Decision 11-07-003 July 14, 2011

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company in its 2009 Nuclear Decommissioning Cost Triennial Proceeding (U39E).	Application 09-04-007 (Filed April 3, 2009) (CONSOLIDATED)
Joint Application of Southern California Edison Company (U338E) and San Diego Gas & Electric Company (U902E) for the 2009 Nuclear Decommissioning Cost Triennial Proceeding to Set Contribution Levels for the Companies' Nuclear Decommissioning Trust Funds and Address Other Related Decommissioning Issues.	Application 09-04-009 (Filed April 3, 2009)

DECISION ADOPTING RECOMMENDATIONS OF THE INDEPENDENT PANEL ON NUCLEAR DECOMMISSIONING COSTS, ESTIMATES, ASSUMPTIONS, AND FORMAT

TABLE OF CONTENTS

Title **Page**

Title **Page**

DECISION ADOPTING RECOMMENDATIONS OF THE INDEPENDENT PANEL ON NUCLEAR DECOMMISSIONING COSTS, ESTIMATES, ASSUMPTIONS, AND FORMAT

1. Summary

This decision will greatly increase the transparency of nuclear decommissioning cost estimates and utility expenditures made for decommissioning. It adopts 12 recommendations made by an independent panel of experts that are expected to also improve the accuracy of decommissioning cost estimates and permit comparisons across utilities where appropriate. In addition, the decision approves a Tier 2 Advice Letter procedure and format for Commission review of the major decommissioning activities currently underway by Pacific Gas and Electric Company (PG&E) at the Humboldt Bay Nuclear Power Plant. The result is that the Commission will be better informed and able to fully exercise its jurisdictional oversight of decommissioning activities and costs in California.

2. Background and Procedural History

In response to issues raised during Phase 1 of the 2009 NDCTP about the lack of transparency and comparability of the decommissioning cost estimates provided for Commission review, the Commission ordered creation of an independent panel (Panel) of decommissioning experts. The Panel was asked to review decommissioning[1] cost estimates and practices by California utilities. The Decision specified that Geoffrey Griffiths of TLG Services (TLG), Nicholas Capik

[1] The term "decommission" is defined in 10 CFR 50.2, and includes only those actions required to terminate the NRC operating license. When used in the Panel's Final Report, the term "decommission" is used with its broader meaning including all post-shutdown activities.

of ABZ Engineering & Management Consulting (ABZ), and Bruce Lacy of Lacy Consulting Group, LLC (Lacy Consulting) would be the Panel members. TLG and ABZ have a long history of providing decommissioning cost estimates for California's nuclear plants, and Mr. Lacy was an expert for TURN in Phase 1 of this 2009 NDCTP. Thus, all of the Panel members started with a detailed insider's view of the current decommissioning cost estimates.

The Commission adopted D.10-07-047 on July 29, 2010. Administrative Law Judge (ALJ) Melanie Darling issued a ruling on August 17, 2010 setting a status conference on August 27, 2010 for the Panel to brief the Commission and parties about the Panel's proposed initial work scope, work plan, and communications plan for the project.

At the status conference, the Panel reported that the project was achievable on schedule and within the approved budget of $275,000, assuming no major changes to the work scope described in D.10-07-047. That decision identified six issues in particular that the panel was to evaluate:

- Identify, compare, and explain the key cost and financial assumptions driving differences in the decommissioning cost estimates between nuclear generating stations at San Onofre (SONGS), Diablo Canyon, and Palo Verde;
- Identify, compare, and explain similarities and differences in decommissioning costs, challenges, and approaches for California's nuclear plants and plants of similar design and configuration in other states;
- Identify and explain financial and cost assumptions that could be applied on a common basis to the estimates for Diablo Canyon, SONGS, and Palo Verde sites;
- Identify and suggest steps that could be taken to minimize decommissioning costs in the future;
- Evaluate whether emerging radiological contamination issues could increase decommissioning costs; and

- Suggest a common format for preparation of decommissioning cost estimates that would permit greater transparency and comparability.

The Panel also agreed to use comparable dollars in the report (e.g., $2008), and added an examination of the definition and role of various "contingency factors" in decommissioning cost estimates.

At the status conference, the Panel, parties, and ALJ worked out a schedule for the Panel to provide interim briefings prior to development of the Final Report in order to get feedback from all stakeholders, including the public. Between September 2010 and December 2010, the Panel provided monthly status reports to the Commission and parties to describe activities performed in the prior month and to identify projected activities in the subsequent month.

On January 25, 2011, another status conference was held in which the Panel provided a preliminary briefing about its work and a draft report to the Commission staff, the ALJ, and other interested parties. The draft report included a number of preliminary recommendations for discussion. The Commission's Energy Division, the ALJ, Pacific Gas and Electric Company (PG&E), The Utility Reform Network (TURN), and Southern California Edison (SCE) provided comments to the Panel seeking explanations, clarifications, and/or additions to the draft report.

Pursuant to a February 1, 2011 ruling by the ALJ, a full briefing of the Commission, the parties and the public occurred on February 22, 2011. Assigned Commissioner Timothy Alan Simon attended the session which was transcribed for the record. No additional comments were submitted to the Panel after February 22, 2011. On behalf of the Panel, the utilities filed the "Report on Nuclear Decommissioning" (Final Report) on March 1, 2011. The parties were

permitted to file comments on the question of whether the panel's recommendations in the Final Report should be adopted by the Commission.

SCE and San Diego Gas & Electric (SDG&E) filed brief comments which generally supported the recommendations.[2] By email to the service list, TURN expressed support for all of the recommendations. Also by email to the service list, PG&E said it "greatly appreciated the work of the Panel reflected in the Report," but did not expressly support or oppose any of the Panel's recommendations.

3. The Panel's Work

After its initial organization, the Panel began its work by defining its scope and developing a work plan. The Panel decided to use public information and data wherever practical in order to achieve the Commission's goal of a fully public report. In addition, the Panel agreed to regular weekly conference calls, assignment of tasks, and mechanisms for sharing data.

In its first monthly status report in September 2010, the Panel described its initial tasks as follows:

- Building agreement on the scope of each of the six tasks specified in the D.10-07-047;
- Developing and issuing a comprehensive data request to the utilities;
- Identification and accumulation of decommissioning cost information from US nuclear plants outside California; and
- Begin development of the list of issues to be researched and compared for the decommissioning cost estimates.

[2] SDG&E took no position on recommendations related to SCE's adjustments to the Palo Verde estimates.

In October 2010, the Panel met to discuss assigned tasks and anticipated future actions. For example, their comparison of the cost estimates for Diablo Canyon and SONGS units resulted in a draft list of issues with quantification of the cost differences. The Panel also identified issues for comparison with non-CA plants given that less information would be available for analysis.

Other work included (1) identification of background issues that needed explanation to support the comparisons between California plants and between California plants and non-California plants, (2) development of a preliminary list of common assumptions to be applied to cost estimates, and (3) identification of additional information needed regarding SCE's adjustments to the site estimate for Palo Verde. The Panel also initiated plans for working visits to each nuclear plant site and interviews with site personnel.

In November 2010, the Panel reported that it had completed (1) the preliminary categorization and quantification of differences between the California sites (Diablo Canyon and SONGS 2&3), (2) an initial evaluation of SCE's adjustments to the Palo Verde cost estimate, (3) a preliminary comparison of non-California decommissioning costs with Diablo Canyon, SONGS and Palo Verde, and (4) collection and organization of data for comparison of historical decommissioning projected costs compared with actual experience. The Panel also made progress on identifying and characterizing decommissioning background issues to support the Panel's recommendations for common assumptions, common formats, emerging radiological issues and measures to minimize future decommissioning costs.

During December 2010, the Panel completed site visits to SONGS, Diablo Canyon, and Palo Verde and conducted extensive interviews with utility

personnel. ALJ Darling accompanied the Panel members during the site visits to Diablo Canyon and SONGS. In January 2011, the Panel completed its data analysis, produced a rough draft of the report, and presented the draft to the Commission staff and parties at the January 25, 2011 status conference. Following the status conference, the Panel received numerous comments from parties about the draft report.

PG&E sought clarification about access to confidential materials, particularly related to security, potential cost mitigation actions by operating utilities, and assumptions about the United States Department of Energy (DOE) performance on its obligations for disposal of greater than Class C radiological waste. The company also sought some terminology changes and consideration of local regulatory requirements for site restoration.

SCE's comments focused on questions related to comparability of cost estimates for other nuclear power plants, inside and outside California. In particular, SCE suggested incorporation of recent industry experience with cost models and actual data, and queried whether future decommissioning cost estimates could more closely reflect the manner, cost, and schedule in which a decommissioning project will likely be implemented. Other comments included a request that the Panel explicitly address the Navy lease requirements and a claim that potential license renewal would only increase costs related to the dry cask storage of spent nuclear fuel, known as "ISFSI."

TURN asked a series of questions on the issues of (1) the impact of the SONGS land lease with the United States Navy (Navy) on site restoration costs, (2) the adjustments by SCE to the cost estimate developed for Palo Verde by its primary owner, (3) sources, types, and cost impact of radiological contamination, and (4) the cost impact of potential 20-year renewal of plant operating licenses.

Energy Division suggested the Panel recommend that SCE re-negotiate its lease with the Navy, and for all utilities to reconsider the assumption of a 12 year cooling period for spent fuel, particularly whether more effective fuel management could help lower costs. Finally, Energy Division also asked the Panel to discuss the impact of possible NRC license renewals for SONGS and Diablo Canyon.

The Panel circulated a draft of the report in February before the final briefing of the Commission and parties. The Commission's Energy Division and SCE submitted additional comments to the Panel, which focused on enhancing the clarity of the Report and better informing the reader.

The Final Report was submitted unanimously by the Panel members on March 1, 2011. In Appendices G and H to the Final Report, the Panel provided responses to all the comments it received during the process. Some comments raised issues which are addressed in the Final Report, others were viewed by the Panel as beyond the scope of the assigned work.

4. The Final Report

The Final Report is nearly 50 pages with several illustrative tables and charts, and appendices attached with supporting information. The Panel's review of the 2008 cost estimates for Diablo Canyon and SONGS did not identify any significant issues given the assumptions and knowledge at the time. The Panel identified a substantial error in the adopted Palo Verde cost estimate but there was no associated revenue requirement approved. The Final Report's substantive findings and recommendations are described below.

The Panel emphasized that any conclusions about future decommissioning costs "involve a significant amount of informed speculation about events that will only be fully understood in the future…and which may resemble historical

events to a greater or lesser degree as circumstances change."[3] In other words, the Commission's interest in having the estimate be consistent with actual future decommissioning performance is limited by the reality that there are many approaches to decommissioning, even during the same time frame, and circumstances and technologies will likely change before the actual decommissioning of SONGS, Diablo Canyon, and Palo Verde.

4.1. Cost Drivers

The cost estimates submitted in each NDCTP should "consider, estimate, and document" various important cost drivers that the Panel concluded will impact the cost of decommissioning. These drivers include:[4]

- Decommissioning strategy;
- Timing of plant shutdown;
- Desired "end-state" (projected federal, state, local and owner requirements);
- Quantities of waste generated;
- Schedule of performance;
- Cost of waste disposition (packaging, transportation, and disposal);
- Expected spent fuel management requirements;
- Cost of labor;
- Program management;
- Security;
- Indirect costs such as taxes and insurance;

[3] Report on Nuclear Decommissioning (February 2011) prepared by Geoffrey Griffiths, Nicholas Capik, and Bruce Lacy (Final Report).

[4] Final Report at 3.

- Contingency; and
- Regulatory agency fees

4.2. U.S. Decommissioning Experience

The Panel examined experiences from past decommissioning of nuclear units inside the U.S. which they thought could be valuable in developing future cost estimates. However, the Panel found substantial barriers to comparing prior decommissioning experiences because reported estimates and costs from around the country are not always public, or even similar in what activities are included and the information disclosed.

During the past twenty years, owners of six commercial Pressurized Water Reactors (PWR) have completed most of the work to decommission the units, including removal and disposal of radiological waste, management of spent nuclear fuel, demolition of most structures, removal of hazardous, non-radiological materials, and some site restoration. SONGS unit 1 was the only one co-located with other units. Two more PWRs will be decommissioned in the next ten years.

The Panel attempted to provide a summary of the U.S. experience in decommissioning PWRs by identifying "Estimated Costs" and "Reported Costs" along with other pertinent information about the license, size, and status of decommissioning.[5] The plants compared, with their locations, are Maine Yankee (ME), Connecticut Yankee (CN), Yankee Rowe (MA), Trojan (OR), Rancho Seco (CA), and SONGS 1 (CA). With the exception of Rancho Seco, all actual costs appear to exceed estimated costs by varying margins, e.g., Connecticut Yankee exceeded estimates by 82% and SONGS 1 by 32.5%. However, the Panel

[5] Table 3.1, Final Report at 8.

presented these results more as indications than actual factual findings due to the challenges of comparison.

As noted above, there were numerous problems in obtaining accurate and comparable figures. For example, some information is withheld as proprietary, public records can be incomplete, and estimates may not include identical activities or may even omit key elements such as site restoration. Another variable is that "Reported Costs" meant to reflect actual costs, may include both costs incurred and projected costs going forward through final steps after all Spent Nuclear Fuel (SNF) is removed.

In addition, early pre-decommissioning estimates did not anticipate actual circumstances, particularly because all six facilities compared shut down early without a transition plan, and the actual contracting differed from what had been assumed. These estimates did not account for all SNF costs of non-performance (including transfer to dry storage) or higher waste volumes arising from discovered leaks and contamination, and made widely different assumptions about availability and cost of radiological waste disposal and site restoration standards. Furthermore, estimates developed prior to September 11, 2001 did not include significantly revised security measures now in effect.

Historical experience in the U.S. has provided no consensus on the best way to decommission a nuclear plant because every site has different challenges, technology is improving, and new ideas are borne from experience. As of the date of this decision, PG&E's Humboldt Bay Power Plant Unit 3 (HBPP) is the only California nuclear plant currently undergoing decommissioning, after years

of being "mothballed" (SAFSTOR).[6] PG&E is managing its own decommissioning project at HBPP, as SCE did for SONGS 1.

Other owners have turned to outside contractors with mixed results. A promising example is the proposed decommissioning of Zion units 1 and 2 in Illinois. The units sat idle for many years because the owner, now Exelon, lacked sufficient funding. Recently, the company settled on a new approach it claims will make decommissioning faster, simpler and less expensive. Instead of hiring a contractor, it has turned the job and the reactors over to a nuclear demolition company[7] that owns a nuclear waste disposal site, thus drastically reducing the cost of waste disposal.[8] Although this option is untested and not suitable for inclusion in current cost estimates, it may prove to be cost-effective, especially for places like California where waste disposal is a serious problem. Both HBPP and Zion will provide cost estimators with additional experience to be considered in the future.

The primary lesson the Panel drew from past experiences was for the plant operators who make modifications or replace components during operations. The Panel opined that these experiences could be useful opportunities to discover unknown contamination and better determine future waste volumes and related packaging, transportation, and disposal costs.

---

[6] HBPP was not included in the Panel's analysis because it is a Boiling Water Reactor, not a PWR, and it is already in the process of decommissioning. Therefore, it was not easily comparable to the units examined at San Onofre, Diablo Canyon, and Palo Verde.

[7] Exelon transferred its Part 50 operating license to the contractor until after completion of decommissioning.

[8] Transcript of Workshop (February 2, 2011) at 16-17, 19-20, 31, 32.

4.3. Comparison of 2008 SONGS and Diablo Canyon Cost Estimates

The Panel performed a comparison of the site-specific decommissioning cost estimates prepared in 2008 for the 2009 NDCTP. The SCE estimate for the SONGS units, prepared by ABZ, was $3.659 billion ($2008).[9] The PG&E estimate for the Diablo Canyon units, prepared by TLG, was $1.828 billion ($2008).[10] The Panel also obtained supplemental information from the utilities, including responses to specific questions, plant site visits, and interviews of expert utility personnel at each site.

Eight items were identified that account for 99.4% of the cost difference between SONGS 2 and 3, and Diablo Canyon 1 and 2. By a large margin, the assumed site condition at the end of decommissioning is the primary difference between the estimates, accounting for about $1.3 billion (72.9%). The scope of the projected work is very different because Diablo Canyon is on land owned by PG&E and the estimate assumes that all structures above three feet below grade are removed.[11] SONGS is located on land leased from the Navy and SCE is generally required, according to the lease, to remove any and all material added to the site during operations.[12] SCE also has a separate lease with the State Lands

---

[9] Final Report at 12.

[10] Ibid.

[11] Id. at 14, fn19. In its cost estimate, PG&E assumes compliance with NRC requirements, i.e., sufficient radioactive contamination is removed to show compliance with NRC standards, and that remaining clean material remains onsite and may be used as fill material.

[12] Ordering Paragraph 10 of D.10-07-047 requires the Commission's Executive Director, on behalf of the Commission, to make a formal written request to the Navy to clarify the applicable site restoration and remediation standards that will be required to terminate the site lease.

Commission (SLC) for its offshore water conduits which may need to be dismantled in decommissioning.

The cost of the estimated waste disposal difference was not separately identified in the 2008 SONGS cost estimate, but the Panel developed the estimate of $1.3 billion, reflecting a projected waste volume of 2.8 billion pounds at SONGS compared to 1.0 billion pounds at Diablo Canyon. The Panel determined it would be useful to the Commission in future NDCTPs, for SCE to provide a specific cost estimate for removal of material exceeding three feet below grade level, the scope applied to Diablo Canyon.

The second largest difference was that SCE included $178 million in personnel severance costs necessary to comply with the California Nuclear Facility Decommissioning Act of 1985. PG&E did not include such costs in its 2008 estimate but late in Phase 1 proposed inclusion of $135 million in similar costs.[13] The Panel determined that to the extent state law requires these severance payments, the amounts could be calculated using similar methodology but reflect the differing staffing needs of each site.

The third largest cost difference between the estimates relates to NRC-required security costs[14] during decommissioning, where SONGS costs are about $147 million higher. The security concerns are very different between the sites. SONGS is located next to a public beach and interstate highway, in contrast to the Diablo Canyon units which sit on a large parcel of PG&E land. The security requirements have increased significantly since 2001, and costs

[13] D.10-07-047 acknowledged that labor termination costs overlooked by PG&E may be reasonable costs at 35-36.

[14] 10 CFR 73.

include management staff, training, supervisors, guards, and licensing compliance. The Panel viewed the input of site security personnel as useful to cost estimators to better reflect the projected security needs during decommissioning.

An additional $140 million difference relates to the estimated cost to remove and dispose of the reactor vessel, its internals, and other large components. There is limited industry experience in this category, and the estimators used different methods. ABZ assumed that scope and cost of this activity could be determined based on prior experience. TLG assumed that additional experience gained would lead to the activities becoming routine and lower cost. The Panel found both methods to be reasonable. The other differences between cost estimates were small and included costs for disposition of radiological and non-radiological waste at final shutdown, insurance costs, dry fuel storage, and survey costs.

4.4. SCE's Adjustments to Palo Verde Estimate

Arizona Power Service (APS), the operating agent for the Palo Verde units, retained TLG to prepare its decommissioning cost study. According to the TLG study, SCE's share of costs, as 15.8% owner, was $324.4 million. However, for the 2009 NDCTP, SCE concluded some of the assumptions made by TLG were inconsistent with SCE's experience and risk tolerance. Therefore, SCE made substantial adjustments to the TLG cost study and then applied a 25% contingency factor to all costs. The net result was the estimate more than doubled to $708.7 million for SCE's share.

The Panel examined each of the adjustments and found that the largest one, for dismantling and disposal of waste, mistakenly included a significant volume of Class A waste which TLG projected would instead be handled

through processing and conditioning, rather than packaging and shipping for disposal. This error had been carried forward in SCE's reviews of Palo Verde decommissioning cost estimates for many years, resulting in an incorrect adjustment to the 2008 Palo Verde estimate of $330.1 million. The Panel advised this error be corrected and SCE, which helped the Panel determine the error, has agreed.[15]

The other adjustments made by SCE related to the cost of large component removal, the contingency factor, and SNF dry storage. The Panel found these adjustments to be reasonable, assuming adequate documentation and explanation is supplied by the utilities.

4.5. U.S. Decommissioning Cost Comparisons

The Panel selected four U.S. nuclear power plants of similar reactor type, reactor vendor, and construction period for comparison of decommissioning cost estimates with those for California's nuclear units. Other factors considered included similar sized plants, geographic diversity, and the availability of somewhat current, public data on decommissioning costs. The selected plants are Indian Point Unit 2 (IP),[16] St. Lucie Units 1 and 2 (St. Lucie),[17] South Texas Project Units 1 and 2 (STP), and Vogtle Units 1 and 2 (Vogtle).[18] Similarities and differences between the plants are described in the Final Report

[15] The erroneous adjustment did not lead to a revenue requirement for these units in Phase 1.

[16] Indian Point units are located in New York.

[17] St. Lucie units are located in Florida.

[18] Vogtle units are located in Georgia.

and summary information for these plants and SONGS, Diablo Canyon, and Palo Verde are listed in Table 5.1.[19]

The Panel carefully scrutinized the cost estimates to extract and compare data from cost estimates developed by different estimators, in part by converting all data to $2008 and assuming an annual 3% inflation rate. All of the estimates were adjusted to be equivalent to the cost of decommissioning a two-unit site and to account for varying contingency factors. The Final Report focused on four areas of quantitative comparison, (1) total cost, (2) annual cash flows, (3) Low Level Radioactive Waste (LLRW) burial volumes, and (4) staffing, as well as examining the important topic of scheduling.

4.5.1. Total Costs

The Panel carefully compared available total cost studies because of differences in definition, format, and data organization. Chart 5.1, which provides a comparison of all sites, shows that all have estimated decommissioning costs between $1- $2 billion, except for SONGS and Palo Verde, as previously adjusted by SCE, which both exceed $3 billion.[20] However, after the Panel corrected the Palo Verde estimate, as discussed above, the revised estimate was just under $2 billion. The SONGS estimate remains the highest among the reviewed sites, in excess of $2 billion, even after the estimated difference for site restoration pursuant to the Navy lease is removed. The Panel said that the SONGS estimate remains higher due, in part, to the challenges of its small site and a higher contingency factor than the non-California plants.[21]

---

[19] Final Report at 19-20.

[20] Final Report at 22.

[21] Id. at 23.

4.5.2. Annual Cash Flows

The Panel created several charts to illustrate the projected annual cash flows to show comparisons between all of the selected plants for total expenditures and in each phase of decommissioning: pre-decommissioning, major decommissioning, wet fuel storage, dry fuel storage, and ISFSI (dry storage) decommissioning.[22] There are two areas where the total projected annual cash flows are significantly different for SONGS and Diablo Canyon from other units examined. These are the extended site restoration activities for SONGS and assumptions about how long SNF will remain in wet storage before moving to dry storage, or "ISFSI." The result is substantial expenditures for SONGS that extend from years 3 to 12 for site work, and to both SONGS and Diablo Canyon in years 12 to 17 due to longer wet fuel storage than other sites.

The pre-decommissioning cash flows are similar between comparable plants. Cash flows during major decommissioning, where the bulk of the work is done and most expenses are incurred, are similar except for SONGS. For all units there is a rapid rise in costs that peaks about the third year of decommissioning when most waste is packaged and removed from the sites. SONGS costs are higher and go on years longer due to its expected additional waste volumes arising from the Navy lease requirements for site restoration.

The primary difference between sites during the wet fuel storage phase is that SONGS and Diablo Canyon assume a 12-year storage period for spent nuclear fuel, rather than five-year period assumed by the non-California sites. Costs rise again when the spent fuel is moved out into dry storage and site restoration of the empty wet fuel pool occurs. The dry fuel storage phase is

generally low cost mostly due to a major reduction in staffing. Removal of the ISFSI and final site restoration are also generally low cost. When the estimated $50 million for SCE to dismantle its offshore water conduits is excluded, all sites are comparable.[23]

4.5.3. Low Level Radioactive Waste

The totals of LLR Class A volumes vary significantly between sites. Chart 5.8 illustrates this comparison and breaks it down into waste expected to be processed for reuse and waste expected to be buried. Except for SONGS, all units anticipate significant processing and conditioning of waste. SONGS has the second highest volume at 1.5 million cubic feet (surpassed only by Indian Point with 2 million cubic feet) and projects 100% of its waste will be buried.[24] The Panel notes that a utility may consider processing and conditioning waste, rather than burial, based on the cost of labor for sorting, decontaminating, and "otherwise reducing the volume of waste" for burial. Some waste is easier to process, and labor costs which escalate faster than burial costs are a motivation for the utilities to achieve a lower unit cost by adapting to more cost efficient methods.

4.5.4. Staffing

Staffing costs during decommissioning are an important cost driver. The Panel broke labor costs into two main categories: craft and utility/contractor.

---

[22] Charts 5.2 through 5.6, Final Report at 24-30.

[23] SCE's lease with the State Lands Commission (SLC) requires removal of the water cooling system and is included in the SONGS cost estimate. However, SCE has said that they are in discussions with SLC to try to negotiate leaving the water conduits in place.

[24] Final Report at 31.

Chart 5.9 illustrates estimated man-hours by category for decommissioning each site.[25] Most use total labor in the range of 10,000,000 man-hours, but SONGS estimates more than twice as much at 25,000,000 total man-hours. The high estimate is primarily the result of the large volumes of waste due to full site restoration requirements of the Navy and State Lands Commission leases.

The Panel found that in all cases, the majority of labor was for utility/contractor hours, particularly for SONGS and Indian Point. Decommissioning cost estimates divide tasks into "activity" costs driven by the scope of the task, while "period" costs derive from the time needed to complete the task. Craft man-hours primarily support activity costs, and utility/contractor hours are generally for period costs. Thus, the efficiency of the utility/contractor man-hours and completion of tasks on schedule will significantly affect period costs.

4.5.5. Schedule

Given the prominent role of "period" costs, keeping to schedule becomes a very important factor in whether actual decommissioning costs will be similar to estimated costs. Furthermore, it matters where the delays occur. For example, a delay in the major decommissioning phase has more serious impacts on actual costs than a delay in a later phase where less work remains to be done.

The Panel determined that the cash flows for each site, except SONGS, reflect similar schedules for the major decommissioning phase. Again, the explanation is the unique site restoration requirements for the leased lands at SONGS.

[25] Id at 32.

4.6. Emerging Radiological Issues

The Panel was asked to evaluate emerging radiological contamination issues and whether the utilities could take action while in operation to minimize the effects, including the future costs of waste removal. They found that every domestic decommissioning project has had to deal with unexpected contamination which increased actual costs.[26]

For this report, the Panel identified two specific contaminants of concern: tritium and carbon 14. Tritium is a radioactive isotope of hydrogen that is created both naturally in the atmosphere and also as a byproduct of nuclear power, normally in reactor coolant and spent fuel pool water. Tritium combines with oxygen to form titrated water which diffuses easily into concrete and soil. The NRC requires a licensee to consider tritium contamination but it can generally be left onsite under NRC standards.[27] The issue for cost estimators is whether lower dose limits set by the EPA or state agencies will require additional waste removal.

Carbon 14 is also naturally occurring and is produced inside the reactor as one of the primary gaseous effluents from PWRs. Its presence at decommissioning can become a cost factor. For example, at Yankee Atomic,

---

[26] Final Report at 34, e.g., fuel at the Connecticut Yankee plant, from an early fuel failure, had contaminated portions of the plant systems, making removal more difficult; at Yankee Rowe, tritium and carbon 14 contamination of concrete converted plans to treat and reuse the concrete on site to disposal as LLRW; during the SONGS steam generator replacement, metal rebar used in the concrete containment walls was found to be radiologically activated.

[27] Final Report at 34, fn 29. Tritium is one of the least dangerous radionuclides because it leaves the body relatively quickly.

carbon 14 contamination led the licensee to ship and bury tons of concrete rather than use it as onsite fill resulting in a direct increase to decommissioning costs.

The utilities monitor both tritium and carbon 14 during operations but only limited data is collected about the distribution of these agents into concrete and soil. The Panel advocated for collection of additional data to facilitate a more accurate estimate of related decommissioning costs, "where the opportunity is provided through routine maintenance and plant modifications."[28]

4.7. Minimizing Future Costs and Uncertainty

As noted before, the estimated costs for decommissioning may not mirror actual results implemented many years later under new and unexpected circumstances. Nonetheless, the Panel identified several actions that the utilities could take into account in future decommissioning cost estimates to reduce costs or minimize uncertainty.

4.7.1. Minimizing Costs

The following are items that have the potential to reduce future decommissioning costs, along with the Panel's comments:

- Operate the plant to minimize end-of-life contamination levels and uncontained environmental releases; this is already happening and NRC has recently promulgated new requirements on this topic at 10 CFR 20.1406(c).
- Consider mitigating actions if LLRW disposal costs are expected to escalate at a rate substantially higher than labor or general inflation; NRC has said with

[28] Id. at 35.

approval that if rates for disposal of LLRW grow faster than labor or inflation rates, then it may be economical to use labor and equipment to reduce the volume of disposable waste.[29]

- Incorporate economies of scale when decommissioning a two-unit site; certain activity costs can be shared, e.g., procedure development, waste packaging analysis, some program management functions.
- Adjust "actual experience" costs to be consistent with the cost estimate contingency model; when the estimator incorporates these costs into the estimate, the estimator should also determine whether it is appropriate to remove some or all of the contingency cost.
- Consider the potential impact of a 20-year license renewal; if decommissioning is deferred for 20 years, it could raise or lower cost estimates, depending on the timing of decommissioning, increased contamination, and spent fuel storage costs linked to DOE performance. If after-tax trust fund earnings lead to balances that exceed inflation rates, license renewal could result in lower net present value of costs.
- Consider the potential impact on recovery of spent fuel damages from the utilities' legal action against DOE for non-performance of its duty to accept SNF; some of the post-shutdown SNF costs will likely be recovered from DOE, however, how much and when is uncertain. NRC requires licensees to manage SNF,

[29] NUREG-1307, Rev. 14, Section A.3., "Report on Waste Burial Charges: Changes in Decommissioning Waste Disposal Costs at Low Level Waste Burial Facilities" (November 2010).

regardless of DOE performance for five years without reliance on DOE recovery.

4.7.2. Minimizing Uncertainty

The Panel identified other items that may have the potential to reduce uncertainty with future decommissioning costs, which might lead to reduced funding requirements:

- Upon opportunity, identify the extent of radionuclides that could impact NRC license termination and state or other standards; this is consistent with new NRC regulations 10 CFR 20-1501(a) and (b).
- Solicit and include input from site security in developing a site-specific decommissioning security model; this is a substantial cost both for direct costs for security department personnel and equipment, and indirect costs for implementation including contractor screening. (The Panel did not suggest any protected security related information be publicly disclosed.)
- Minimize stored LLRW to be disposed of during decommissioning; disposing of waste generated during operations reduces uncertainty of disposal costs in the future where costs are expected to escalate.

4.8. Contingency Factor

When a cost estimate is made for a future activity, it inherently includes various risks. The Panel identified and discussed four areas of risk that have resulted in added costs to recent decommissioning projects. These are performance risk, scope risk, regulatory risk, and financial risk. ABZ and TLG

estimates typically address only performance risk, and assign contingency on a line-by-line basis (i.e., a lower contingency for a routine activity).[30]

Performance risk is associated with completing the defined scope of activities within the allotted schedule and cost, and is expected to be fully spent by the end of the project. Types of conditions that reflect this risk include weather delays, equipment and tool breakage, waste packaging problems, and personnel turnover. The cost estimates from ABZ and TLG typically assign a performance risk contingency between 17% and 22%.[31] In the 2009 NDCTP, the Commission adopted an overall 25% contingency value for both SONGS and Diablo Canyon, based in part on what the NRC requires for funding assurances.[32]

Scope risk is the risk that the defined scope did not consider all required activities, leading to unforeseen additional work. For example, an estimator may rely on plant drawings that do not reflect the actual configuration of the site, such as underground pipes and cables, or the distribution of contamination. Previously unknown or unidentified contamination can also lead to unexpected costs and delays, as it did at SONGS and Yankee Atomic where previously unknown contamination vastly increased cleanup activities.[33]

Regulatory risk relates to the risk that estimators cannot accurately predict the specific rules that will govern future decommissioning work.

---

[30] Final Report at 40.

[31] Ibid.

[32] 10 CFR 50. 75.

[33] In Phase 1, PG&E argued for a higher contingency factor for Diablo Canyon than SONGS based on the assumption that the full site restoration requirements for SONGS meant a lower risk of scope changes.

Estimators determine costs based on the current regulatory scheme. The last type of risk, financial, is the risk that one or more of the financial assumptions used for the funding analysis was wrong due to the estimator's inability to forecast financial variables e.g., escalation, rates of return for the trust funds, and taxes.

The Panel identified and supported three methods for the utilities to mitigate these risks, including (1) use of performance risk contingency, (2) conservative assumptions for cost escalation and rates of return, and (3) periodic reassessment of costs.

4.9. Common Assumptions

SONGS and Diablo Canyon are both PWRs located in California and have similar license expiration dates. Despite separate ownership, the Panel concluded there are assumptions that should be reasonably consistent between SONGS and Diablo Canyon. These cost drivers are identified below:

- DOE Spent Fuel performance – significant assumptions including the projected start date for DOE performance and the annual acceptance rate;
- Waste management options and costs – the assumed estimated unit rates because it is reasonable to assume both sites will have access to the same disposal facilities;
- Severance Costs – state-mandated labor termination costs, although there may be owner-specific assumptions and different staffing needs;
- Federal and State "End State" acceptance criteria – there are multiple layers of criteria for site restoration some of which would be consistent, e.g., requirements by the NRC, EPA, and California state agencies; in contrast, local and owner-specific requirements would be unique, e.g., Navy lease; and

- Share existing "actual" decommissioning-related activity performance and cost data – utilities should consider sharing performance and cost data, particularly where relevant to future decommissioning costs, e.g., waste packaging densities, production rates for dismantling components, manhours for packaging large components, use of alternate waste disposal sites. (The Panel did not advocate public disclosure of proprietary, confidential, or commercially sensitive materials.)

4.10. Common Format

The Panel was asked to develop a common format for decommissioning cost estimates that would result in greater transparency and comparability. However, the fact that cost estimators use proprietary and substantially different decommissioning cost models to develop their estimates, combined with the unique aspects of decommissioning SONGS, make a common cost model impractical. Instead, the Panel concluded the objectives could be achieved through a common summary format.

The Panel identified a list of information it deemed the most pertinent and useful, divided into estimate assumptions and estimate results. Although the Panel created a sample format (included as Appendix E to the Final Report), they encouraged the utilities to develop together an actual common summary format to be used in the next NDCTP. The Panel also suggested that cost estimate information for SONGS without the lease requirements should be included in the common summary.

5. Recommendations

The Panel developed 12 recommendations for utilities to incorporate into future decommissioning cost estimates beginning with the 2012 NDCTPs. These recommendations follow verbatim below:[34]

1. Actual data should be used, where appropriate, as a basis for estimated costs. Actual data, however, should be reviewed to remove any embedded contingency and preclude unnecessary contingency.
2. Plant security should be involved with the development or review of the security assumptions and costs used in the decommissioning cost estimate, to ensure that the costs are appropriate for the projected security needs during decommissioning. This should not involve sharing of Safeguards[35] information with estimators or the public.
3. The utilities should avail themselves of every opportunity to obtain volumetric contamination or activation data with which the decommissioning cost estimate contamination assumptions can be verified or modified. These opportunities are expected to include plant modifications and maintenance activities (similar to the recent steam generator replacements). Similarly, data from site monitoring should be used to confirm or adjust decommissioning assumptions. The results of these efforts should be reviewed in the NDCTPs and the effort adjusted depending upon the results. In addition, the utilities should follow industry activities with respect to hard-to-detect nuclides, including tritium and carbon 14, and update the estimates as additional industry knowledge and experience is gained.
4. The utilities should consider sharing decommissioning activity performance and cost data, where practical, and

[34] Final Report at 46-47.

[35] NRC prohibits disclosure of security information categorized as "Safeguards."

where the sharing does not violate confidentiality or concerns on commercially sensitive data. The data can also be provided in a form that protects those concerns, if practical.

5. The utilities should consider and use common assumptions where appropriate. The Panel suggests that these assumptions include:
   a. DOE performance;
   b. State requirements for severance payments;
   c. State requirements for site restoration; and
   d. Alternatives and pricing for LLRW burial.
6. The utilities should consider and agree on a Common Summary Format (Summary) for use in the next NDCTP that includes decommissioning cost estimate assumptions and results.
7. The Panel recommends that assumptions in the Summary be organized into categories, to include:
   a. Common assumptions from recommendation 5;
   b. Extent of site and building contamination; and
   c. Low-level radioactive and hazardous waste anticipated to be present on site at the start of decommissioning.
8. The Panel recommends that results compared in the Summary include:
   a. Craft and non-craft labor hours, total, and by period;
   b. Security labor hours, total, and by period (non-safeguards);
   c. Average craft, non-craft, and security labor rates;
   d. LLRW handled, and removed from site;
   e. Clean waste handled, and all waste removed from site; and
   f. Major "activity" and "period" costs that are comparable between the estimates.

9. The Panel recommends that the Commission consider requesting that the next SONGS 2 and 3 cost estimate quantify the increased cost associated with the Navy lease above that required for site restoration comparable to that assumed in the Diablo Canyon estimate. The Panel understands that this effort may have considerable added cost.
10. The SCE adjustments to the PV estimate for waste volume should be reviewed and corrected, if submitted again.
11. The SCE adjustments to the PV estimate for large component removal, contingency, and spent nuclear fuel should be fully explained each time they are used.
12. The Panel has concluded that it is reasonable for PG&E and SCE to use different contingency values to reflect the different risks faced at both sites, and that the values used for both estimates are not unreasonable.

6. Positions of the Parties

All of the parties had an opportunity to file briefs on the question of whether the 12 recommendations made by the Panel should be adopted by the Commission, in whole or part. SCE supported adoption of all the recommendations, but emphasized that the Panel left it to the discretion of the utilities to agree on an exact Common Summary format. SDG&E "took no exceptions" to any of the findings or recommendations, but excluded support for Recommendations 10 and 11 regarding the Palo Verde cost estimates because it has no ownership interest in those facilities. SDG&E also agreed with Recommendation 9 that the site restoration costs related to the SONGS leases should be quantified, but left it to SCE as majority owner to determine whether and when a study would occur to do so. PG&E declined to file comments but said it "greatly appreciates the Panel's work." TURN supported all of the recommendations.

7. Discussion

During Phase 1 of this proceeding, it became clear that some important decommissioning cost information was difficult to find or assess, underlying assumptions between utilities were sometimes different or hard to identify, and various activities and costs were often not easily comparable. These factors contributed to a sense of frustration by the ALJ and parties over extraordinary time spent teasing out facts, and a realization that the current approach to cost estimates could lead to unnecessary confusion or delay. As the agency charged with approving collection of revenue to fund decommissioning, the Commission has a strong interest in assuring that the cost data is presented in a manner that is informative and comparable.

In addition, the Commission expressed its concern in D.10-07-047 that the amount of decommissioning funds accumulated by the utility trust funds in California is high when compared with other states. The idea of an independent panel of experts was formed during Phase 1 to explore the differences between cost estimates and their accuracy, in order to assure that sufficient, but not surplus, funding is provided by the utilities' ratepayers.

The Panel's undertaking was unique and of particular importance to the Commission at this time when SONGS is likely to follow Diablo Canyon in applying to the NRC for license renewal and 20 years of extended life. First, the Panel thoroughly examined the 2008 cost estimates for decommissioning SONGS, Diablo Canyon, and Palo Verde units to identify what was similar, what was different, and why it was different. They applied their vast professional experience to extract areas where decommissioning activities, costs, and assumptions could be similar between these units, and to offer advice about how to best develop certain costs. They found a key error that reduced the Palo Verde

estimate by about half. The Panel also provided a sample format for utilities to include in their future NDCTP applications which would present important cost drivers in a summary form for easier review.

The Commission benefits from the Panel's broader observations about the common history at U.S. nuclear plants of unexpected contamination, emerging radiological issues, higher than estimated waste removal costs, limited disposal options, and varying standards for site restoration. The Panel members' extensive knowledge about past decommissioning activities and cost estimates at other U.S. nuclear plants provided a sound basis for selection of similar units for comparison of both decommissioning experience and estimated costs for future decommissioning activities.

We approve of the work plan and methods adopted by the Panel to develop the Final Report. The individual experts each took on specific tasks and professionally executed them. They amassed a great deal of data and met the challenges of sorting out comparable and incomparable bits to the extent possible. The utilities fully cooperated with the Panel and provided them with broad access to the nuclear plant sites and to experienced personnel for interviews. Moreover, the Panel presented a draft report, provided briefings to the Commission staff, parties, the ALJ, the public, and the assigned Commissioner, wrote a unanimous and public Final Report, and got the Final Report filed on time. We find that the $275,000 approved in D.10-07-047 for the Independent Panel's work was reasonable and well spent.

The overall goal of the Panel's work was to provide advice and recommendations for improving the accuracy, transparency, and comparability of the decommissioning cost estimates submitted by PG&E, SCE, and SDG&E every three years to the Commission for review. We think the Panel achieved

some success in an area where significant uncertainty exists primarily due to site differences and the long time frame before decommissioning begins for the currently active units at SONGS, Diablo Canyon, and Palo Verde.

Accuracy is an illusive ideal in predicting future decommissioning. However, the first four of the Panel's recommendations will likely improve the accuracy of future cost estimates. First, the panel recommended that actual data be used, where appropriate, to replace or inform current estimates for certain activities. Second, involving plant security in the development of security assumptions and costs will yield a more reliable estimate, without disclosure of any confidential information. Third, we agree that encouraging the utilities to share decommissioning performance and cost data, though restrained by confidentiality or commercial concerns, could lead to more accurate estimates or efficient methods. Fourth, the utilities are encouraged to take advantage of opportunities to obtain site contamination or activation data, from ordinary monitoring or new testing done during plant modifications and maintenance activities. This data can be used to confirm or adjust volumetric assumptions about LLRW waste, a key cost driver. The utilities are prompted to stay current on industry activities regarding hard-to-detect nuclides including tritium and carbon 14.

All of these recommendations emphasize use of the most accurate information available, including from each other where it is appropriate. Since unexpected contamination is a common source of cost overruns, keeping current on industry response to contaminants, and increased on-site monitoring during operations may provide better estimates of actual LLRW volume onsite.

Recommendations 9 through 12 address the Commission's goal of transparency of decommissioning cost estimates. A significant result of the

Panel's work was the discovery of a $300 million error in SCE's adjustments to the Palo Verde estimate. It took a lot of digging by the Panel and SCE to figure out that a double counting of waste volume had occurred, and it was discovered as a result of the Panel's inquiries rather than during Phase 1. Other SCE adjustments to the Palo Verde estimate for large component removal, contingency, and SNF were viewed as potentially reasonable but in need of continuing review. Therefore, the Panel recommended that the waste volume error be corrected in the next NDCTP, and all other Palo Verde adjustments be fully explained each NDCTP. The Panel's explanation of various contingencies, specifically the use of performance contingency by TLG and ABZ, shed light on contradictory information from Phase 1 and supported the recommendation that different contingency values may be appropriate for different sites.

The Panel also recommended that the Commission require SCE to quantify the increased cost associated with the site restoration the company believes is required under the terms of the Navy lease, even if this adds some cost to preparing the estimate. By a wide margin, this activity was the biggest cost difference between SONGS and all other comparison plants. The excess waste removal was estimated by the Panel to be about $1.3 billion of the 2008 SONGS cost estimate; however, the amount is not separately calculated by SCE in its cost estimate. The Commission and public would benefit from having a clearer picture of the direct and indirect costs of this contract condition, in part as an argument to the Navy to negotiate a site release standard more comparable to the NRC.

Lastly, Recommendations 5 through 8 address the Commission's goal of comparability between cost estimates. We recognize that each site will have some unique characteristics that impact the final cost estimate, but some costs

and assumptions may be common. Other activities may be common but have site-specific differences which, if explained, help the Commission evaluate both estimates. For example, in Phase 1, SCE included labor termination costs pursuant to state law, but PG&E did not. If state law requires such payments then the law must apply to both SCE and PG&E, even if staffing requirements may differ. There are other areas identified by the Panel where the utilities could apply common assumptions, e.g., DOE performance (when it will remove SNF), state and federal requirements for site restoration, alternatives and pricing for LLRW burial.

The Panel also recommended that the utilities agree on a "Common Summary Format" (CSF) for use in the next NDCTP that includes key decommissioning cost estimate assumptions and results. We agree that use of a CSF to immediately provide key elements of a cost estimate, may lead to more public awareness of decommissioning activities and could even reduce the costs of future NDCTPs because of more efficient discovery and cross-examination.

The proposed assumptions for the CSF are those listed above, plus the extent of site and building contamination, and LLRW and hazardous waste anticipated to be present at the start of decommissioning. Recommended "results" for the CSF include a breakdown of manhours by craft and non-craft, total, and period; security labor hours, total, and by period; average craft, non-craft, and security labor rates; LLRW previously handled, packaged, and/or removed from site; clean waste handled and removed; and major "activity" and "period" costs that are comparable.

We agree with the Panel's recommendations but think a modest expansion would be of significant assistance to the Commission and public. First, in the 2012 NDCTP, the utilities shall agree to use the same year for expression of

dollars, e.g., $2011. The list of estimate assumptions should include the type of contingency used and the rate applied, as well as how long SNF will stay in wet storage. The "results" should also identify the assumed LLRW disposal rates and escalation rate, and the escalation rate applied to labor costs. We agree that the utilities should work together to arrive at a CSF, but this is primarily a list of important items which all of the participating utilities should henceforth provide as an attachment to their NDCTP applications. The utilities may use the same form individually or provide a side-by-side comparison with each application. However, the lists must follow the same format to facilitate comparison.

In addition, we find that such an extract of key information is similarly useful in relation to the assumed trust fund performance. Therefore, we require the utilities to add to the CSF, the most recent year-end trust fund balances and assumed rates of return, along with the proposed revenue requirement by site.

We conclude that the Panel's recommendations are reasonable, useful, and will aid the Commission in exercising its jurisdictional oversight of assuring adequate funding for reasonable future decommissioning costs. Furthermore, use of a Common Summary format promises to be an important advancement in the review of decommissioning cost estimates and revenue requirements by both the Commission and the public. To the extent we have directed some additional information be included in the CSF, it will add more depth to the snapshot of each application with little extra effort by the utilities.

The Commission greatly appreciates the assistance of numerous personnel of PG&E and SCE, including responses to information requests, coordination of the site visits, and the availability for interview of dozens of people at the sites who contributed to the Panel's efforts and the Final Report.

8. Transparency of Major Decommissioning Expenditures

To date, the Commission has only its experience with the decommissioning of SONGS 1 as a basis to develop its methods for exercising oversight of the utilities' decommissioning activities. PG&E, as its own contractor, has recently begun to decommission Humboldt Bay Power Plant and has used Advice Letters to communicate with the Commission about its activities. The procedures followed by PG&E and SCE for SONGS are different due to a lack of direction from the Commission. Further, PG&E's Advice Letters have not contained all of the information necessary for the Commission to adequately or promptly review how closely actual costs are following estimated costs during the major decommissioning phase where the vast majority of activities and expenses occur. We think this is an essential part of our oversight and waiting for triennial review after hundreds of millions of dollars may be spent, perhaps well in excess of what has been previously estimated, is unreasonable.

Therefore, at the March 14, 2011 evidentiary hearing in Phase 2 of this proceeding, representatives of the utilities agreed to meet with Energy Division to discuss the Advice Letter process for notice and authorization to withdraw funds from the nuclear decommissioning trust funds. PG&E agreed to a periodic Advice Letter process under Tier 2 to request approval for anticipated trust fund disbursements and which will include, *inter alia*, specific information about the activities, prior cost estimates, actual costs, and whether trust fund reimbursement has been obtained. A description of the process and contents of the Advice Letters is attached hereto as Attachment B.

SCE and SDG&E expressed their preference to not have this process apply to SONGS 1 until Phase 3 and commencement of SONGS 2 and 3

decommissioning. We agree at this time because the ongoing decommissioning expenses at SONGS 1 are minor, giving the Commission time to evaluate the Advice Letter process for HBPP to determine whether it is appropriate and sufficient review before extending it to other decommissioning activities.

9. Comments of Proposed Decision

The proposed decision of ALJ Darling in this matter was mailed to the parties in accordance with Section 311 of the Public Utilities Code, and comments were allowed under Rule 14.3 of the Commission's Rules of Practice and Procedure. Comments were filed on June 20, 2011 by PG&E.

10. Assignment of Proceeding

Timothy Alan Simon is the assigned Commissioner and Melanie M. Darling is the assigned ALJ in this proceeding.

Findings of Fact

1. Future decommissioning cost estimates submitted to the Commission should contain the cost drivers set forth in Section 4.1 because they will impact the cost of decommissioning.

2. The primary reason that the decommissioning cost estimate for SONGS 2 and 3 is much higher than for other nuclear plants is the anticipated costs of extra site restoration required by the U.S. Navy and State lands Commission leases to SCE.

3. Other reasons for the high cost estimate for SONGS 2 and 3 include personnel severance costs necessary to comply with the California Nuclear Facility Decommissioning Act of 1985, NRC-related security requirements, and the cost of removal and disposal of large components.

4. The SONGS and Diablo Canyon cost estimates assume a 12-year storage period for spent nuclear fuel, rather than the five-year period assumed by the non-California sites.

5. The SONGS cost estimate assumes more than twice as many total man-hours for decommissioning as similar nuclear plants, primarily based on large volumes of waste expected due to the full site restoration requirements of the Navy and State Lands Commission leases.

6. Decommissioning cost estimates have not consistently considered emerging radiological issues, the potential presence of tritium and carbon 14 at the time of decommissioning, or whether the EPA and/or state agencies are likely to lower acceptable levels for various contaminants in the future.

7. The potential to reduce future decommissioning costs would be improved if the utilities operate the plants to minimize end-of-life contamination levels and uncontained environmental releases.

8. The potential to reduce future decommissioning costs would be improved if utilities incorporate economies of scale when decommissioning a two-unit site.

9. The potential to reduce uncertainty with future decommissioning costs would be improved if utilities identified the extent of present radionuclides that could impact NRC license termination and state or other standards for site restoration.

10. The potential to reduce uncertainty with future decommissioning costs would be improved if utilities minimized stored LLRW to be disposed of during decommissioning.

11. There are assumptions that should be reasonably consistent between SONGS and Diablo Canyon cost estimates, including DOE spent fuel

performance, waste management costs and options, state requirements for labor termination, federal and state requirements for site restoration.

12. Utilities could mitigate the added costs arising from inherent risks related to future decommissioning by (1) use of performance risk contingency, (2) conservative assumptions for cost escalation and rates of return, and (3) periodic reassessment of costs.

13. The Panel's recommendations set forth in Section 5 will improve the accuracy, transparency, and comparability of the decommissioning cost estimates submitted to the Commission.

14. If utilities provided a summary of key information with the NDCTP applications that included key information about assumptions, results, and forecasted returns for the trust funds, transparency of the applications would be improved and costs of the review proceedings may decrease.

15. In order for the Commission to adequately and promptly review how closely actual costs are following estimated costs during the major decommissioning phase of a nuclear plant, the utility should provide particular information about these expenses to the Commission through a common Advice Letter process and format agreed to by the Commission's Energy Division.

16. The $275,000 approved in D.10-07-047 for the work of the Independent Panel was reasonable and results in a material contribution to the Commission's evaluation and review of nuclear decommissioning costs now and in the future.

Conclusions of Law

1. The Panel's recommendations in Section 5 of the decision should be adopted, with the additional information required in Common Summary format set forth in Attachment A to this decision.

2. The Commission should establish the Advice Letter Process set forth in Attachment B for utilities to notify the Commission of decommissioning activities, expenses, and trust fund reimbursements related to nuclear decommissioning. It is reasonable to first apply the process to PG&E, which has the only active decommissioning project within the Commission's jurisdiction, so the Commission may evaluate its efficacy for future decommissioning projects.

3. In addition to the information set forth in Appendix E to the Final Report, the utilities should include the following information in the common summary format attached to their future NDCTP applications:

- Dollar-year used in the estimate;
- Escalation rate for LLRW burial costs;
- Average time fuel will spend in wet storage;
- Escalation rate for labor rates;
- Balances in each trust fund at the end of the preceding quarter;
- Assumed rate of return for equity investments;
- Assumed rate of return for fixed income investments; and
- Overall combined after-tax rate of return per trust fund.

4. The utilities may seek reimbursement from their respective trust funds for their share of the $275,000 cost of the Final Report by the Independent Panel.

O R D E R

IT IS ORDERED that:

1. The recommendations of the Independent Panel are approved and Southern California Edison Company, San Diego Gas & Electric Company, and Pacific Gas and Electric Company shall incorporate them into future nuclear decommissioning cost estimates submitted to the Commission.

2. Southern California Edison Company, San Diego Gas & Electric Company, and Pacific Gas and Electric Company shall agree on a common summary format to identify the key information from their nuclear decommissioning cost estimates and proposed revenue requirements as listed in Attachment A, and attach it to their applications in future Nuclear Decommissioning Cost Triennial Proceedings.

3. Pacific Gas and Electric Company shall adhere to the Advice Letter Process set forth in Attachment B to notify the Commission of decommissioning activities, expenses, and trust fund reimbursements related to nuclear decommissioning of the Humboldt Bay nuclear power plant. During the major decommissioning phase, Pacific Gas and Electric Company shall file the Advice Letters at least once during each calendar year.

4. Southern California Edison Company, San Diego Gas & Electric Company, and Pacific Gas and Electric Company may be reimbursed by their respective trust funds for their share of the $275,000 cost of the Final Report by the Independent Panel.

5. Application (A.) 09-04-007 and A.09-04-009 remains open.

This order is effective today.

Dated July 14, 2011, at San Francisco, California.

MICHAEL R. PEEVEY
President
TIMOTHY ALAN SIMON
MICHEL PETER FLORIO
CATHERINE J.K. SANDOVAL
MARK J. FERRON
Commissioners

ATTACHMENT A

INFORMATION TO BE INCLUDED IN COMMON SUMMARY FORMAT FOR DECOMMISSIONING COST ESTIMATES SUBMITTED IN NDCTP

The utilities shall agree on a common format to provide the following information in summary form as an attachment with each application in future Nuclear Decommissioning Cost Triennial Proceedings. The form shall also include the requested revenue requirements.

Assumptions:

- $ year used in estimate
- DOE performance (common)
- State severance requirements (common)
- Alternatives and pricing for LLRW burial (common)
- Escalation rate for LLRW burial
- Extent of site and building contamination
- LLRW and hazardous waste on site at beginning of decommissioning including large components
- Average time fuel will spend in wet storage

Results:

- Craft and non-craft labor hours, total , and by period
- Security labor hours, total and by period
- Average craft, non-craft and security labor rates
- Escalation rate for labor rates
- LLRW handled, and removed from site
- Clean waste handled, and all waste removed from site
- Major "activity" and "period" costs that are comparable between estimates

Trust Fund Forecasts

- Balances in each trust fund at the end of the preceding quarter
- Assumed rate of return for equity investments
- Assumed rate of return for fixed income investments
  Overall combined after-tax rate of return per trust fund

(END OF ATTACHMENT A)

ATTACHMENT B

Information to be Included in Nuclear Trust Fund Disbursement Advice Letter Filings

Future advice letter filings will continue to be made on a periodic basis and in the general format used for previous advice letters for Humboldt Bay Power Plant Unit 3. Humboldt Bay Power Plant Unit 3 advice letters will be made under Tier 2, and will request approval for anticipated Trust Fund disbursements. In addition, each advice letter will contain the following information:

- Summary of Previous Advice Letter Approvals and Trust Withdrawals
  - Previously identified activities
  - Amount previously requested for each activity
  - Actual expenditures
  - Total Trust disbursements
  - Comparison of any advances to actual expenditures
- Anticipated Disbursements
  - Activity
  - Amount estimated to be spent in next period
  - Correlation of cost to the most recent NDCTP cost study, including nominal dollar adjustment
  - Explanation for differences (amount and timing) from NDCTP cost study estimate (e.g. schedule accelerated)
- Comparison Chart
  - Graph tracking NDTCP forecast and actual decommissioning expenditures

As is the case presently, during the calendar year, PG&E would be able to seek reimbursement from the Trusts for up to the total amount authorized, i.e., PG&E could withdraw funds for a particular activity in excess of the annual request for that activity so long as the total disbursements were within the advice letter authorization. Any such variances would be identified in the next advice letter.

The format for the above information will be in the form of an excel spreadsheet, with the exception of any explanation, which will be in a narrative attachment.

(END OF ATTACHMENT B)