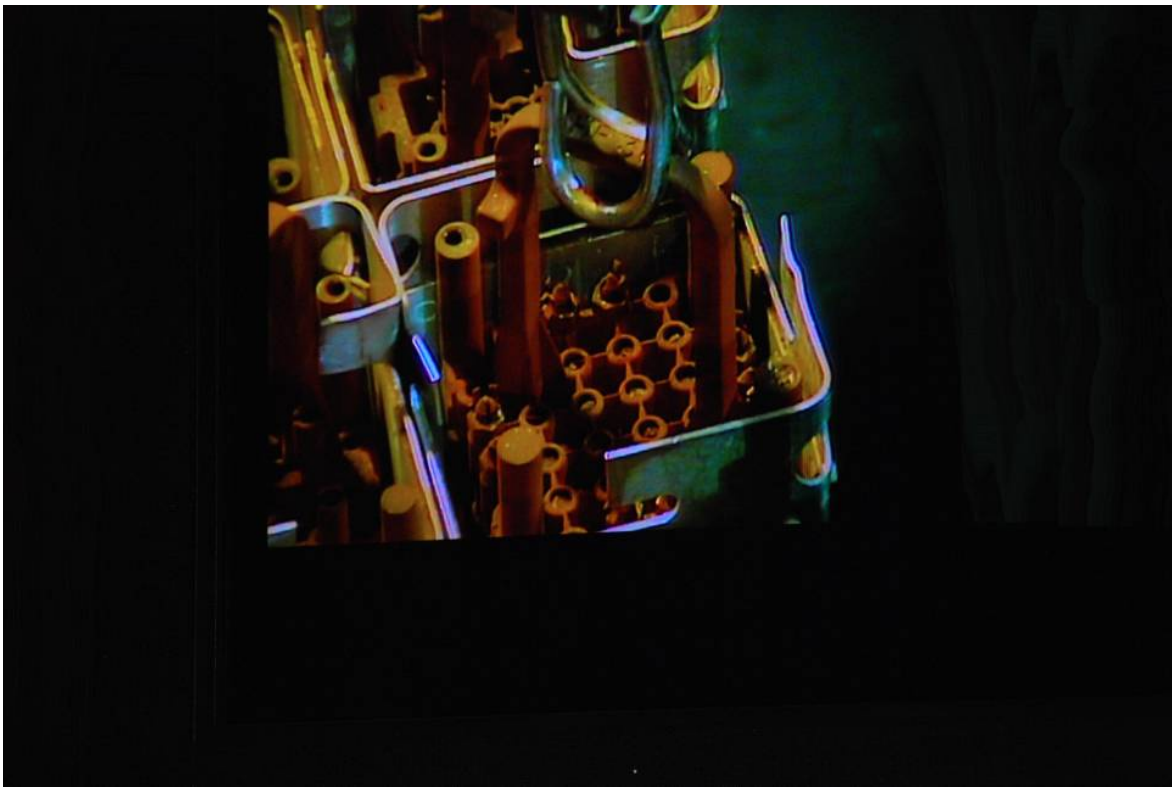
The cask will be lowered 35 feet to the bottom of the pool. The technicians near the cask are spraying a laminar coat of distilled water on it to help prevent contamination from plating out on the outside.

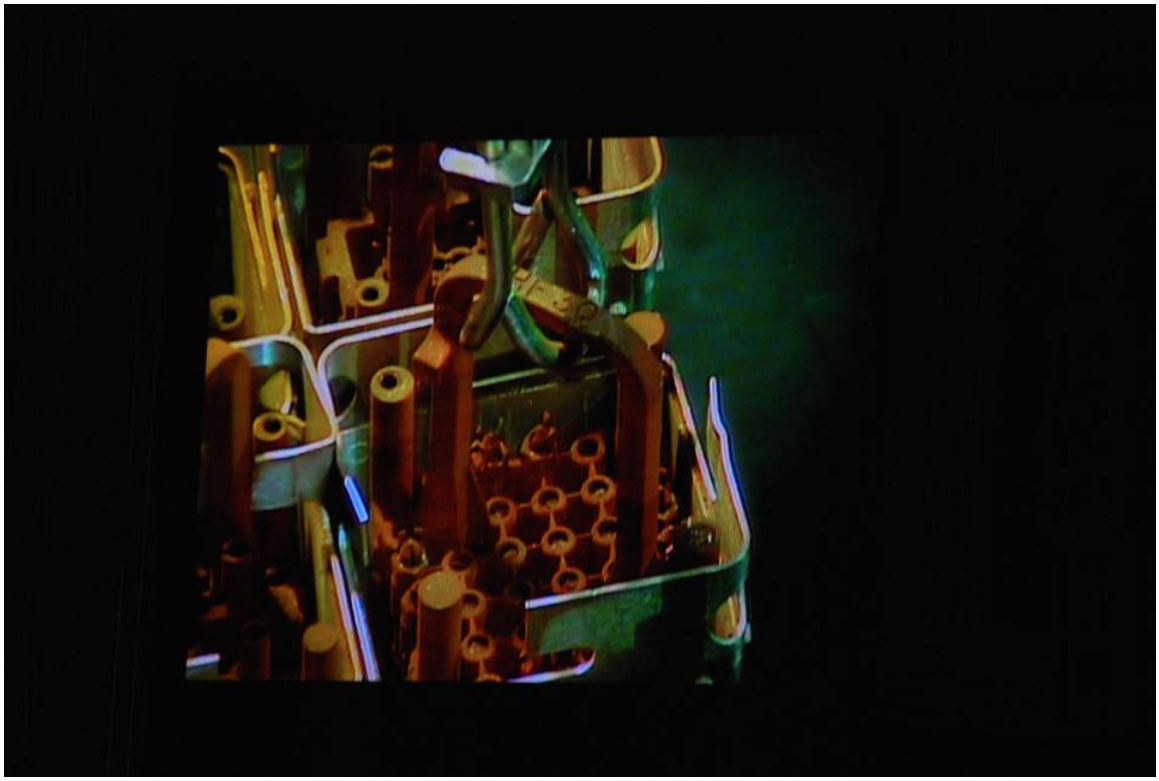
Fuel handlers on the SFP bridge select an assembly…

An underwater camera is used to guide the fuel grapple onto the assembly bail.

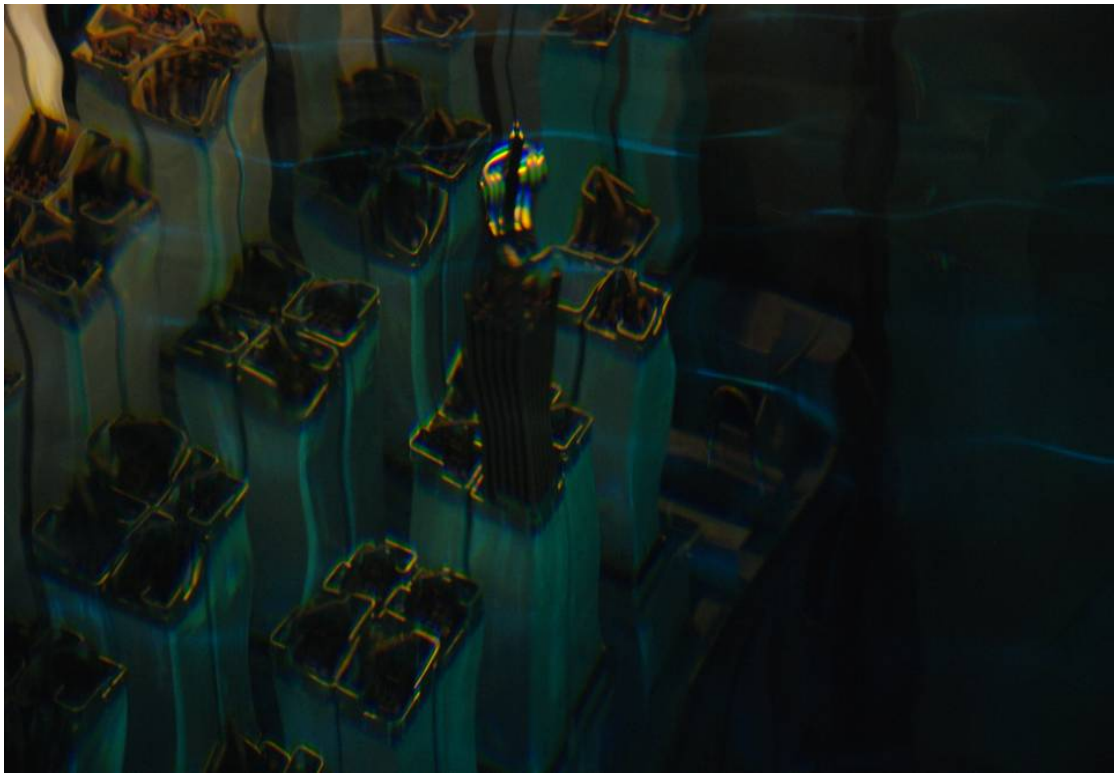
The grappling process follows…



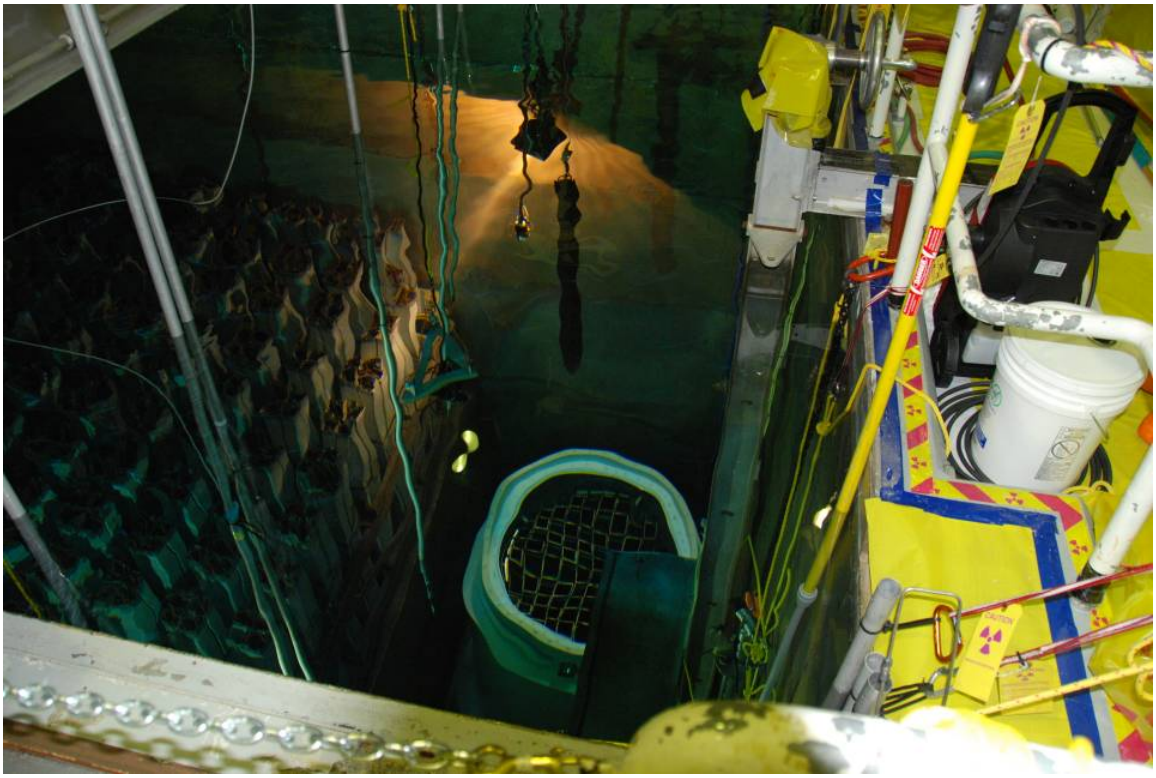




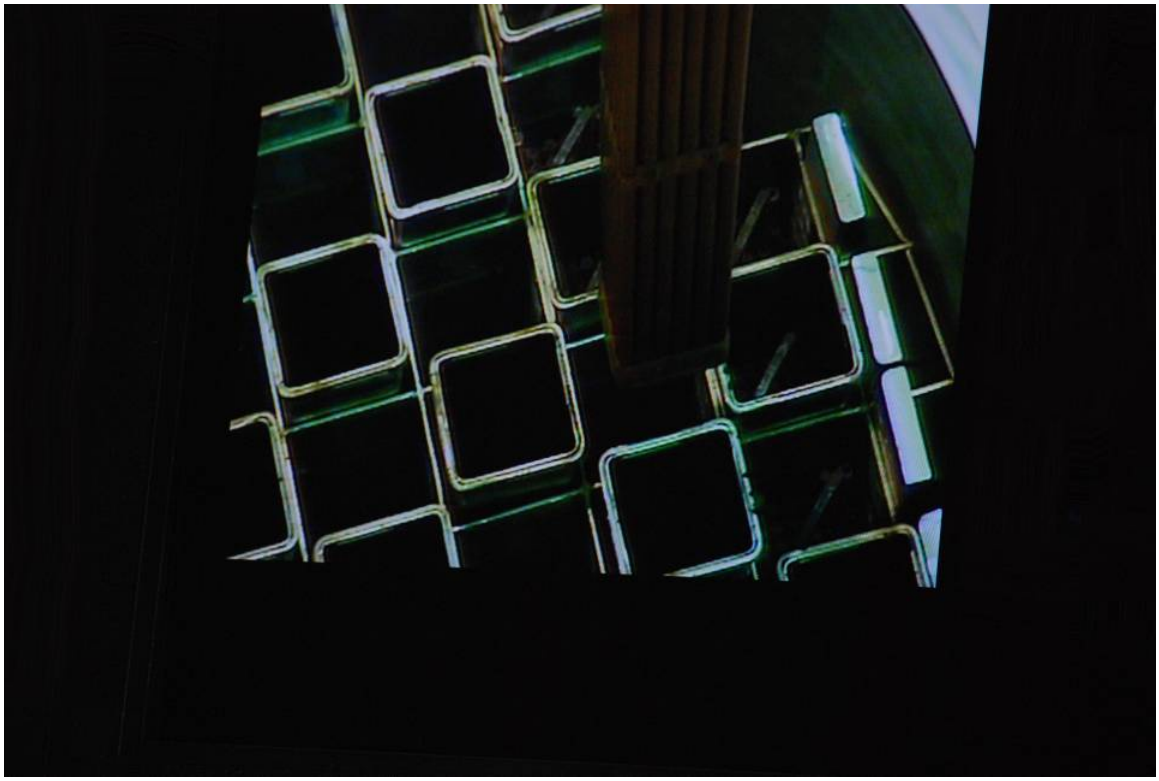
After which the fuel assembly is hoisted out of its BorAl can…

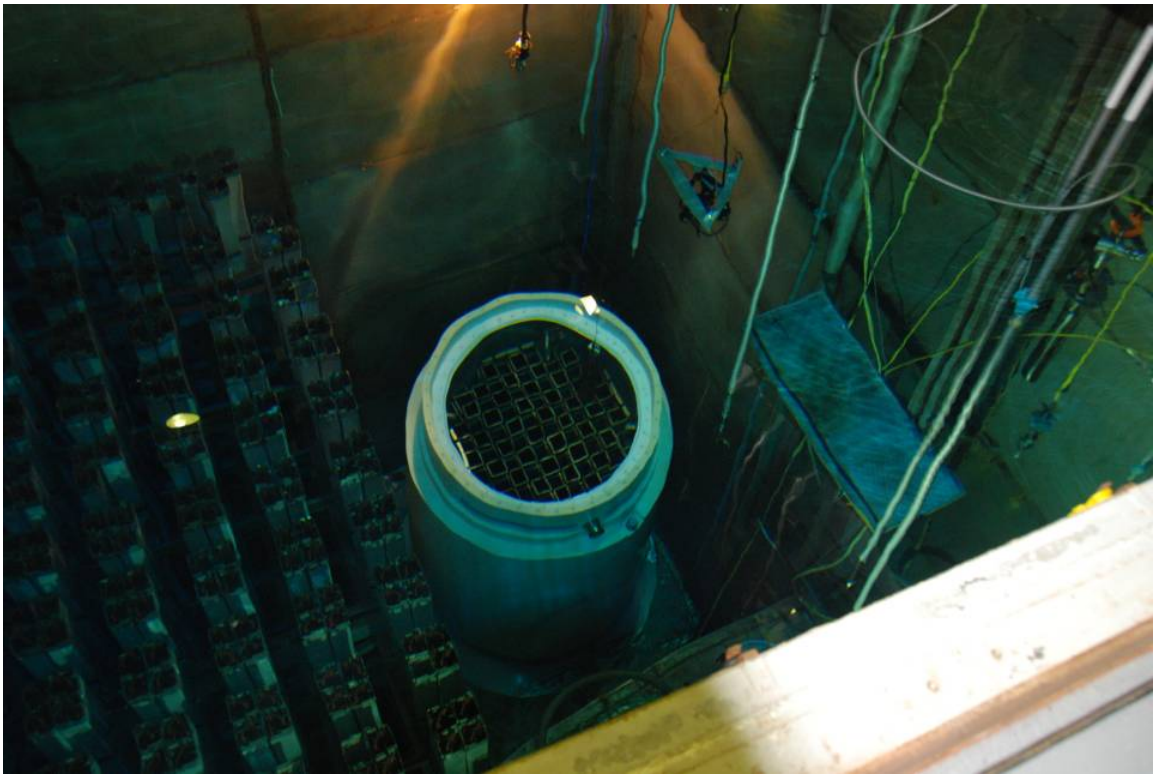


Moved over the cask…

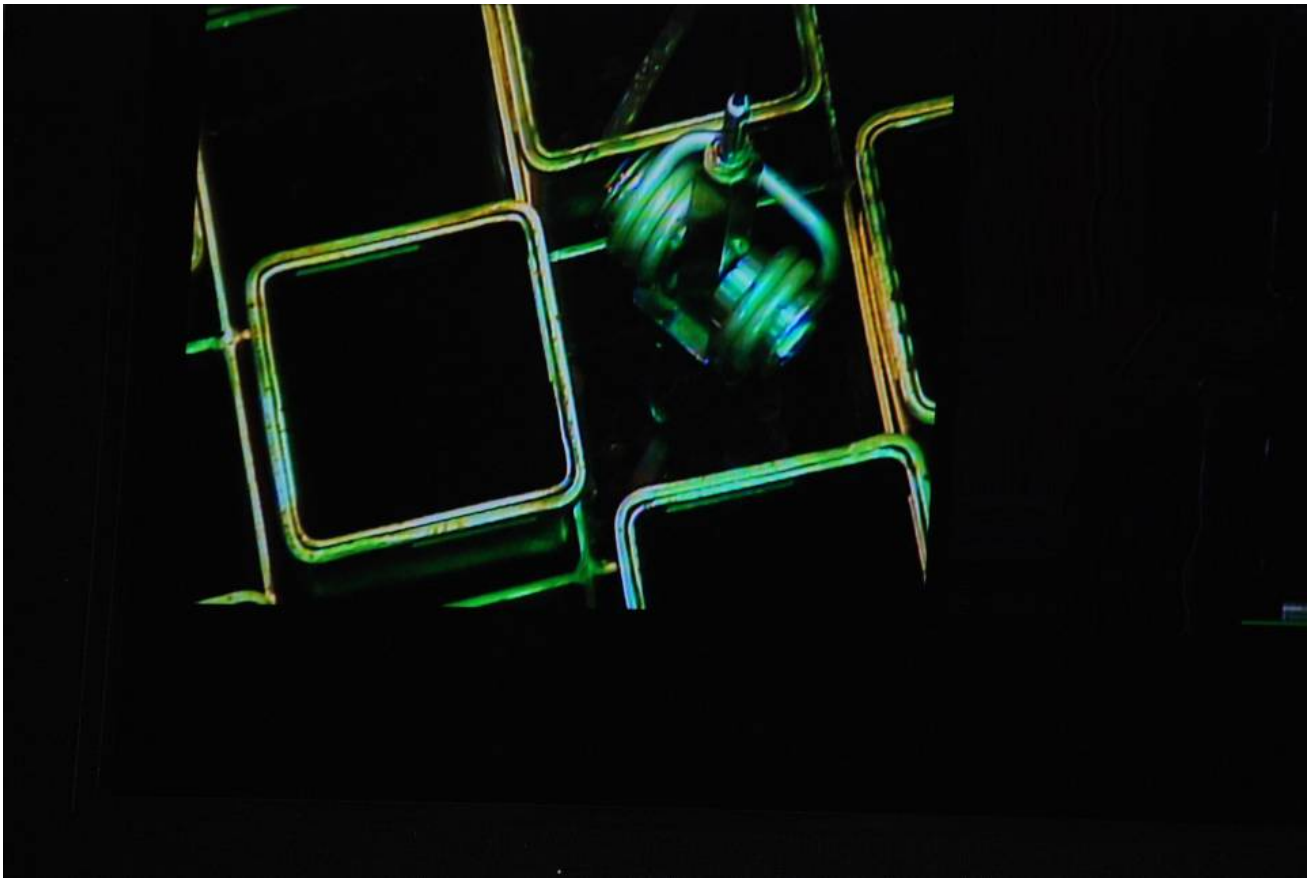


…and lowered into a cell in the MPC.



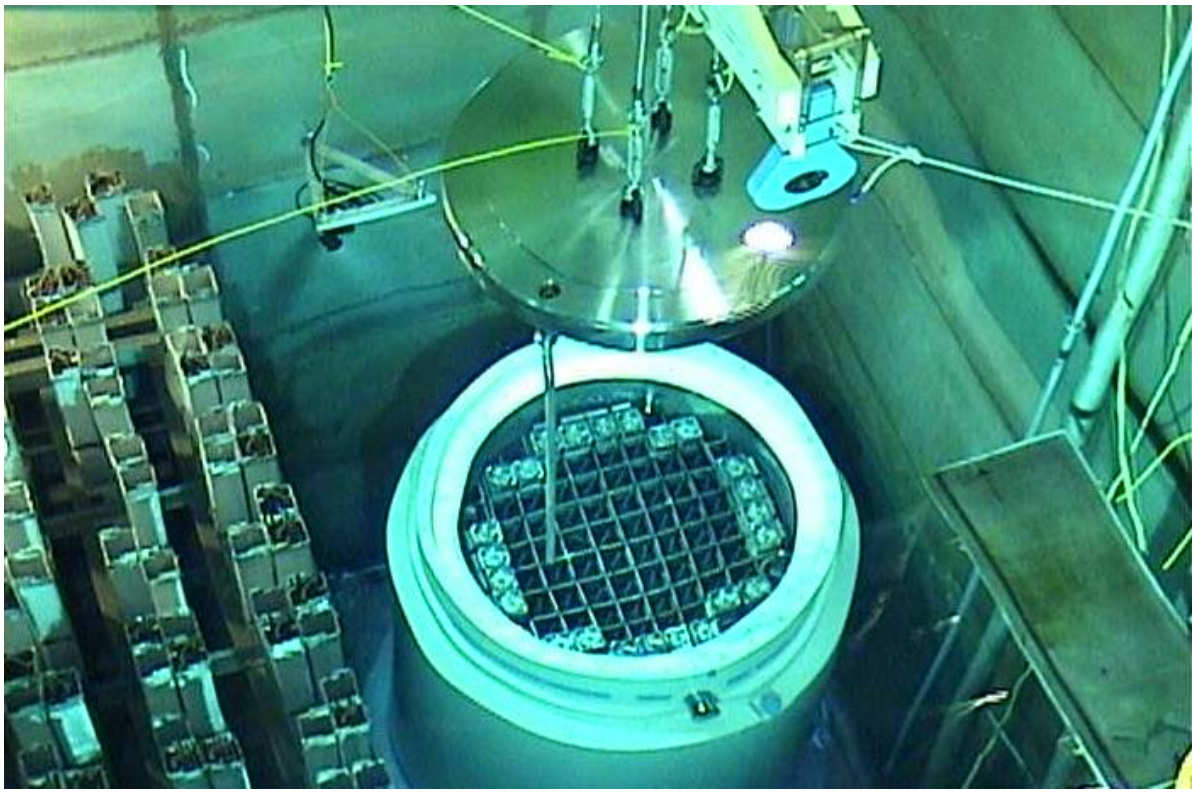


The grapple is removed from the fuel assembly, and the process is repeated until the cask is full.



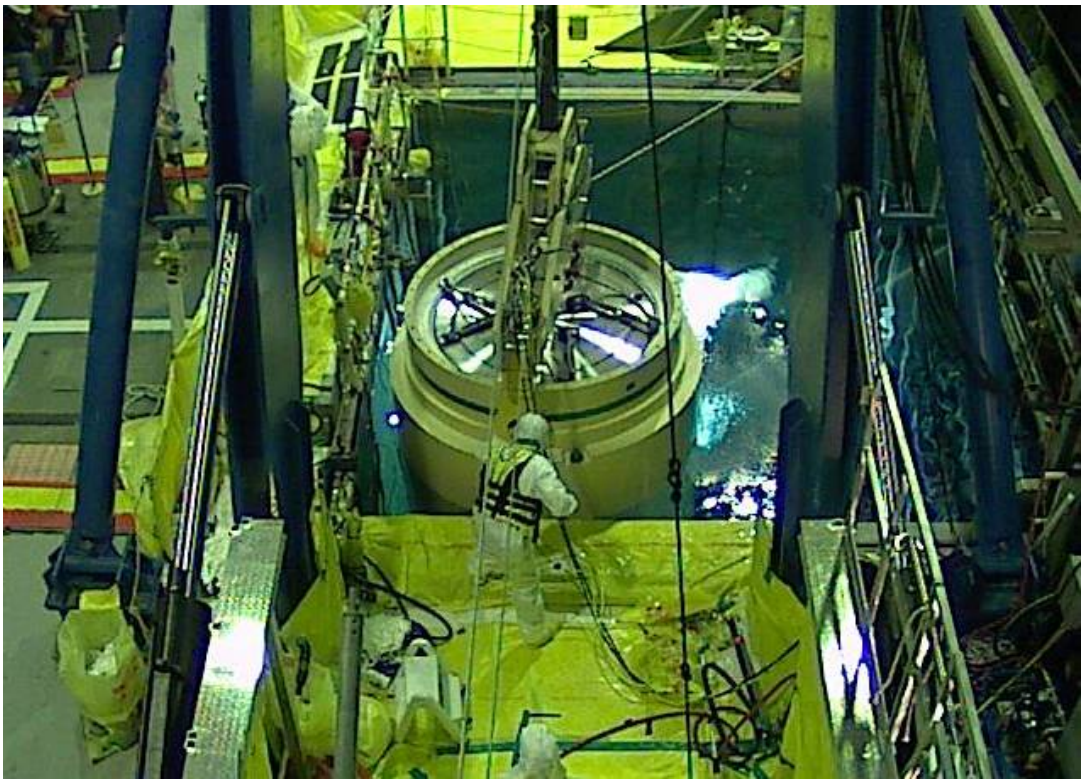
The MPC lid is now lowered into the pool…

…and onto the MPC. Note the drain tube attached to the lid.



Once in place, the lid will provide shielding from the radiation...

…so that the loaded cask can be lifted out of the pool.

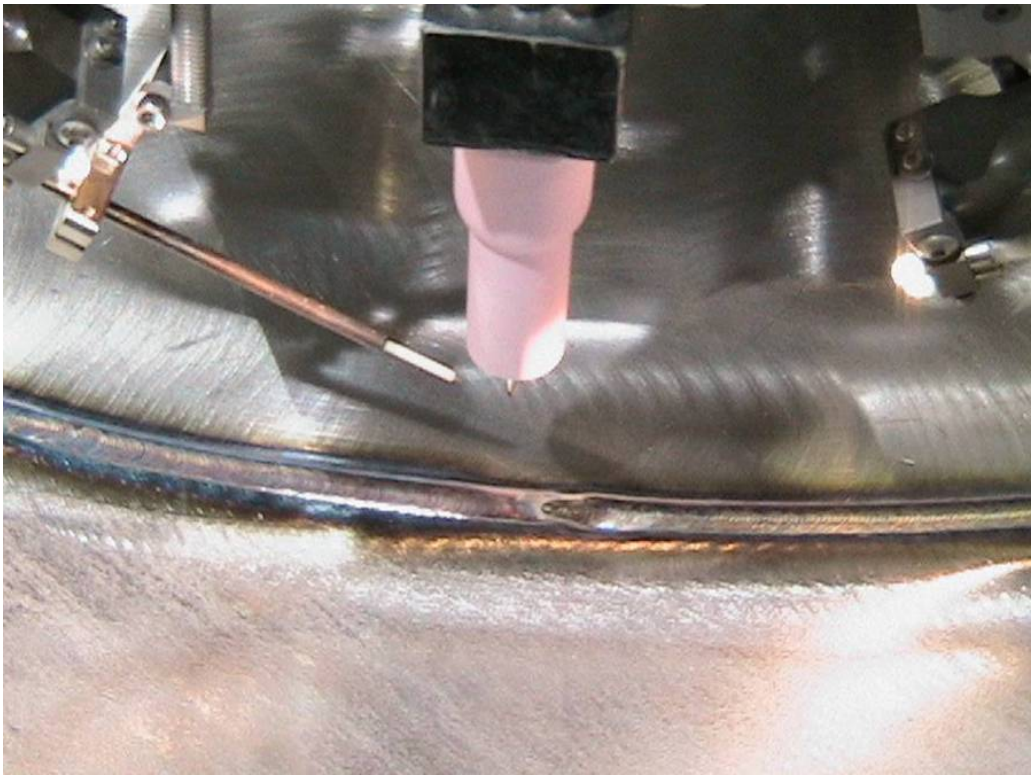


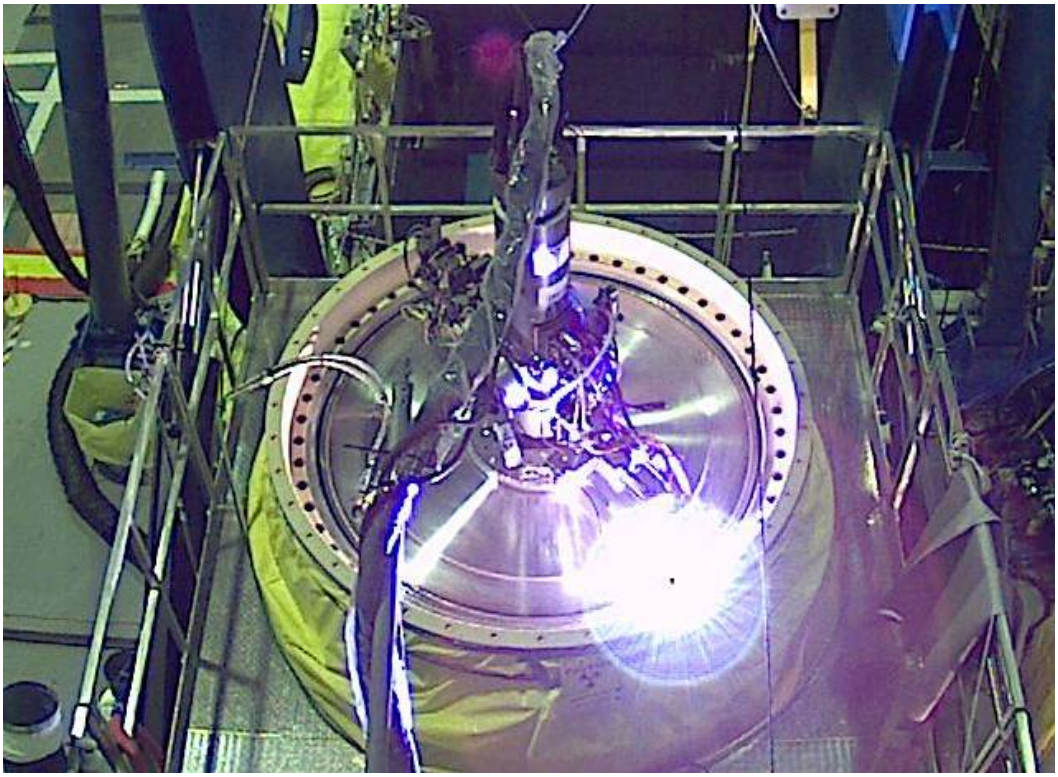
The cask will remain suspended while the exterior is decontaminated.

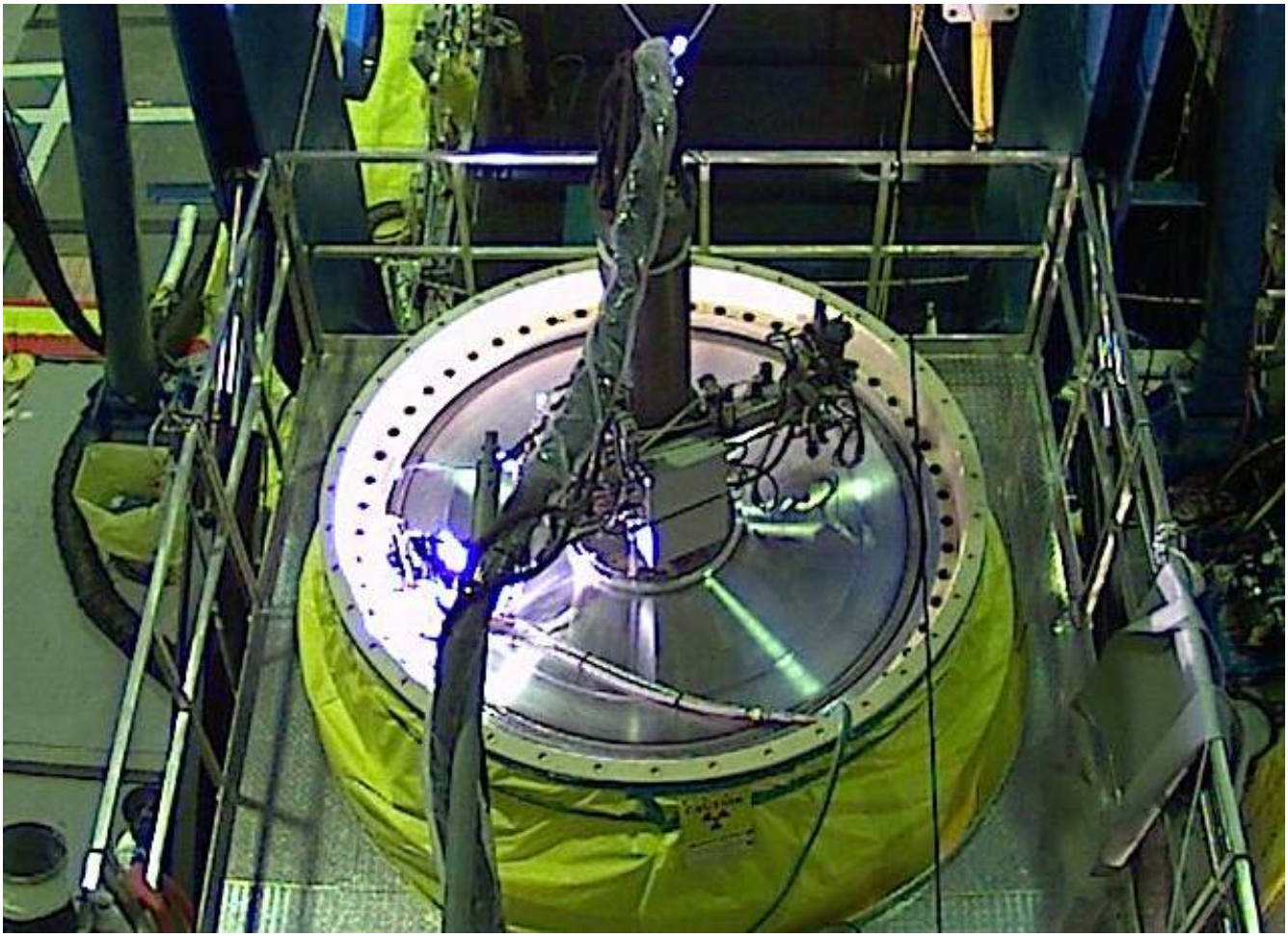
Once decontaminated, the cask is surveyed for radiation dose rates in preparation for welding the lid in place.

An automated welding machine is placed on the lid…

…and the process of welding the lid to the MPC begins.

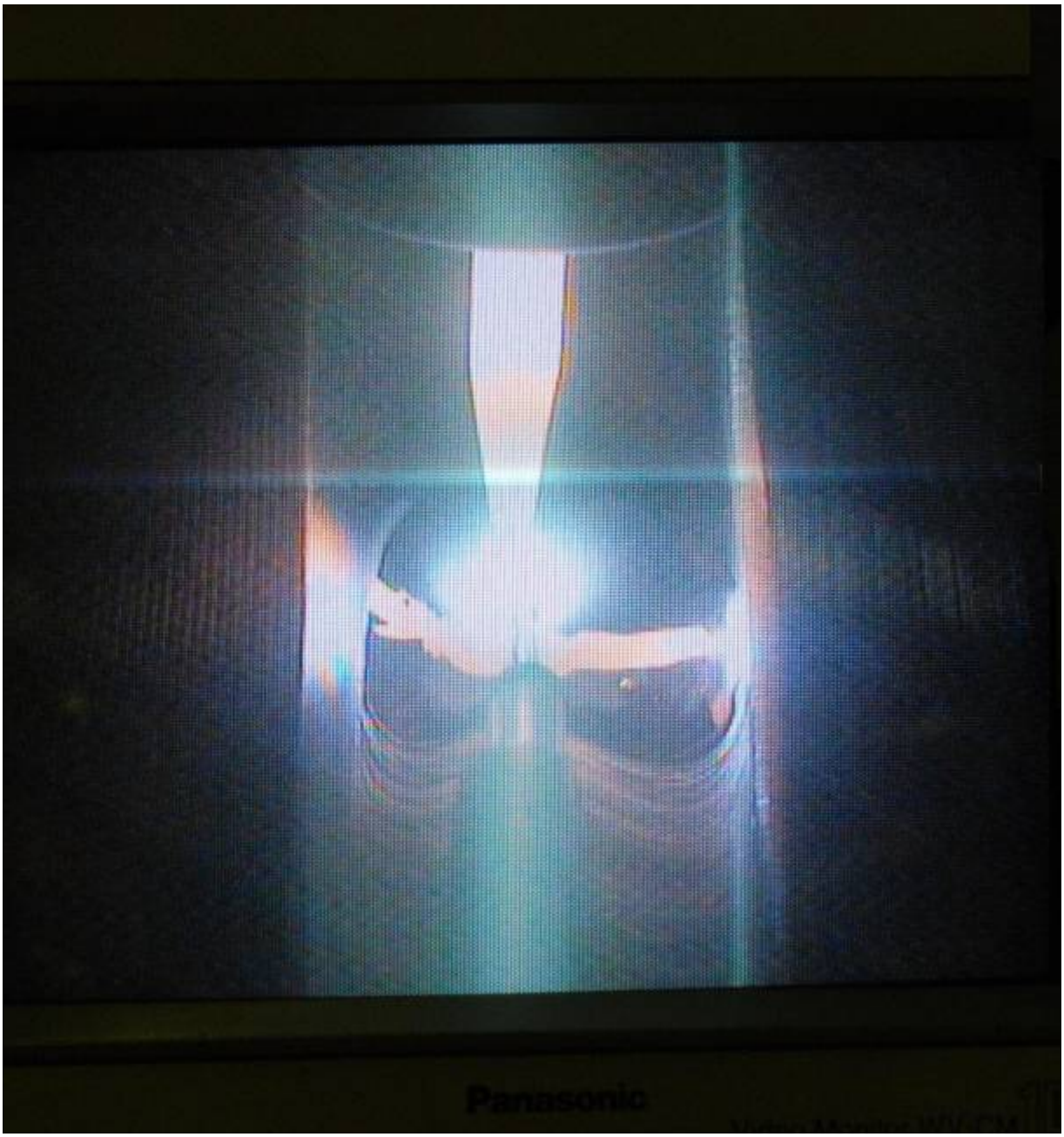






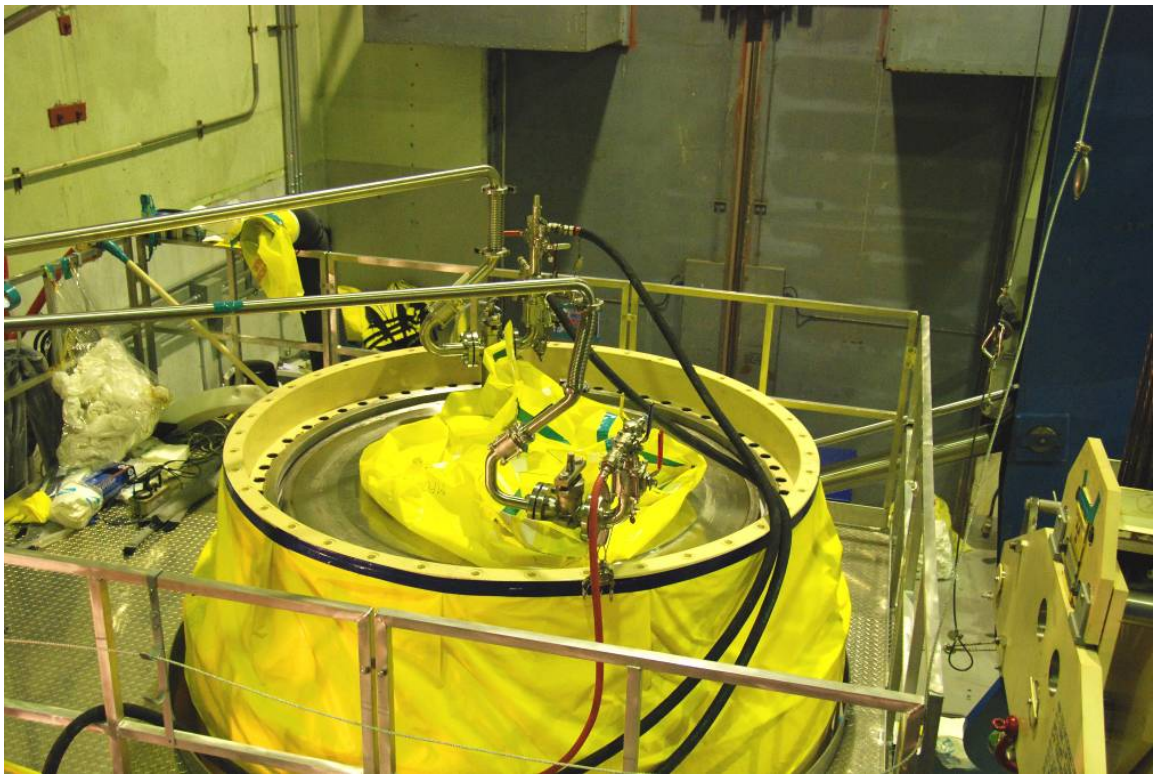
The process is monitored by technicians on the control platform using remote controls and cameras.

The “puddle” of molten metal as seen on the TV screen.



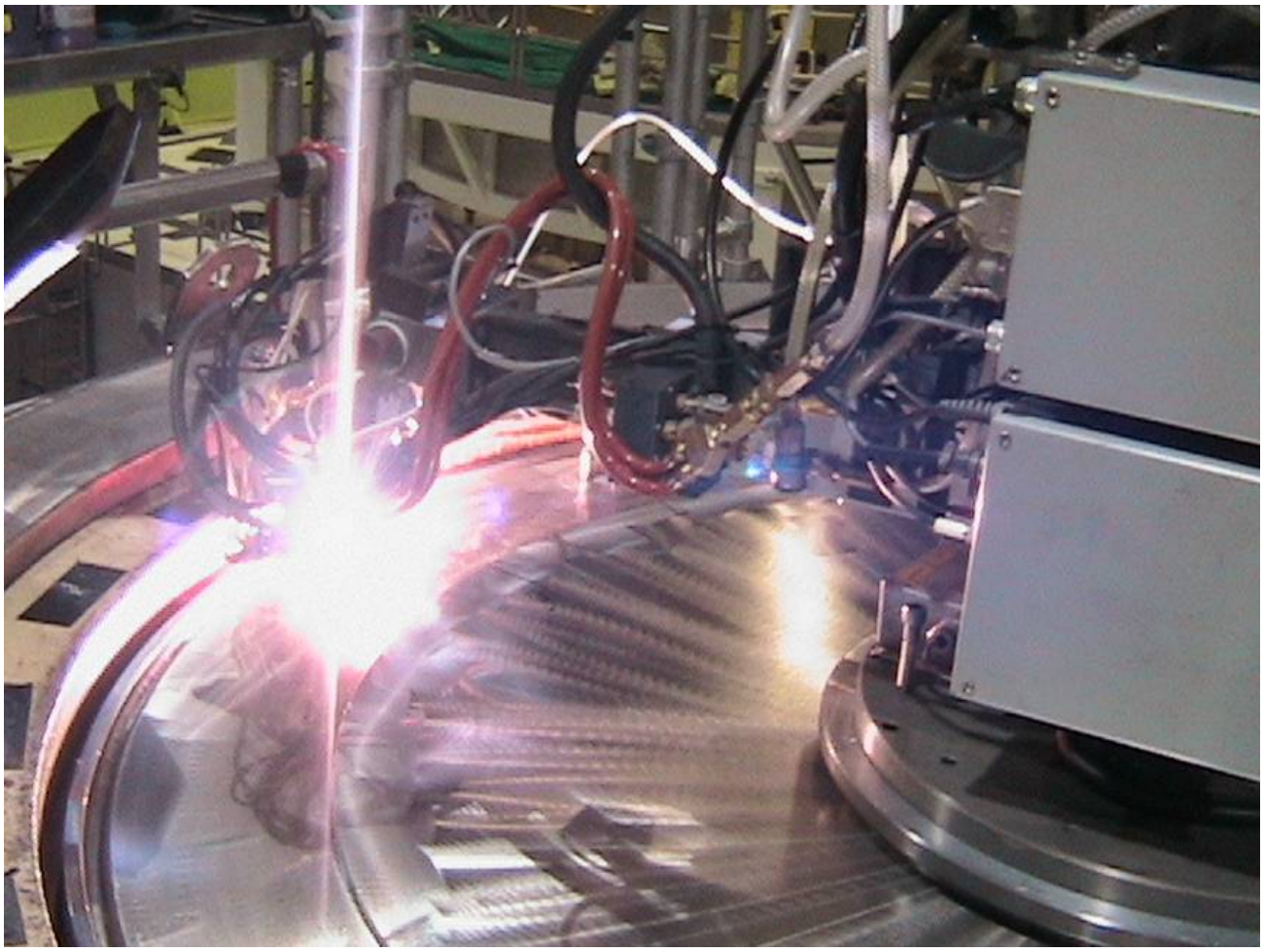
With the welding completed, the vacuum drying system is mounted onto orifices in the MPC lid.

The drying system will first remove standing water, and then create a vacuum inside the MPC to completely dry it.

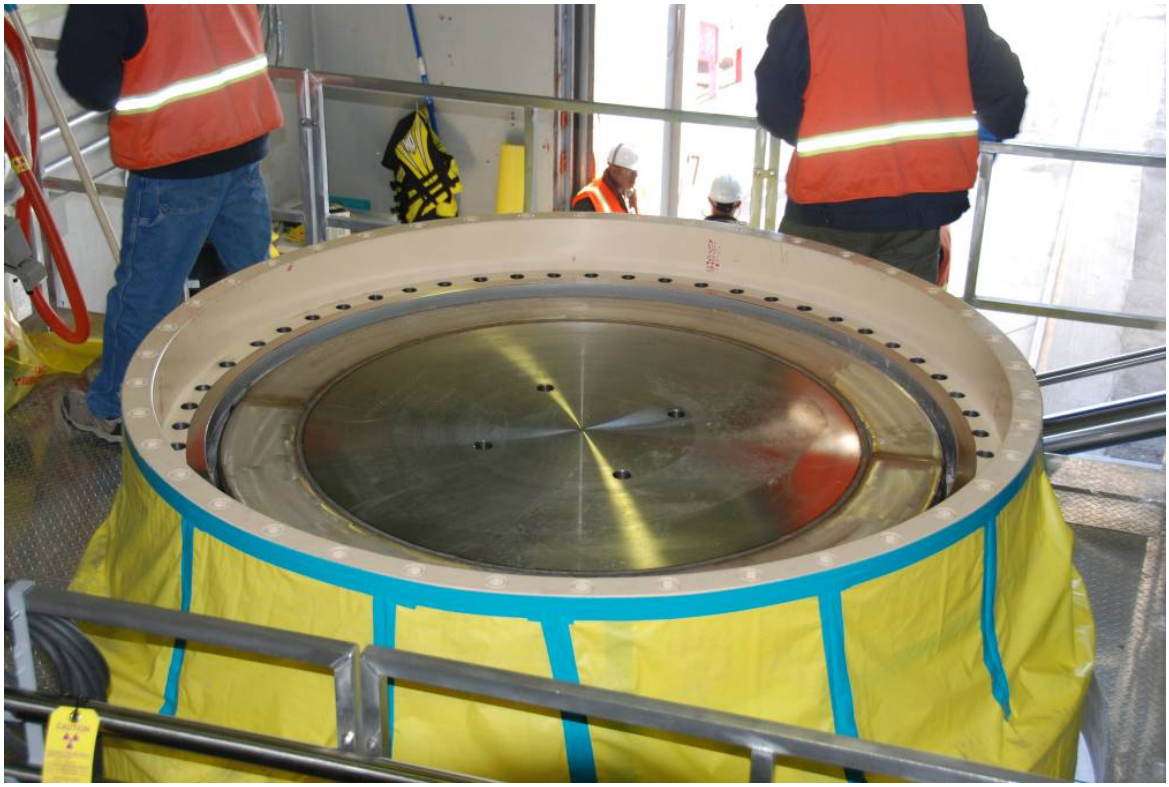


Technicians monitor the process at the drying system control console.

Once vacuum drying is complete, the drying system is disconnected and a seal ring is welded over the vacuum ports and the closure weld.



The cask is now ready for the installation of the outer lid.



It’s brought into the building with a crane, and hoisted into position…

…set in place…

…and bolted down. The Annulus, the space between the MPC and the cask, will be vacuum dried.

The loaded cask can now be rolled out of the building …

…and picked up by the crawler.

At the Restricted Area boundary, the crawler is surveyed for contamination.

The crawler exits the gate…

…turns around…

…and begins its final trek up the hill to the ISFSI vault, attended by armed guards, Radiation Protection technicians, engineers, and fuel handlers.

S-3

Guards control the traffic through the ISFSI gate.

Before the crawler and personnel are allowed into the installation…

…everyone, including the crawler operator, is logged into the area and searched for weapons and explosives.

As the crawler and the cask now approach the open silo…

Precision is the order of the day.

The crawler rolls up onto the concrete pad…

…and is carefully guided into position.

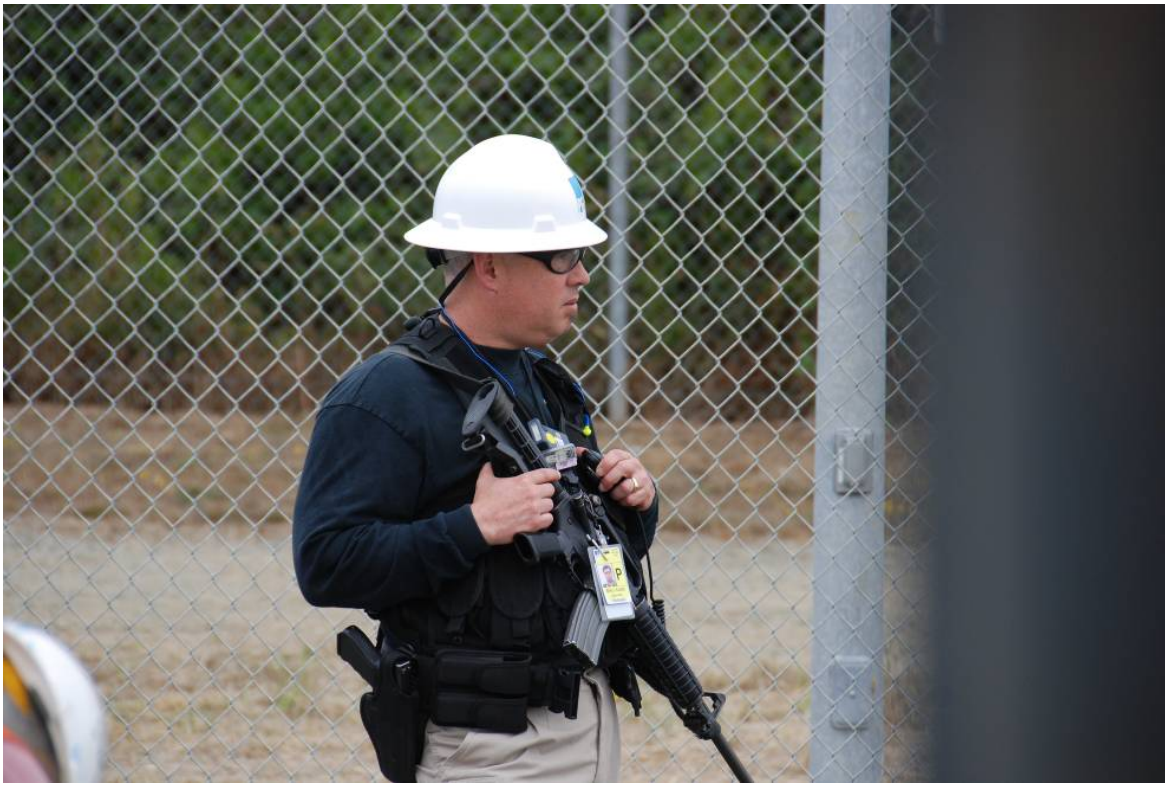
Directly over the silo, the cask is lowered into place.

Once landed in the silo, the cask is released by the crawler.

The crawler backs away, and exits the ISFSI.

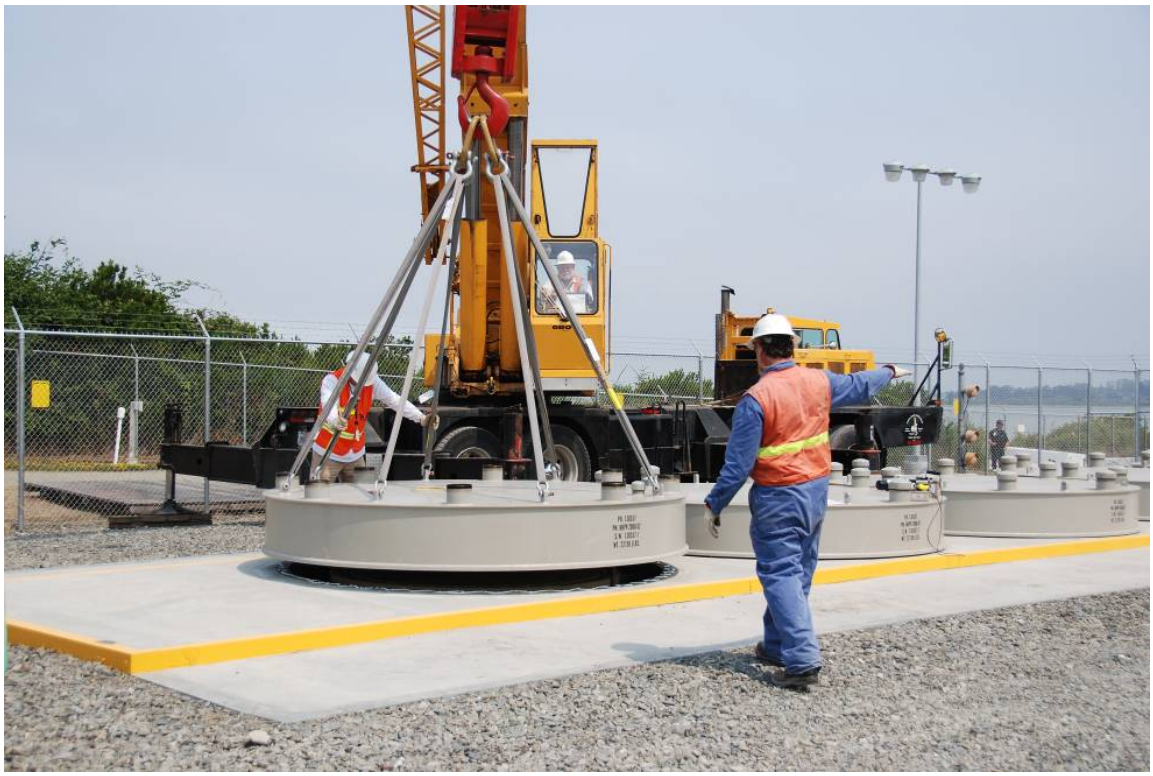
RP technicians continue to monitor radiation levels…

…as Security continues to watch the perimeter.



Seismic braces are placed at the top edges of the silo.

The lid is lowered into place…



…sealed, and bolted down.

The spent fuel will remain in five of the silos (the sixth is for what is called “greater than class C” waste other than spent fuel) until, as noted earlier, a permanent storage facility is provided for it or the country goes back to reprocessing spent fuel as we did up until 1979. It will be well protected; the building at the right of the picture is the guards’ station, where they’ll be holed up with all kinds of sophisticated surveillance and defense capabilities. The lids are about 11,000 pounds apiece – mostly for shielding. A few years from now, as you drive by where the power plant used to be all you’ll see will be the guard building, the fencing, lights and antennas – and if you look closely, you’ll see these lids just poking up out of the vault.

PACIFIC GAS AND ELECTRIC COMPANY

APPENDIX D

LEVERAGING INDUSTRY EXPERIENCE INTO HBPP DECOMMISSIONING PLANNING

Humboldt Bay Power Plant Personnel – Nuclear Decommissioning Experience

Company/Decommissioning Personnel		Decommissioning Sites/Projects	Scope of Work
Personnel (1)			
PG&E	Kerry Rod, Decom Manager	TOCDF, PCAPP, JACADS, Oyster Creek, Saxton	Planning, Engineering, Scheduling, Work Packages, Characterization, Accident Analyses, ISFSI, Implementation, Design for Closure

Staff Augmentation (Contractors Existing) (14)			
ANATA	Ted Ferrando, Decom Project Assistant	Trojan, FWENC, ME Yankee, CT Yankee, Fort Calhoun	Procedures, Planning, ISFSI, Assessment, CAP, Cask Loading Supervisor, Technical Director, Readiness Review
PSG	Brian Thomas, Conceptual Planning Lead	JACADS, Savannah River	Conceptual Planning, Rigging Engineering
PSG	Bruce Ratcliffe, Field Engineer	JACADS	Conceptual Planning, Rigging Engineering
PSG	Robert Thor, Decom Scheduler	K-25 Oak Ridge	Work Control
ANATA	Ray Peacock, Decom Estimator	CT Yankee, ME Yankee, Berkeley (UK)	Planning, Construction Management
Enercon	Dennis Kerwick, Decom Estimator	Hanford, INEL	Planning, Project Management
NEC	Jack Ray, Procedures Lead	ME Yankee, Molten Reactor Experiment Oak Ridge	Rad Waste, ISFSI, Final Status Survey, Characterization, Rad Engineering, Source Term Reduction
ANATA	John Heselton, Work Package Writer	Yankee Rowe, ME Yankee, CT Yankee	Work Planning
ANATA	Brett Mullins, Work Package Writer	Big Rock Point, CT Yankee, NASA Plumbrook, Advanced Medical Services, Braidwood, Indian Point	Field Supervisor, Planning, Procedures, Commodity Removal
ANATA	Al Berry, Job Supervisor	CT Yankee, Hanford, Yankee Rowe, ME Yankee	Supervision, QA, QC, CAP, Procedures, Instructional Technologist
ANATA	Jerry Houff, Job Supervisor	CT Yankee	Operations, Maintenance, Ground Water Controls
ANATA	Scott Kerr, Work Package Writer	NASA Plumbrook, Rancho Seco, Big Rock Point, Los Alamos National Lab	Decon Tech, Decon-Demo Supervisor, Decom Site Supervisor
ANATA	Brad Shepard, Job Supervisor	CT Yankee, ME Yankee	ISFSI Cask Loading Supervisor
Bartlett	Mike Stein, Instrumentation Respiratory Protection Supervisor	Rancho Seco, Trojan	Rad Engineering

Humboldt Bay Power Plant Personnel – Nuclear Decommissioning Experience

Company/Decommissioning Personnel		Decommissioning Sites/Projects	Scope of Work
Planning and Special Projects (Contractors) (21)			
Enercon	Scott Altmayer, Decon Plan Author	INEL, DOE sites Ohio, Rocky Flats, West Valley NY	Waste Management, Waste Treatment Technologies
Enercon	Mike Snyder, Decon Plan Author	Rancho Seco	Rad Waste Supervisor, Rad Engineering
ANATA	Les Dugay, Special Projects - ISFSI and Reactor Vessel Removal	Trojan, FWENC, ME Yankee, CT Yankee, Yankee Rowe	Fuel Transfer, Program Reduction, Final Status Survey, Management, Oversight
ANATA	Steve Shelanskey, PEP and Transition Plan Author	ME Yankee, CT Yankee	Training, Readiness Review, Assessment, CAP, Material Control, Safety Rep
Enercon	Jeff White, Technical Position Paper Oversight	CT Yankee, ME Yankee	Engineering Supervisor
DW James	Rob Snyder, Rad Waste Packaging/Transportation Supervisor	Rancho Seco, Camp Parks, Hanford, San Onofre, GE Vallecitos	Rad Waste Management, Project Management
ANATA	Tony Bejma, Engineering Support	Yankee Rowe, ME Yankee, Trojan, CT Yankee, Bradwell (UK)	Records Management, ISFSI, QA, QC, Safety, Project Management, CAP, Procedures
ANATA	Mark Stock, Trainer	Rancho Seco, NASA Plumbrook, Oak Ridge	Training, MARRSIM, Dismantlement, Remediation, SR HP Tech, FSS
Enercon	Leon Brown, Technical Writer	Fort St. Vrain, Rancho Seco, Big Rock Point, Army Materials Technology Laboratory Facilities, Army Materials Technology Laboratory Research Reactor	Accident Analyses, Procedures, Decommissioning Planning, Program Assessments, Environmental Assessment, License Termination Planning, Dose Modeling, Technical Bases Document Development, ODCM, FSS,
Davincounsel	Peter Davin, Risk Management	Ft Calhoun, Florida Steel, Molycorp, NASA Plumbrook, Millstone, Big Rock Point, Rancho Seco	Senior Corporate Business, Project Management
ANATA	Gary Bouchard, Technical Oversight	Zion, CT Yankee	Decom Project Management, Decom Planning Management
ANATA	Rick Williams, Technical Oversight	Yankee Rowe, Zion	Decom Project Management, Decom Planning Management
DW James	David James, Technical Oversight	Rancho Seco, Ft Greely, La Crosse	Characterization, Segmentation Planning
DW James	Rich Mcgrath, Waste Management Plan Author	CT Yankee	Rad Engineering, FSS Manager, HP Manager

Humboldt Bay Power Plant Personnel – Nuclear Decommissioning Experience

Company/Decommissioning Personnel		Decommissioning Sites/Projects	Scope of Work
DW James	William Doolittle, Transportation Plan Author	CT Yankee, Rancho Seco, Ft Greely, DOE Fuel Processing Plants, Honeywell NY Fuel Processing Plant, La Crosse	Rad Engineering, Rad Shipping Supervisor
DW James	John Newey, Liquid Rad Waste Position Papers Author	Rancho Seco	Rad Waste Engineering, FSS, Chemistry, Characterization, Radiation Safety Officer
DW James	Tom Kalinowski, Project Manager	CT Yankee, Rancho Seco, Ft Greely, DOE Fuel Processing Plants, Honeywell NY Fuel Processing Plant, La Crosse	Characterization, Radiation Safety Officer, Rad Waste Management
Enercon	Gerry Williams, Project Manager, Technical Oversight	Saxton, Westinghouse Test Reactor, UW Test Reactor, Heritage Minerals, Westinghouse facilities, fuels facilities, metal facilities, chemical facilities	Waste Management, Soil Remediation, MARRSIM, FSS, Planning, Estimating, Licensing Modifications and Interfaces, Characterization, Building Remediation, License Termination
Enercon	Keith Mahosky, Technical Oversight	ME Yankee, Saxton, Westinghouse Test Reactor, Fuels Facilities, Metal Facilities, Brookhaven National Labs, GE Vallecitos, Oak Ridge National Labs	Waste Management, Soil Remediation, MARRSIM, FSS, Planning, Estimating, Licensing Modifications and Interfaces, Characterization, Building Remediation, License Termination
Enercon	Cort Horton, Characterization Lead	Honeywell UF6 Conversion Plant, Flannery Building Radium Facility, Vallecitos, Oak Ridge National Laboratory DOE Complex, Idaho National Engineering and Environmental Laboratory DOE Complex, RMI Ashtabula Site, Monsanto Plutonium Facility, Ottawa Illinois Radium Dial, Weldon Springs DOE Facility, Battelle Columbus Laboratory, Knolls Atomic Power Laboratory, Westinghouse Hematite Facility	Characterization, FSS, RP Support, License Termination Support, Building Remediation, Waste Packaging and Shipping, Building Demo, Decommissioning License Support,
Enercon	Scott LaBuy, Scheduler	Hematite Fuel Fabrication Facility, Vallecitos, University of Washington, Training and Research Reactor, Brookhaven National Lab, Global Nuclear Fuels, Wilmington NC, East Tennessee Technology Park (ETTP), Oak Ridge, INEL	Scheduler, Tank Remediation, D/D Planning

Humboldt Bay Power Plant Personnel – Nuclear Decommissioning Experience

Site Decommissioning Debriefs (13)

Company/Decommissioning Personnel		Decommissioning Sites/Projects	Scope of Work
Consumers Power	Kurt Haas	Big Rock Point	Decommissioning Site Project Manager
TSSD	Todd Smith	CT Yankee, Yankee Rowe, ME Yankee	Cost, Senior Management
TSSD	Matt Marston	ME Yankee, CT Yankee	Engineering, Fuel Transfer
RSCS	Eric Darois	CT Yankee	Certified Health Physicist
ERM	Ken Dow	Yankee Rowe	Environmental
Field Safety Corp	Denise Dudek	CT Yankee	Safety
SMUD	Steve Redeker	Rancho Seco	Plant Manager
	Mike Snyder	Rancho Seco	Principal Rad Engineer
	Jim Field	Rancho Seco	Engineering Superintendent
	Mike Bua	Rancho Seco	Radiation Protection Manger
	Bob Decker	Rancho Seco	Lead FSS
	Wayne Hawley	Rancho Seco	Decom Manager - Dismantlement
	Einar Ronnigen	Rancho Seco	Decom Manager - Radiological

PACIFIC GAS AND ELECTRIC COMPANY

APPENDIX E

STATEMENTS OF QUALIFICATIONS

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF GEOFFREY M. GRIFFITHS

Q 1 Please state your name and business address.

A 1 Geoffrey M. Griffiths, TLG Services, Inc. (a subsidiary of Entergy Nuclear, Inc. (ENI)), 148 New Milford Road, East Bridgewater, Connecticut.

Q 2 Briefly describe your responsibilities.

A 2 Manager, Cost and Estimating, Decommissioning Services. As manager, I am responsible for supervising and managing the work of the decommissioning estimating staff at TLG Services. For specific projects, I function as Project Manager for designated contracts.

Q 3 Please summarize your educational and professional background.

A 3 I have a total of 35 years of experience with expertise in the following areas: nuclear facility decommissioning estimating, nuclear power plant construction, and plant maintenance. I completed my Bachelor of Science degree in Mechanical Engineering at the U.S. Naval Academy in 1973 and my Masters degree in Business Administration from the University of Connecticut, in 1982. I was on active duty in the U.S. Navy between 1973 and 1978, and completed nuclear submarine officer training and served on operating submarines. I joined TLG Services in 1991. When TLG Services was purchased by ENI in September 2000, I was retained as Manager, Cost and Estimating for ENI. I was employed by Nuclear Energy Services in Danbury, Connecticut from 1978 until 1990, providing services to nuclear plants under construction or during refueling outages.

Q 4 What experience do you have with the process of decommissioning and the estimation of decommissioning costs at nuclear power plants?

A 4 I have extensive experience in decommissioning and preparing decommissioning cost studies.

I was responsible for the preparation of the Saxton Decommissioning Cost Estimate, included in the Decommissioning Plan submittal to the Nuclear Regulatory Commission (NRC).

I was responsible for providing a detailed analysis of the regulatory requirements and physical activities necessary to package and remove the Saxton reactor vessel.

I prepared the radiological and hazardous materials Characterization Plan for the decommissioning of the Saxton Nuclear Experimental Facility (an experimental reactor located in Saxton, Pennsylvania, owned by GPU Nuclear).

As project manager, I was responsible for providing many of the Safety Analyses associated with the one-piece removal and disposal of the Trojan reactor vessel and internals.

As project manager, I was responsible for the preparation of decommissioning cost estimates used to support rate case hearings, asset retirement obligations, and/or utility management planning decisions. Estimates have been prepared for the following stations:

- Florida Power and Light – St. Lucie Unit 1 and 2;
- Florida Power and Light – Turkey Point Unit 3 and 4;
- Northeast Utilities – Millstone Unit 1;
- GPU Nuclear – Oyster Creek;
- New Brunswick Power – Point Lepreau;
- Ontario Power Generation – Bruce Station;
- Ontario Power Generation – Pickering Station A and B;
- Ontario Power Generation – Darlington Station;
- Hydro Quebec – Gentilly-2;
- South Texas Project Nuclear Operating Company – South Texas Project;
- Nuclear Management Company – Palisades, Point Beach, and Prairie Island;
- Southern Company – Hatch, Vogtle, and Farley;
- Entergy – Indian Point Energy Center;
- Entergy – Pilgrim;
- Pacific Gas and Electric – Humboldt Bay 3 and Diablo Canyon;
- SKB – Barseback Units 1 and 2 (Sweden); and
- Portland General Electric – Trojan ISFSI Decommissioning.

Q 5 What experience do you have with the process of decommissioning and the estimation of decommissioning costs at non-power producing nuclear facilities?

A 5 I have extensive experience in process of decommissioning and the estimation of decommissioning costs at non-power producing nuclear facilities.

Specific Experience

Decommissioned the Mallinckrodt RadPharm facility in Burlingame, California. Responsible for both the preparation and submittal of the Decommissioning Plan and management of the field activities. On-site work included radiological characterization of the facility, decontamination of an activated concrete vault, adjacent Hot Cell structures, demolition of the "clean" facility, and final release survey.

Prepared a detailed "bottoms-up" cost estimate for decommissioning the Separations Processing Research Unit (SPRU) under a contract with the US Department of Energy (DOE), CH Operations Office. SPRU was a facility built and operated in the early 50's that was designed to extract Plutonium from irradiated Uranium.

Consulting assignments to review the cost estimate and progress of the operations at the Battelle Columbus Laboratories Decommissioning Project, including detailed review of characterization costs, the environmental health and safety costs, and the management and support staff structure.

Prepared a detailed "bottoms-up" cost estimate for decommissioning the RMI Metals facility located in Ashtabula, Ohio under a contract with the USDOE, CH Operations Office. RMI was a facility that was designed to extrude depleted uranium into various forms and shapes.

Prepared a comprehensive remediation specification for buildings extensively contaminated with radium. Specification was prepared in accordance with NAVFAC SPECINSTAT system format.

Performed a DOE-sponsored peer review of the PNL ARAM facilities disposition module, used by the DOE in its 1995 Baseline Environmental Management Report.

Prepared a detailed "bottoms-up" cost estimate for decommissioning the West Jefferson (WJ) facility owned by Battelle Columbus Laboratories. WJ is a facility that includes a pool reactor, numerous hot cells and related laboratory and other support facilities.

Conducted an independent review of the costs to "transition" the PFP from operations to "long-term" shutdown status. PFP was a facility designed to process plutonium solutions into functional products.

Conducted an independent review of the costs to "transition" the FFTF (a liquid-sodium cooled research reactor) from operations to long-term shutdown status.

International Agency Decommissioning Experience

Participated in a technical assistance program to evaluate and make recommendations on the Ignalina Nuclear Station Decommissioning Plans (Lithuania).

Participated in a technical assistance program to evaluate and make recommendations on the Armenian Nuclear Plant (Metsamor) Decommissioning Plans.

Q 6 Have you authored or co-authored papers on decommissioning cost estimating?

A 6 Yes. I have authored or co-authored the following:

"Decommissioning an Activated Radiopharmaceutical Facility in a Light Industrial/Office Park Area," presented to International Symposium on Decontamination and Decommissioning, 1994, Knoxville, Tennessee.

"Area-Based Decommissioning Cost and Schedule Estimate," presented at 1996 Decommissioning Conference, 1996, Captiva Island, Florida.

"Determining the Measurement of a Liability for an SFAS 143 Asset Retirement Obligation," presented to 2003 ANS Conference, 2003, San Diego, California.

"Comparison of Reported Costs to NRC Funding Levels," presented to 2004 Decommissioning Conference, 2004, Pt. Clear, Alabama.

"Estimating End of Life Liabilities for Plant Licensing and Financial Planning for Similarly Configured Stations," presented to 2008 Decommissioning Challenges Conference, sponsored by SFEN, French Nuclear Energy Society, Avignon, France.

Q 7 What is the purpose of your testimony?

A 7 I am sponsoring Chapter 4, "Diablo Canyon Power Plant Nuclear Decommissioning Cost Study," and Chapter 6, "Humboldt Bay Power Plant

Nuclear Decommissioning Cost Study," of PG&E's Nuclear Decommissioning Cost Triennial Proceeding.

Q 8 Does this conclude your statement of qualifications?

A 8 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF JAMES L. HIGHAM, JR.

Q 1 Please state your name and business address.

A 1 My name is James L. Higham, Jr., and my business address is PG&E Corporation, One Market, Spear Tower, San Francisco, California.

Q 2 Briefly describe your responsibilities at PG&E Corporation.

A 2 I am the tax manager of Research and Planning within the Tax Department. I handle various research and planning issues with respect to federal income taxes, including the creation and submission of Internal Revenue Service ruling requests under Section 468A of the Internal Revenue Code.

Q 3 Please summarize your educational and professional background.

A 3 I received a Bachelor of Arts degree in Fine Arts (Art History) from the College of William and Mary, Williamsburg, Virginia, in 1990. I received a Juris Doctor from the University of Mississippi School of Law, Oxford, Mississippi, in 1993. I received a Masters in Law (Taxation) from New York University School of Law, New York, New York, in 1995. I joined Pacific Gas and Electric Company in April 1998. Since that time, I have gained increasing responsibilities within the Tax Department, including overseeing the submission of six separate ruling requests with the Internal Revenue Service related to PG&E's nuclear decommissioning funding. Prior to my employment with PG&E, I was a Tax Manager at the accounting firm of KPMG Peat Marwick LLP in Los Angeles, California.

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring Chapter 3, "Diablo Canyon Nuclear Decommissioning Expense," and Chapter 5, "Humboldt Bay Power Plant Unit 3 Nuclear Decommissioning Expense" of PG&E's Nuclear Decommissioning Cost Triennial Proceeding.

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF NIELSON D. JONES

Q 1 Please state your name and business address.

A 1 My name is Nielson D. Jones, and my business address is Pacific Gas and Electric Company, 77 Beale Street, San Francisco, California.

Q 2 Briefly describe your responsibilities at Pacific Gas and Electric Company (PG&E or the Company).

A 2 I am a supervisor in the Revenue Forecasting and Analysis section of the Analysis and Rates Department, where I am responsible for supervising the preparation of revenue requirement models, marginal cost analyses, and developing related testimony.

Q 3 Please summarize your educational and professional background.

A 3 I received a Bachelor of Science degree in Nuclear and Power Engineering from the University of Cincinnati in 1985. I received a Master of Business Administration degree from Golden Gate University in 1995. From 1985 to 1987, I worked as an engineer for Westinghouse Electric Corporation.

I joined PG&E in 1987 as an engineer in the Nuclear Power Generation Department. My responsibilities included nuclear fuel utilization analysis and reactor physics calculations. I was promoted in 1995 to supervisor, responsible for fuel and core technical analysis. In 1997, I was promoted to acting director of Nuclear Technical Services. My responsibilities included managing technical projects and programs supporting the Diablo Canyon Power Plant.

In late 1998, I left PG&E to join Altran Corporation, a management and engineering consulting company. As a senior consultant, I supported utilities throughout the United States on projects such as Y2K auditing, plant licensing review and probabilistic reliability studies.

I rejoined PG&E as a senior rates analyst in late 2000 and was promoted to the position of team lead of the operations and maintenance (O&M) expense group in August 2003. In this position, I was the working cash expert witness in the 2003 and 2007 General Rate Cases (GRC) as well as the O&M expense witness in Federal Energy Regulatory Commission (FERC) filings. In June 2006, I assumed my current position,

supervisor of the results of operations group. In this position, I continue to be the PG&E expert witness for working cash in addition to being an expert witness for revenue requirement calculations and being a case manager for the cost of capital regulatory filing. Most recently, I was the revenue requirement witness in PG&E's SmartMeter™ Program Upgrade filing made on December 12, 2007 and PG&E's 2009 Rate Design Window (RDW) filing made on February 27, 2009.

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring Chapter 8, "Nuclear Decommissioning Revenue Requirement Request," of PG&E's Nuclear Decommissioning Cost Triennial Proceeding.

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF LOREN D. SHARP

Q 1 Please state your name and business address.

A 1 My name is Loren D. Sharp, and my business address is Diablo Canyon Power Plant, P.O. Box 56, Avila Beach, California.

Q 2 Briefly describe your responsibilities at Diablo Canyon Power Plant.

A 2 I am the senior director of Engineering Services at Diablo Canyon. All of Diablo Canyon Engineering, Diablo Canyon Capital Projects management/ subcontractors, Diablo Canyon nuclear fuels department, and PG&E corporate Geo-Sciences expertise team report to me. I report directly to the Diablo Canyon Site Vice President.

Q 3 Please summarize your educational and professional background.

A 3 I received a Bachelor of Science degree in Nuclear Engineering, Master of Science degree in Nuclear Engineering, Professional Engineer in Mechanical Engineering, and Senior Reactor Operator Certification. I have a total of 35 years of experience with expertise in the following areas: engineering design, plant operation, plant management, and project management.

Q 4 What is the purpose of your testimony?

A 4 I was hired by PG&E based on my plant management and project management expertise to complete nuclear fuel assembly loading into storage casks at Humboldt Bay Nuclear Plant. In addition, I was hired to provide the leadership to transition the Humboldt site into the Decommissioning phase after fuel cask loading was completed. I had been part of the management team that successfully designed for decommissioning for the Department of Defense Chemical weapons demilitarization sites. I was a Vice President/Plant General Manager for Raytheon/Washington Group International for ten years destroying nerve agents or blister agents and provided the senior leadership for plants at Johnston Island in the South Pacific, Umatilla in Oregon, Pueblo in Colorado, Blue Grass in Kentucky, and Tirana in Albania.

I am sponsoring the following testimony, Chapter 1, “Introduction and Policy,” Chapter 2, “Humboldt Bay Power Plant Unit 3 – Nuclear Production

Expenses," and Chapter 7, "Humboldt Bay Power Plant Unit 3 – Pre-Decommissioning Activities." In addition, I am sponsoring Appendices A through D.

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.