BEFORE THE CALIFORNIA PUBLIC UTILITIES COMMISSION

Application of Southern California Edison Company and San Diego Gas & Electric Company for the 2005 Nuclear Decommissioning Cost Triennial Proceeding to Set Contribution Levels for the Companies' Nuclear Decommissioning Trust Funds and Address Other Related Decommissioning Issues.	)	**Application 05-11-008**
Application of Pacific Gas and Electric Company in its 2005 Nuclear Decommissioning Cost Triennial Proceeding	)	**Application 05-11-009**

Direct Testimony of
David A. Schlissel
Synapse Energy Economics, Inc.

On Behalf of
The Utility Reform Network

April 7, 2006

Q. Please state your name, position and business address.

A. My name is David A. Schlissel. I am a Senior Consultant at Synapse Energy Economics, Inc, 22 Pearl Street, Cambridge, MA 02139.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of The Utility Reform Network ("TURN").

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics ("Synapse") is a research and consulting firm specializing in energy and environmental issues, including electric generation, transmission and distribution system reliability, market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Q. Please summarize your educational background and recent work experience.

A. I graduated from the Massachusetts Institute of Technology in 1968 with a Bachelor of Science Degree in Engineering. In 1969, I received a Master of Science Degree in Engineering from Stanford University. In 1973, I received a Law Degree from Stanford University. In addition, I studied nuclear engineering at the Massachusetts Institute of Technology during the years 1983-1986.

Since 1983 I have been retained by governmental bodies, publicly-owned utilities, and private organizations in 24 states to prepare expert testimony and analyses on engineering and economic issues related to electric utilities. My clients have included the Staff of the California Public Utilities Commission, the Staff of the Arizona Corporation Commission, the Staff of the Kansas State Corporation Commission, the Arkansas Public Service Commission, municipal utility systems in Massachusetts, New York, Texas, and North Carolina, and the Attorney General of the Commonwealth of Massachusetts.

I have testified before state regulatory commissions in Arizona, New Jersey, Connecticut, Kansas, Texas, New Mexico, New York, Vermont, North Carolina, South Carolina, Maine, Illinois, Indiana, Ohio, Massachusetts, Missouri, and

Wisconsin and before an Atomic Safety & Licensing Board of the U.S. Nuclear Regulatory Commission.

A copy of my current resume is attached as Exhibit DAS-1.

Q. Have you previously submitted testimony before this Commission?

A. Yes. I submitted testimony in Commission Docket No. 90-12-018 in 1991, 1992, and 1993 on the issue of whether any of the outages of the three units at the Palo Verde Nuclear Generating Station during 1989 and 1990 were caused or extended by mismanagement. I also testified in Commission Dockets Nos. A.04-01-009 in August 2004 and A. 04-02-026 in February 2005 concerning Pacific Gas & Electric and Southern California Edison's proposed replacement of the steam generators at the Diablo Canyon and San Onofre Units 2 and 3 Power Plants.

Q. What is the purpose of your testimony?

A. Synapse was asked by TURN to review the Triennial Decommissioning Filings by Pacific Gas and Electric Company ("PG&E"), Southern California Edison Company ("SCE") and San Diego Gas & Electric Company ("SDG&E") and to evaluate whether the companies' decommissioning cost estimates and proposed decommissioning contributions are reasonable. This testimony presents the results of our investigations.

Q. Please explain how Synapse conducted its investigations of the companies' decommissioning cost estimates and proposed contributions from ratepayers.

A. We completed the following tasks as part of this investigation:

1. Reviewed the testimony submitted by PG&E, SCE and SDG&E and prepared data requests that TURN submitted to the company.
2. Reviewed the responses to those data requests.
3. Reviewed relevant CPUC and other state regulatory commission Orders.

4. Examined articles, papers, reports and testimony in my files related to decommissioning cost estimates for other nuclear power plants and collection of decommissioning costs from ratepayers.

5. Examined materials available in the U.S. Nuclear Regulatory Commission's public docket files related to nuclear power plant decommissioning cost estimates, projected trust fund earnings rates and projected escalation rates.

Q. Have you evaluated the reasonableness of decommissioning cost estimates and proposed ratepayer contributions for other nuclear power plants?

A. Yes. I have evaluated the reasonableness of the decommissioning cost estimates and proposed ratepayer contributions for the Kewaunee, Zion, Duane Arnold, Summer, Millstone, Vermont Yankee, Three Mile Island Unit 2, and Maine Yankee nuclear power plants. I also have examined the impact of nuclear power plant life extensions on decommissioning costs and the levels of collections required from ratepayers.

Q. Please summarize your findings.

A. My findings are as follows:

1. Based on the evidence presented in my testimony and the analyses presented in the testimony being submitted on behalf of TURN by Mr. William Marcus, the Commission should reject in its entirety PG&E's request to collect from its ratepayers $9.491 million each year from 2007 through 2009 for the decommissioning of Diablo Canyon Unit 1. PG&E's decommissioning cost trust fund for Diablo Canyon Units 1 and 2 will be adequate without these collections.

2. SCE and SDG&E have requested Commission approval to (1) increase the maximum equity portion of their decommissioning investments to 60 percent and (2) to invest in higher yield bonds. If the Commission decides to approve these requests, it should require SCE and SDG&E to recalculate the annual contributions required for the decommissioning of

Palo Verde and SONGS 2&3 to reflect the higher post-tax rates of return that could be expected.

3. The Commission should apply only a 18-21 percent contingency factor to the Palo Verde decommissioning cost estimate. In the alternative, the Commission should base its decommissioning cost decision on the assumption that the operating lives of each of the three Palo Verde nuclear units will be extended by an additional twenty years.

4. The Commission could suspend in their entirety decommissioning cost collections from the ratepayers of SCE and SDG&E if it assumes that the operating lives of SONGS 2&3 will be extended by an additional twenty years.

Q. Do you believe that it is important that utilities collect adequate funds to dismantle and decommission their nuclear power plants at the end of their services lives?

A. Yes. I believe that it is essential that nuclear power plant owners have adequate funds in place to pay for what, at this time, appear to be the reasonably estimated costs of dismantling and decommissioning their nuclear power plants.

At the same time, however, I agree with the Commission's position that costs should not be imposed on today's ratepayers which, if funding exceeds future costs, would represent a windfall to future ratepayers.[1] Therefore, I believe it is important that the Commission not allow the utilities to over-collect from today's ratepayers.

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[1] CPUC Decision 95-12-055, at 63 CPUC2d 570, 612.

Diablo Canyon Units 1 and 2

Q. Has PG&E indicated that the Russell Investment Group has revised the asset return assumptions on which the Company relied for its estimated decommissioning trust fund returns?

A. Yes. PG&E has said that the Russell Investment Group updated its asset return assumptions on February 9, 2006. Russell's 10-year horizon model now forecasts equity returns of 8.5% versus the previous forecast of 8%, on which PG&E relied.[2] The model now forecasts 5.8% aggregate fixed income returns versus the previous 5.4% estimate.[3]

Q. Has PG&E updated its estimates of the required decommissioning contributions from ratepayers to reflect these higher projected returns on fund investments?

A. No.

Q. What year does PG&E's filing in this proceeding forecast for the end of Diablo Canyon Unit 1's operating life and the start of decommissioning activities?

A. PG&E's filing in this proceeding projects that Diablo Canyon Unit 1's operating life will end in 2021, at the conclusion of the unit's current NRC-issued operating license, and that decommissioning activities will start immediately thereafter.

Q. Is this consistent with PG&E's current plans?

A. No. PG&E has stated that it expects to receive a license extension from the NRC that would extend Diablo Canyon Unit 1's operating life through November 2024.[4] This date would reflect the expected approval by the NRC of the request that the end of license life be defined as 40 years after the issuance by the NRC of

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[2] PG&E Response to Data Request No. TURN 002-07.

[3] Id.

[4] PG&E Response to Data Request No. TURN 001-33

the full power operating license for Diablo Canyon Unit 1, not 40 years after granting of the low power license.

Q. Have you quantified the impact that (1) extending Diablo Canyon Unit 1's operating life by an additional three years until November 2024 and (2) reflecting the higher equity and fixed income returns now projected by the Russell Investment Group will have on the annual decommissioning trust fund contributions that PG&E would have to collect from ratepayers?

A. Mr. Marcus will present this quantification. However, it is clear that increasing the forecast fund earnings rates and allowing an additional three years for the Diablo Canyon Unit 1 decommissioning trust fund to grow through the reinvestment of earnings will significantly reduce, if not eliminate, the need for any further contributions by PG&E's ratepayers into the decommissioning trust funds.

Q. What contingency factor has PG&E used in developing its Diablo Canyon decommissioning cost estimate?

A. PG&E has used a 35 percent overall contingency factor in the decommissioning cost estimates for Diablo Canyon Units 1 and 2. This is the contingency factor that the Commission adopted in the 2002 Nuclear Decommissioning Cost Triennial Proceeding.[5]

Q. Do you agree that a 35 percent contingency factor is necessary in order to assure that adequate funds will be collected for the eventual dismantling and decommissioning of Diablo Canyon Units 1 and 2?

A. No. I believe that a lower contingency factor would be sufficient. I believe that a contingency factor in the range of the approximate 19 percent factor included in the TLG site-specific Diablo Canyon decommissioning cost study would be adequate and appropriate.

[5] Decision 03-10-014, at pages 24 and 25.

Q. What factors suggest that a decommissioning cost contingency factor lower than 35 percent is now appropriate for Diablo Canyon?

A. I believe that there are three factors that suggest that a contingency factor below the 35 percent level adopted by the Commission in Decision 03-10-014 is now appropriate for Diablo Canyon:

1. There is now significant actual experience in the decommissioning of large nuclear power facilities. This should reduce the Commission's concern over possible unanticipated future decommissioning costs.

2. The new Diablo Canyon decommissioning cost study includes significant costs that are the direct result of the failure of the U.S. Department of Energy to begin removing spent nuclear fuel from the site by January 31, 1998. However, the study does not reflect the likelihood that the Department of Energy will pay some of these costs.

3. There is a reasonable likelihood that PG&E will seek to renew the operating licenses of Diablo Canyon Units 1 and 2 and, thereby, extend their operating lives by an additional twenty years. Extending Diablo Canyon's operating life would allow additional time for PG&E's decommissioning fund to grow through the reinvestment of earnings. It is reasonable to expect that the earnings rates on the fund will be higher than the rate at which the cost of performing the decommissioning activities will escalate. As a result, there could be significant excess funds remaining in Diablo Canyon's Qualified Decommissioning Trust when decommissioning is completed.

Q. Which nuclear power plants have been decommissioned in recent years?

A. Significant activities under an immediate decommissioning methodology have been accomplished at five commercial nuclear power plants: Haddam Neck-Connecticut Yankee, Maine Yankee, San Onofre Unit 1, Trojan, and Yankee Rowe. Substantial decommissioning activities also have been completed to place the permanently shut down Zion Unit 1 and Unit 2 and Millstone Unit 1 commercial nuclear power plants into cold storage/mothball status pending the ultimate decommissioning of these facilities at a later date. This actual decommissioning experience should reduce the possibility and, hence, lessen the Commission's concern that major unanticipated problems and costs will be experienced when other nuclear facilities, such as Diablo Canyon, are ultimately decommissioned at the end of their operating lives. This is not to say that there will be no risk that currently unanticipated problems and costs will be experienced. I only mean that there is less of a risk that such problems and costs will be experienced from today's perspective given that there is now substantial actual experience decommissioning large commercial nuclear power plants.

Q. Please summarize the decommissioning-related activities that have been completed at these facilities.

A. The extent to which each plant has been decommissioned varies from site to site. However, in general, major primary and secondary system components at a number of plants, including the reactor vessels, reactor coolant pumps, and steam generators, have been decontaminated, removed and shipped to waste burial sites. In some cases, highly radioactive reactor internal structures have been cut and removed. The highly radioactive spent nuclear fuel is being transferred to long-term dry cask storage at some sites. Some buildings also have been decontaminated and demolished.

Q. Does the nuclear industry share the lessons learned during the decommissioning of these plants?

A. Yes. The nuclear industry shares public information about actual decommissioning experience at conferences and through journal articles. For example, an article in the January 2003 issue of Nuclear News reported on a workshop at a recent conference sponsored by the American Nuclear Society' Decommissioning, Decontamination and Reutilization Division. The title of the workshop was "Saving a Few Hundred Million Dollars: What Nuclear Power

Plant Operators Should Be Learning from Plants in Decommissioning."[6] Panelists in the workshop reported on the lessons learned during the decommissioning of the Maine Yankee, Rancho Seco, and San Onofre Unit 1 nuclear plants.

Q. Are any of the nuclear plants that are being decommissioned or that have been placed into mothball/safe storage condition similar in design to Diablo Canyon?

A. Yes. Although there are some important site-specific differences, the Haddam Neck-Connecticut Yankee, Maine Yankee, San Onofre Unit 1, Trojan, Yankee Rowe, and Zion Units are all pressurized water reactors, like Diablo Canyon. In addition, like Diablo Canyon, Connecticut Yankee, San Onofre Unit 1, Trojan and the Zion units had nuclear system supply systems designed by Westinghouse.

Q. Does the current TLG Decommissioning Cost Study for Diablo Canyon reflect the actual experience in decommissioning nuclear power facilities?

A. Yes. According to PG&E:

> The TLG 2005 study reflects lessons learned or practices developed from the actual decommissioning of nuclear power plants since 2002. TLG continually monitors the industry and assesses experience from ongoing decommissioning projects for incorporation within cost model. However, lessons learned do not necessarily translate into cost savings; experience can also identify additional activities (and costs) that should be recognized. In addition, not all lessons are applicable or directly translated into cost-related activities.
>
> Examples of changes since 2002 include; additional recycling of contaminated material, removal of plant piping in larger quantities, revisions to the management organization, intact disposition of the fuel racks and revisions to the basis for estimating labor costs associated with the reactor vessel and internals disposition.
>
> TLG does not quantify the financial impact of incremental changes to its cost model, since the impact can be cumulative, affect numerous cost elements and vary by the type of facility and

6 *Nuclear News*, January 2003, at page 65.

> other site-specific factors. Changes can also have off-setting effects (both positive and negative) on the total cost to decommission (e.g., increased processing of low-level waste as a means of reducing direct disposal costs).[7]

Q. PG&E's testimony lists a number of contingencies that increased the costs for decontamination and dismantling tasks during past decommissioning projects.[8] Was PG&E able to quantify the amount by which each such event increased the costs for decontamination and dismantling tasks?

A. No. PG&E's response to TURN discovery noted that "No information has been made available (by the contractors or the owners involved) to quantify the financial impact of each and every contingency-related event."[9]

Consequently, it is not possible to know whether the events listed by PG&E caused the actual costs of the decommissioning project to rise above the estimated costs.

Q. Was TLG able to provide any evidence reconciling the actual costs of past decommissioning projects with costs that had been estimated prior to the start of decommissioning?

A. No. PG&E has indicated that TLG has not prepared any variance analyses (between the projected and actual costs of decommissioning [facilities that have been decommissioned]), nor has it been provided the information needed to conduct such assessments.[10]

Q. Are you arguing that the contingencies in the TLG decommissioning cost study for Diablo Canyon are too high?

A. Not at all. I believe that the contingencies used by TLG appear reasonable and to be based on their engineering experience. In fact, I see no evidence that higher

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7 PG&E Response to Data Request No. TURN 001-20.

8 PG&E Prepared Testimony at page 4-22, line 25, to page 4-26, line 23.

9 PG&E Response to Data Request No. TURN 001-24.

10 PG&E's Response to Data Request No. TURN 001-19.c.

contingencies are necessary to assure that adequate funds will be available to dismantle and decommission the Diablo Canyon units.

Q. In Decision 03-10-014 the Commission based its decision to use a significantly higher contingency factor for Diablo Canyon because PG&E's estimate has not been refined to the same level as SCE's estimate for SONGS 2&3.[11] Do you believe that the level of refinement in the current Diablo Canyon decommissioning cost study is sufficiently below that in the current SONGS 2&3 study as to justify the use of a significantly higher contingency factor?

A. No. The level of detail represented by the 2005 TLG decommissioning cost study for Diablo Canyon is comparable to the level of detail represented in the 2005 SONGS 2&3 decommissioning cost estimate prepared by ABZ, Inc. Indeed, in my experience the 2005 TLG decommissioning cost study is comparable to other TLG-prepared studies that have formed the basis for decisions by nuclear plant owners and regulatory commissions regarding the required levels of annual decommissioning cost collections. I see no reason why the approximate 18.7 percent contingency factor included in the TLG Diablo Canyon study needs to be increased to as high a level as 35 percent in order to provide a reasonable assurance that sufficient funds will be available to dismantle and decommission Diablo Canyon Units 1 and 2 at the end of their operating lives.

As SCE and SDG&E have noted in their testimony in this proceeding, neither the SONGS 2&3 or the TLG Palo Verde decommissioning cost analyses are based on detailed planning studies.[12] The same is true for the 2005 TLG Diablo Canyon decommissioning cost analysis. However, such planning studies are not required until several years before the actual start of decommissioning.

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[11] At page 24.

[12] Exhibit No. SCE-2, at page 7.

Q. Has the U.S. DOE's failure to begin taking spent nuclear fuel on January 31, 1998 impacted the estimated cost of decommissioning Diablo Canyon?

A. Yes. The failure by the U.S. DOE to begin taking spent nuclear fuel from nuclear power plants on January 31, 1998, as required by the Nuclear Waste Policy Act, has increased the estimated cost of decommissioning Diablo Canyon. For example, PG&E has explained that:

> As a result of the delay in the start of repository operations, a significant number of spent fuel assemblies are expected to reside in Diablo Canyon Power Plant's (DCPP) spent fuel storage pools at the scheduled cessation of operations. An independent spent fuel storage installation (ISFSI) is being constructed at the site to support operations. The ISFSI may also be used to so that the fuel can be removed from the pools following the cessation of plant operations and the station decommissioned (operating license(s) terminated) in the shortest time possible. PG&E will incur costs to decommission the ISFSI. Had the DOE initiated repository operations by January 31, 1998, PG&E would not have constructed an ISFSI and would not have incurred the costs to decommission that facility.[13]

In addition, there appear to be substantial costs in the decommissioning cost estimate associated with the multi-year operation of the dry cask storage facility after the Unit 1 and Unit 2 spent fuel pools are emptied.

Q. Are spent fuel related costs a significant element of the total estimated cost of decommissioning Diablo Canyon?

A. Yes. The 2005 TLG Diablo Canyon study indicates that spent fuel management costs represent $179.5 million (in 2004 dollars) or 12.3 percent of the total estimated cost of decommissioning Diablo Canyon. However, not all of these costs are the result of the DOE's failure to begin taking spent nuclear fuel as of January 31, 1998.

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13 PG&E Response to Data Request No. TURN 001-21.a.

Q. Has PG&E quantified how much of the spent nuclear fuel-related costs in the 2005 TLG decommissioning cost study are related to the U.S. DOE's failure to begin taking spent fuel on January 31, 1998?

A. No. PG&E has said that there is no overall assessment or quantification of the effects of DOE's failure on cost or scheduling of decommissioning at Diablo Canyon.[14] Nevertheless, it is clear that these costs will be significant and that to the extent that the DOE will compensate PG&E for these costs, that the net decommissioning cost in the recent TLG is overstated.

Q. Is it reasonable to expect that PG&E will recover some of the additional costs that it will incur as a result of the DOE's failure to begin taking spent nuclear fuel starting in 1998?

A. Yes. Federal courts have decided that the U.S. government was unconditionally obligated to begin removing spent nuclear fuel by January 31, 1998.[15] The Federal Court of Claims has subsequently determined the individual utilities are owed damages resulting from the DOE's failure to carry out this responsibility. Only the size of the payments remains to be determined and the amount of damages owed to individual utilities, like PG&E, will continue to grow as the DOE is further unable to remove spent nuclear fuel from plant sites.

The DOE has acknowledged that it is responsible for removing spent nuclear fuel and is liable for the damages resulting from its failure to do so.[16]

Therefore, it is very reasonable to expect that at some point before Diablo Canyon is ultimately decommissioned, PG&E will receive payments from the DOE (or equivalent services in lieu of payments) for increased spent fuel costs at Diablo Canyon, either as the result of litigation or negotiation.

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[14] PG&E Response to Data Request No. TURN 001-29.

[15] For example, an article on Nuclear Waste in the September 25, 2000 issue of Environment and Energy Daily.

[16] For example, see the August 2, 2000 issue of the Foster Electric Report, at page 24.

Q. Have any utilities settled their disputes with U.S. DOE over spent fuel costs?

A. Yes. Exelon settled its dispute with the U.S. Department of Energy in August 2004. According to published reports, Exelon was to immediately receive $80 million in reimbursements for storage costs already incurred as a result of the DOE's failure to begin taking spent nuclear fuel on January 31, 1998, with additional amounts to be reimbursed annually for future costs. If the Yucca Mountain national repository opens by 2010, and the DOE begins accept the spent fuel, the amount owed to Exelon under the settlement would eventually total about $300 million. If the DOE should fail to accept spent fuel by 2010, the amount paid to Exelon could exceed $600 million by 2015.[17] The payments will be made out of the federal Judgment Fund, which is available for court judgments and DOJ settlements of actual or imminent lawsuits against the government.

Therefore, it is very reasonable to expect that at some point before Diablo Canyon is ultimately decommissioned, PG&E will receive payments from the DOE (or equivalent services in lieu of payments) for increased spent fuel costs at Diablo Canyon, either as the result of litigation or negotiation.

Q. Please summarize the trends in the nuclear industry concerning the relicensing of power plants?

A. NRC regulations currently allow licensees to apply to renew the operating licenses of their nuclear units by an additional twenty years. All of the owners of nuclear plants, of which I am aware, are seeking to take advantage of these regulations and relicense their plants for an additional twenty years of operating life.[18]

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17 *Nuclear News*, September 2004, at page 17.

18 As early as 1999, Entergy's President warned other companies: "License renewal -- everybody's jumping on that bandwagon…. If you've not already decided, you better do it quickly because resources are going to get tight." *Inside NRC*, August 16, 1999, at page 1.

In fact, as of the end of March 2006, the NRC had issued extended operating licenses for 39 nuclear units.[19] At the same time, the NRC currently is considering applications for license renewal for another twelve nuclear units. In addition, the owners of another 27 units have submitted letters to NRC indicating their intent to apply for license renewal.

This means that the owners of at least 78 of the 104 operating power reactors in the U.S. have decided to renew their operating licenses. The owners of the remaining reactors can be expected to do the same at the appropriate time so long as the unit is projected to be cost-effective relative to alternatives.

Q. Are you aware of any nuclear power plant owners that have decided not to relicense their nuclear unit(s)?

A. No. I am not aware of any current nuclear power plant owner that has said that it will not relicense its plant if it continues to maintain ownership of the facility.

Q. Is there a significant risk that the NRC would deny an application submitted by PG&E to renew Diablo Canyon's operating license?

A. No. The NRC has never denied an application for relicensing. In fact, I am aware of only one instance in which the NRC even has returned an application because it found that the application was too vague and incomplete to make a proper review possible. In this instance, the NRC is permitting the applicant to revise and supplement its original application.

Q. Is there a significant risk that the NRC will change its regulatory requirements to make it more difficult to relicense?

A. No. The emphasis of the NRC has been on learning from prior relicensing experience and streamlining the process for new applicants. Thus, the evidence is that the NRC has been working to improve the relicensing process for applicants, not issuing regulations that make it more difficult to relicense. For example, an

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[19] NRC website, at www.nrc.gov/reactors/operating/licensing/renewal/applications.html

article in Nuclear News, a monthly publication of the American Nuclear Society, has explained:

> The process is likely to improve as more plants go through the process and the NRC settles on what NRC commissioner Jeffrey Merrifield calls "the right regulatory touch – not asking for too much information, but [asking for] a sufficient amount so we can feel confident." Merrifield said the NRC needs to be disciplined to ensure that the requirements of the second wave of license renewal applicants are the same as the first, and that the agency needs to continually strive to operate "more efficiently, better, faster, and less expensively."[20]

In fact, industry representatives have commended the NRC's approach to license renewal. For example, the President of the industry's Nuclear Energy Institute has said that the NRC's review of the Calvert Cliffs and Oconee licenses renewal applications "provides a clearly marked path for other electric companies pursuing license renewal."[21] At the same time, the Vice President for Nuclear Generation at Duke Energy Company observed as early as 1999 that as the cost for seeking license renewal comes down with experience gained on the initial reviews and the NRC review time shrinks, "it becomes more likely that utilities are going to line up [for license renewal]."[22] This prediction has been proven correct.

Q. What effect would extending the operating lives of Diablo Canyon Units 1 and 2 have on the adequacy of the funds in PG&E's Qualified Decommissioning Trust?

A. Extending Diablo Canyon's operating life by an additional twenty years would allow additional time for the decommissioning funds to grow through reinvestment of earnings. It is reasonable to expect that the fund's earnings rates would be higher than the rate at which the cost of performing the decommissioning activities would escalate. As a result, there could be significant

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20 *Nuclear News*, August 1999, at page 41.

21 *Nucleonics Week*, May 25, 2000, at page 1.

22 *Inside NRC*, August 16, 1999, at page 1.

excess funds remaining in PG&E's Qualified Decommissioning Trusts when decommissioning was completed.

Q. Have you quantified the impact of life extension on the adequacy of the Diablo Canyon decommissioning trust fund?

A. Mr. Marcus is presenting the results of this quantification.

Q. Would there be a significant risk that PG&E's decommission trusts will not be adequate to fund the cost of decommissioning Diablo Canyon Units 1 and 2 if the Commission were to reject PG&E's request to collect $9.36 million starting in 2007.

A. No. For the reasons I have stated I believe that it is reasonable to expect that PG&E will have sufficient funds to dismantle and decommission Diablo Canyon Units 1 and 2 even if the Commission were to reject PG&E's request.

Q. What could the Commission do if it decides in this proceeding that PG&E should not make any annual decommissioning collections from its ratepayers after 2007 and at some later date subsequently finds that the accumulated Diablo Canyon decommissioning funds will be insufficient?

A. I understand that the Commission is required to revisit the decommissioning issue every three years. If it appears in 2008 or 2011 that the Diablo Canyon decommissioning funds will be inadequate, because of some currently unanticipated costs or problems, the Commission can order that PG&E again make annual decommissioning cost collections from its ratepayers to cover any projected fund shortfalls.

But even if there are not adequate funds in PG&E's decommissioning trusts in 2024, or whenever the Unit's operating lives are completed, the NRC permits licensees to undertake delayed decommissioning after maintaining their permanently shut down plants in SAFSTOR conditions for up to twenty or more years. Therefore, if the Diablo Canyon decommissioning trusts are not fully funded when the unit's are permanently retired, the owners would have the option of delaying the start of active decommissioning for a few years to permit the funds to continue to grow through the reinvestment of earnings.

Palo Verde

Q. What projected post-tax rates of return does SCE use in its ratepayer contribution analyses for Palo Verde Units 1, 2 and 3?

A. The projected post-tax rates of return used by SCE in its ratepayer contribution analyses are shown in Table I-5 on page 17 of Exhibit Utilities-1. As shown in that Table, SCE is assuming a 5.53 percent average annual post-tax rate of return for its Palo Verde decommissioning trust investments for the years 2007 through five years before the expected shutdown of the Palo Verde units.

Q. Is the 5.53 percent annualized post-tax rate of return used by SCE for its Palo Verde decommissioning trust investments consistent with historic performance of the SCE decommissioning trust fund?

A. No. The 5.53 percent post-tax rate of return is below the 6.0 percent annualized post-tax return achieved by the fund during the past ten years, the 6.8 percent annual return achieved by the fund during the past fifteen years, and the 6.7 percent annualized return achieved by the fund since its inception on February 29, 1988.[23]

Q. How does this 5.53 percent annualized post-tax rate of return compare with the rates of return assumed by the other Palo Verde owners for their decommissioning trust investments?

A. Table 1 below shows the assumed decommissioning trust rates of return that were reported by the Palo Verde owners to the NRC in their most recent Decommissioning Funding Status Report:

[23] SCE's Response to TURN Data Request 01-06.

Table 1: Non-SCE Palo Verde Owner Assumed Rates of Return on Decommissioning Trust Fund Investments[24]

Owner	Assumed Rate of Return
Arizona Public Service	6.75%
Salt River Project	7.65%
El Paso Electric	7.33%
Public Service of New Mexico	6.31%
SCAPPA	6.83%
LADWP	7.0%

Q. In general, do each of the Palo Verde owners have access to the same securities markets, with the same investment opportunities?

A. I have not reviewed all of the limitations on each of the owner's decommissioning fund investments. However, in general, each of the owners has access to the same securities markets, with the same investment opportunities.

Q. Does the 5.53 percent annualized post-tax rate of return assumed by SCE reflect the investment policy changes that SCE and SDG&E have requested in this proceeding?

A. No. The 5.53 percent rate of return used by SCE does not reflect the utilities request that the Commission (1) allow them to increase the trust fund maximum equity percent to 60 percent and (2) to allow them to invest up to 20 percent of the funds in higher yield bonds rated B or higher by Standard & Poors or B2 or higher by Moodys. Instead, the 5.53 percent rate of return assumes that only 50 percent of the trust fund investments would be in equities.

Q. What impact would Commission approval of these requests have on the projected annual rate of return for SCE's decommissioning trust investments?

A. SCE's workpapers show that increasing the equity percentage of the trust fund investments to 60 percent would increase the overall post-tax rate of return from

[24] Palo Verde Decommissioning Funding Status Report, dated March 30, 2005.

5.53% to 5.73 percent.[25] However, the workpapers do not estimate the impact of investing approximately 20 percent of the funds in higher yield bonds.

Q. Have you quantified the annual contributions that would be needed from SCE's ratepayers if the company's ratepayer contribution analysis assumed the higher 5.73 percent post-tax rate of return?

A. Yes. As shown on Table 2 below, the annual contributions by SCE's ratepayers to the Company's Palo Verde decommissioning fund could be reduced by $1.75 million merely by assuming the slightly higher returns that could be expected if the Commission approves the utilities request to raise the maximum equity percentage to 60 percent.

Table 2: Required Annual Contributions from SCE Ratepayers to Palo Verde Decommissioning Fund under Different Assumed Rates of Return[26]

	SCE Requested Contribution based on 5.53 Percent After-Tax Rate of Return (Thousands of Dollars)	Reduced Contribution based on 5.73 Percent After-Tax Rate of Return (Thousands of Dollars)
Palo Verde Unit 1	$6,708	$6,170
Palo Verde Unit 2	$7,521	$6,935
Palo Verde Unit 3	$5,593	$4,945
Total Palo Verde	$19,822	$18,050

Moreover, the rate of return would be even higher if the analysis reflected the potential investment in higher yield bonds that SCE and SDG&E have requested approval to make in addition to a 60 percent maximum equity investment limit. Consequently, the annual contribution figures shown in the third column of Table 2 above would be even lower.

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25 Workpapers for Exhibit Utilities-1, at page 117.

26 The worksheets for the reduced contributions shown in the last column in Table 2 are included in Exhibit DAS-2.

Q. Does the 2004 TLG Decommissioning Cost Study for Palo Verde appear to reflect the actual experience in decommissioning large size nuclear power facilities?

A. Yes.

Q. Has SCE further adjusted the 2004 TLG decommissioning cost estimate for Palo Verde?

A. Yes. SCE has noted that, in addition to increasing the contingency factor to 35 percent, it has made five other adjustments to the 2004 TLG cost estimate:

1. Provided for a sufficient number of dry storage canisters to empty the three Palo Verde spent fuel pools after plant retirement.
2. Maintained the fuel in dry storage at the Palo Verde site for a duration consistent with SCE's current assumptions regarding the DOE's acceptance of the fuel.
3. Continued to use the same volume of LLRW that TLG estimated in its 1998 cost study and which SCE used in both its 1998 and 2001 Palo Verde cost estimates.
4. Applied the $200 per cubic foot LLRW burial rate adopted in D.03-10-015 escalated to 2004 dollars.
5. Adjusted for large component removal costs based on SCE's experience in decommissioning the SONGS 1 large components.[27]

In total, these adjustments have more than doubled SCE's share of the estimated cost of decommissioning Palo Verde from $335,704,000 (in 2004 dollars) in the 2004 TLG Study to $738,852,000 (also in 2004 dollars).

[27] SCE Response to Data Request Set TURN-SCE-01 Question 022.

Q. Do these adjustments lead to any anomalies between SCE's Palo Verde decommissioning cost estimate and its SONGS 2&3 decommissioning cost estimate?

A. Yes. Reviewing the workpapers provided by SCE and SDG&E, it appears that the adjustments made by SCE to the TLG 2004 Palo Verde cost estimate have dramatically increased the burial costs portion of the estimate. As a result, burial costs represent 44.09 percent of SCE's Palo Verde decommissioning cost estimate (in 2004 dollars) but only 22.95 percent of SCE's SONGS 2&3 estimate (also in 2004 dollars).

Q. Have you made any adjustment for this anomaly?

A. No.

Q. Given the other cost adjustments made by SCE to the 2004 TLG Study, do you believe it is necessary for the Commission to continue to apply a 35 percent contingency to the Palo Verde decommissioning cost estimate?

A. No. The 2004 TLG Palo Verde decommissioning cost estimate, on its own or as adjusted by SCE, appears to be sufficiently detailed and definitive to allow for the use of a lower contingency. I would recommend that the Commission use a contingency somewhere in the range of the 18-19 percent contingency included in the TLG Study or the 21 percent contingency applied in the 2005 ABZ SONGS 2&3 estimate.

As I noted earlier, SCE has testified that neither the 2004 TLG Palo Verde Study or the 2005 ABZ SONGS 2&3 estimate reflect detailed planning studies.[28] I see no reason why the Commission should conclude that the TLG Palo Verde Study is less definitive than the ABZ SONGS 2&3 estimate and, consequently, requires a much higher contingency factor.

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[28] Exhibit No. SCE-2, at page 7.

Q. Has SCE quantified how much of the spent nuclear fuel-related costs in its Palo Verde decommissioning cost estimate are related to the U.S. DOE's failure to begin taking spent fuel on January 31, 1998?

A. No. During discovery, TURN asked SCE to:

> a. Identify each way in which the failure of the US DOE to begin taking spent fuel by January 31, 1998 has increased the estimated cost of decommissioning the Palo Verde nuclear units.
>
> b. Quantify the amount by which the failure of the US DOE to begin taking spent fuel by January 31, 1998 has increased the estimated cost of decommissioning the Palo Verde nuclear units.[29]

In its response, SCE failed to provide the requested information. Instead, SCE merely objected to the TURN request, noted that APS had failed a complaint against the U.S. Department of Energy, and further noted that SCE did not have copies of any APS materials related to this complaint.

Nevertheless, it is likely that these costs will be significant and that to the extent that the DOE will compensate the Palo Verde owners for at least some of these costs, the <u>net</u> decommissioning costs in the recent TLG Study and in SCE's adjusted Palo Verde decommissioning cost estimate are overstated.

Q. Is it reasonable to expect that the Palo Verde owners will recover some of the additional costs that they will incur as a result of the DOE's failure to begin taking spent nuclear fuel starting in 1998?

A. Yes. As I noted earlier in this testimony, based on the public discussion between the DOE and nuclear plant owners and the recent settlement between DOE and Exelon, I believe that it is reasonable to expect that the Palo Verde owners will recover some of the additional costs that they will incur as a result of the DOE's failure to begin taking spent nuclear fuel starting in 1998.

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[29] Data Request Set TURN-SCE-01 Question 35.

Q. How should the Commission reflect the potential recovery of such damages from the DOE?

A. The Commission should consider such potential recovery of damages as supporting the use of a lower contingency factor in the Palo Verde decommissioning cost estimate.

Q. Have the Palo Verde owners filed a license renewal application with the NRC seeking an additional twenty years of operating life for each of the three Palo Verde units?

A. No. The Palo Verde owners have not yet filed a license renewal application.

Q. Have you seen any evidence that leads you to conclude that the Palo Verde owners will file a license renewal application at some time in the relatively near future?

A. Yes. Back in 2003, the Palo Verde owners joined what is called a Stars Alliance which is composed of nuclear plant-owning companies in the southwestern region of the U.S. The Stars alliance intends to work jointly to submitted license renewal applications for the members' nuclear plants. The alliance has established an office at Palo Verde called the Plant Aging Management Center of Business. According to Arizona Public Service this Center of Business was established to reduce the cost of the License Renewal Application process by "maintaining a staff of contractor and STARS employees that will conduct [License Renewal Application] projects for all the participating STARS members. [30]

In addition, the Palo Verde owners discussed a Plant Aging Management Project in 2005. Such a project is a necessary precursor to submitting a license renewal application. Arizona Public Service, the operator of Palo Verde, provided the following justification and economic analysis for the Plant Aging Management Project:

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[30] APS June 3, 2005 Work Authorization Requiring Action, provided in SCE's Response to Data Request TURN-SCE-01 Question 43.

> Justification:
> Successful completion of this project will achieve regulatory approval for an additional 20 years of operation. Using a conservative assumption of 1300 MWEnet per unit (post SG and turbine replacement) this project avoids the purchase or construction of 3900 MWE capacity for 20 years. Future license extensions beyond 60 years of operation are permitted by federal regulations although none have been requested to date.
>
> Economic Analysis:
> As stated above the impact of not completing the License Renewal Application Project is the loss of an additional 20 years of power production at [Palo Verde Nuclear Generating Station]. The current cost of replacement power is accepted to be $40/MWHr. Using the 3900 MWEnet stated above the cost of replacement power would be $24.598 Billion in today's dollars assuming a 90% capacity factor.31

Q. Has Arizona Public Service indicated when a license renewal application may be submitted for Palo Verde?

A. APS has explained that:

> The Federal Code of Regulations (10CFR54.4) provides the opportunity for holders of operating licenses to renew those licenses for a period of up to forty years from the date of the renewal application. Eligibility for renewal is afforded in a window from the 20th year of the initial operating license date to the 35th year. Industry practice has been to initiate the License Renewal Application (LRA) as close to the front of this window as possible. This allows utility planners to factor at least sixty years of operation into their load planning.32

In a presentation, APS indicated an October 2008 submission date for a license renewal application to the NRC.[33]

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31 Ibid.

32 Ibid.

33 PVNGS License Renewal Project Overview Presentation, provided in SCE's Response to Data Request Set TURN-SCE-01 Question 43.

Q. Is there a significant possibility that a license renewal application to extend the operating lives of the three Palo Verde units will be submitted to the NRC and will be approved by the NRC.

A. As I explained earlier, the NRC already has approved license renewal applications for 39 nuclear units without rejecting any such applications. Given this evidence and the statements and actions taken by the Palo Verde owners, I believe it would be reasonable for the Commission to assume that the operating lives of the Palo Verde units will be extended by an additional twenty years when determining the required ratepayer contributions to the units' decommissioning funds. At a minimum, the Commission should consider the strong potential for life extension as an argument in favor of the use of a contingency factor substantially lower than 35 percent.

Q. Have you quantified the impact on the annual contributions that would be required from SCE's ratepayer if the Commission were to assume that the operating lives of the Palo Verde units will be extended by an additional twenty years?

A. Yes. If the Commission approves SCE's proposed contribution schedule and then the operating lives of the Palo Verde units are subsequently extended by an additional twenty years, SCE's Palo Verde decommissioning funds can be expected to have significant surpluses when decommissioning is ultimately concluded. In fact, those surpluses could be expected to be approximately $4.9 billion, if the Commission assumes an average annual 4.5 percent cost escalation rate. The projected fund surpluses would remain above $3 billion, even if an higher 5.0 percent average annual decommissioning cost escalation rate is assumed.

This leads to the conclusion that, as shown on Table 3, the annual contributions that would be required from SCE's ratepayers would be significantly lower if the Commission were to assume that the operating lives of the Palo Verde units will be extended by an additional twenty years.

Table 3: Required Annual Contributions from SCE Ratepayers to Palo Verde Decommissioning Fund with Twenty Years of Additional Operating Life[34]

	SCE Requested Annual Contributions (Thousands of Dollars)	Annual Contributions Required if 20 Year Life Extension and 5.53% Annual Return are Assumed (Thousands of Dollars)	Annual Contributions Required if 20 Year Life Extension and 5.73% Annual Return are Assumed (Thousands of Dollars)
Palo Verde Unit 1	$6,708	$2,145	$878
Palo Verde Unit 2	$7,521	$2,862	$1,542
Palo Verde Unit 3	$5,583	$1,250	$0
Total Palo Verde	$19,812	$6,257	$2,420

Q. What assumptions underlie the figures presented in Table 3?

A. The figures in Table 3 reflect all of SCE's cost assumptions for the cost of decommissioning Palo Verde, including the use of a 35 percent contingency factor. The only changes I have made to any SCE assumptions are to assume (1) a post-tax rate of return of 5.73 percent during the years 2007 through five years before the shutdown of the Palo Verde units to reflect a 60 percent maximum equity investment, (2) twenty years of additional operating life for each Palo Verde unit and (3) a 4.5 average annual decommissioning cost escalation rate during the twenty years of each unit's extended operating life.

The use of this 4.5 decommissioning rate produces a real earnings rate of approximately 1.23 percent (that is, the 5.73 percent after tax return less 4.5 percent). NRC regulations allow licensees that use external sinking funds to take credit for up to a two percent real rate of return unless the licensee's rate-setting authority has specifically authorized a higher real rate of return.[35] Thus, the 1.23 percent real rate of return that I have assumed for the twenty years of additional operating life for each Palo Verde unit is conservative.

[34] The worksheets for Table 3 are included in Exhibit DAS-3.

[35] 10CFR50.75(e)(1)(ii).

Q. Are you aware of any state regulatory commission that has directed that annual decommissioning collections from ratepayers reflect the relicensing of a nuclear power plant before the owner of that plant actually applied to the NRC to renew the unit's operating license?

A. Yes. In 2002, the Kansas Corporation Commission ordered that the decommissioning fund collections by the Kansas utilities that owned the Wolf Creek Nuclear Plant be based on an expected 60 year operating life that reflected a twenty year extension of the plant's NRC operating license.[36] At the time that the Kansas Commission made this decision, the owners of the Wolf Creek had not yet filed an application with the NRC to renew the unit's operating license. Indeed, the currently expected filing date for that application is September 2006.

Similarly, in 2000, the Arkansas Public Service Commission suspended decommissioning fund collections due to the potential for renewal of the operating licenses for Entergy's two Arkansas Nuclear units.[37] At the time that the Arkansas Commission made this decision Entergy had already applied to the NRC for the renewal of the operating license of one of its nuclear units and had announced that it intended to seek a similar renewal of the license for the other nuclear unit. But the first application had not yet been approved by the NRC and the second application had not yet been filed.

Q. Are you aware of any nuclear power plant owners that voluntarily stopped making annual collections from ratepayers because it believed that its decommissioning funds already were adequate?

A. Yes. The Omaha Public Power District, the owner of the Fort Calhoun nuclear station, ceased making annual decommissioning collections starting in 2002.

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36 Kansas Corporation Commission Order in Docket No. 02-KG&E-663-MIS, dated March 8, 2002.

37 Arkansas Public Service Commission Order in Docket No. 87-166-TF, dated October 3, 2000.

Q. What could the Commission do if it decides in this proceeding that SCE should significantly reduce or eliminate altogether its annual decommissioning collections from its ratepayers after 2007 and at some later date subsequently finds that the accumulated Palo Verde decommissioning funds will be insufficient?

A. I understand that the Commission is required to revisit the decommissioning issue every three years. If it appears in 2008, 2011 or any subsequent year that the Palo Verde decommissioning funds will be inadequate, because of some currently unanticipated costs or problems, the Commission can order that SCE again make annual decommissioning cost collections from its ratepayers to cover any projected fund shortfalls.

SONGS 2&3

Q. What projected post-tax rates of return does SCE use in its ratepayer contribution analyses for SONGS 2&3?

A. The projected post-tax rates of return used by SCE in its ratepayer contribution analyses are shown in Table I-5 on page 17 of Exhibit Utilities-1. As shown in that Table, SCE is assuming a 5.55 percent average annual post-tax rate of return for its SONGS 2&3 decommissioning trust investments for the years 2007 through five years before the expected shutdown of the SONGS units.

Q. Is the 5.55 percent annualized post-tax rate of return used by SCE for its SONGS 2&3 decommissioning trust investments consistent with historic performance of the SCE decommissioning trust fund?

A. No. The 5.53 percent post-tax rate of return is below the 6.0 percent annualized post-tax return achieved by the fund during the past ten years, the 6.8 percent annual return achieved by the fund during the past fifteen years, and the 6.7

percent annualized return achieved by the fund since its inception on February 29, 1988.[38]

Q. Does this 5.55 percent annualized post-tax rate of return assumed by SCE reflect the investment policy changes that SCE and SDG&E have requested in this proceeding?

A. No. The 5.55 percent annualized rate of return used by SCE to calculate the required ratepayer contributions to its SONGS 2&3 decommissioning funds does not reflect the utilities request that the Commission (1) allow them to increase the trust fund maximum equity percent to 60 percent and (2) to allow them to invest up to 20 percent of the funds in higher yield bonds rated B or higher by Standard & Poors or B2 or higher by Moodys. Instead, the 5.55 percent rate of return assumes that only 50 percent of the trust fund investments would be in equities.

Q. Has SCE quantified what the annualized rate of return for its SONGS 2&3 decommissioning funds would be if it reflected these two policies changes that it is requesting from the Commission?

A. SCE's workpapers do show that using a 60 percent maximum equity limit would increase the annualized post-tax rate of return for its SONGS 2&3 decommissioning investments from 5.55 percent to 5.75 percent.[39] However, I have not seen any recalculation of the post-tax rate of return that could be achieved if the investment trusts were permitted to invest in higher yield bonds.

Q. Have you quantified the annual ratepayer contributions that would be required if the Commission assumed that the post-tax rate of return was 5.75 percent instead of 5.55 percent?

A. Yes. The results of this quantification are shown on Table 4 below:

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[38] SCE's Response to TURN Data Request 01-06.

[39] See page 117 of the workpapers for Exhibit Utilities-1.

Table 4: Required Annual Contributions from SCE Ratepayers to SONGS 2&3 Decommissioning Fund under Different Assumed Rates of Return[40]

	SCE Requested Contribution based on 5.55 Percent After Tax Rate of Return (Thousands of Dollars)	Reduced Contribution based on 5.75 Percent After Tax Rate of Return (Thousands of Dollars)
SONGS 2	$22,032	$20,084
SONGS 3	$15,913	$13,640
Total SONGS	$37,945	$33,724

It is important to note that the annual contributions from SCE's ratepayers could be reduced even further to reflect the utilities request for Commission approval to invest in higher yield bonds.

Q. Have you quantified the impact on the annual contributions that would be required from SCE's ratepayer if the Commission were to assume that the operating lives of SONGS 2&3 will be extended by an additional twenty years?

A. Yes. If the Commission approves SCE's proposed contribution schedule and then the operating lives of the SONGS 2&3 units are subsequently extended by an additional twenty years, SCE's SONGS decommissioning funds can be expected to have significant surpluses when decommissioning is ultimately concluded. In fact, those surpluses could be expected to exceed $11 billion, if the Commission assumes an average annual 4.5 percent cost escalation rate. The projected fund surpluses would remain above $7 billion, even if an higher 5.0 percent average annual decommissioning cost escalation rate is assumed.

This leads to the conclusion that the annual contributions from SCE's ratepayers could be suspended if the Commission were to assume that the operating lives of SNGS 2&3 will be extended by an additional twenty years.

[40] The worksheets for the reduced contributions shown in the last column in Table 4 are included in Exhibit DAS-4.

Q. What assumptions underlie this conclusion?

A. The worksheets for my analysis of the impact of assuming extended operating lives for SONGS 2&3 on the adequacy of SCE's decommissioning trust funds are presented in Exhibit DAS-5. This analysis reflects all of SCE's cost assumptions as to the projected cost of decommissioning SONGS 2&3. The only changes I have made to SCE's assumptions are to assume (1) a post-tax rate of return of 5.75 percent during the years 2007 through five years before the shutdown of SONGS 2&3 to reflect a 60 percent maximum equity investment, (2) twenty years of additional operating life for each unit and (3) a 4.5 average annual decommissioning cost escalation rate during the twenty years of each unit's extended operating life.

Q. Do your conclusions concerning SCE's decommissioning trust funds for SONGS 2&3 also apply to SDG&E?

A. Yes. SDG&E's requested contributions from ratepayers could be reduced to $10,940,000 (a reduction of $1,107,000) if the analysis merely reflected a 5.74 percent after-tax rate of return based on a 60 percent maximum equity investment. SDG&E's requested contributions could be reduced even more if the assumed rate of return were to reflect the utilities request for Commission approval to invest in higher yield bonds. Finally, contributions by SDG&E's ratepayers into the funds could be suspended entirely if the Commission were to assume that the operating lives of SONGS 2&3 will be extended by an additional twenty years.

Q. Does this complete your testimony?

A. Yes.

EXHIBIT DAS-1

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SUMMARY

I have worked for thirty years as a consultant and attorney on complex management, engineering, and economic issues, primarily in the field of energy. This work has involved conducting technical investigations, preparing economic analyses, presenting expert testimony, providing support during all phases of regulatory proceedings and litigation, and advising clients during settlement negotiations. I received undergraduate and advanced engineering degrees from the Massachusetts Institute of Technology and Stanford University, respectively, and a law degree from Stanford Law School

PROFESSIONAL EXPERIENCE

Electric System Reliability - Evaluated whether new transmission lines and generation facilities were needed to ensure adequate levels of system reliability. Investigated the causes of distribution system outages and inadequate service reliability. Examined the reasonableness of utility system reliability expenditures.

Transmission Line Siting – Examined the need for proposed transmission lines. Analyzed whether proposed transmission lines could be installed underground. Worked with clients to develop alternate routings for proposed lines that would have reduced impacts on the environment and communities.

Power Plant Operations and Economics - Investigated the causes of more than one hundred power plant and system outages, equipment failures, and component degradation, determined whether these problems could have been anticipated and avoided, and assessed liability for repair and replacement costs. Examined power plant operating, maintenance, and capital costs. Analyzed power plant operating data from the NERC Generating Availability Data System (GADS). Evaluated utility plans for and management of the replacement of major power plant components. Assessed the adequacy of power plant quality assurance and maintenance programs. Examined the selection and supervision of contractors and subcontractors.

Power Plant Repowering - Evaluated the environmental, economic and reliability impacts of rebuilding older, inefficient generating facilities with new combined cycle technology.

Power Plant Air Emissions – Investigated whether proposed generating facilities would provide environmental benefits in terms of reduced emissions of NO_x, SO_2 and CO_2. Examined whether new state emission standards would lead to the retirement of existing power plants or otherwise have an adverse impact on electric system reliability.

Power Plant Water Use – Examined power plant repowering as a strategy for reducing water consumption at existing electric generating facilities. Analyzed the impact of converting power plants from once-through to closed-loop systems with cooling towers on plant revenues and electric system reliability. Evaluated the potential impact of the EPA's Proosed Clean Water Act Section 316(b) Rule for Cooling Water Intake Structures at existing power plants.

Nuclear Power - Examined the impact of the nuclear power plant life extensions and power uprates on decommissioning costs and collections policies. Evaluated utility decommissioning cost estimates and cost collection plans. Investigated the significance of the increasing ownership of nuclear power plants by multiple tiered holding companies with limited liability company subsidiaries. Investigated the potential safety consequences of nuclear power plant structure, system, and component failures.

Electric Industry Regulation and Markets - Investigated whether new generating facilities that were built for a deregulated subsidiary should be included in the rate base of a regulated utility. Evaluated the reasonableness of proposed utility power purchase agreements with deregulated affiliates. Investigated the prudence of utility power purchases in deregulated markets. Examined whether generating facilities experienced more outages following the transition to a deregulated wholesale market in New England. Evaluated the reasonableness of nuclear and fossil plant sales and the auctions of power purchase agreements. Analyzed the impact of proposed utility mergers on market power. Assessed the reasonableness of contract provisions and terms in proposed power supply agreements.

Economic Analysis - Analyzed the costs and benefits of energy supply options. Examined the economic and system reliability consequences of the early retirement of major electric generating facilities. Evaluated whether new electric generating facilities are used and useful. Quantified replacement power costs and the increased capital and operating costs due to identified instances of mismanagement.

Expert Testimony - Presented the results of management, technical and economic analyses as testimony in more than ninety proceedings before regulatory boards and commissions in twenty three states, before two federal regulatory agencies, and in state and federal court proceedings.

Litigation and Regulatory Support - Participated in all aspects of the development and preparation of case presentations on complex management, technical, and economic issues. Assisted in the preparation and conduct of pre-trial discovery and depositions. Helped identify and prepare expert witnesses. Aided the preparation of pre-hearing petitions and motions and post-hearing briefs and appeals. Assisted counsel in preparing for hearings and oral arguments. Advised counsel during settlement negotiations.

TESTIMONY, AFFIDAVITS AND COMMENTS

New Jersey Board of Public Utilities (Docket No. EM05020106) – November and December 2005 and March 2006
The market power implications of the proposed merger between Exelon Corp. and Public Service Enterprise Group.

Virginia State Corporation Commission (Case No. PUE-2005-00018)– November 2005
The siting of a proposed 230 kV transmission line.

Iowa Utility Board (Docket No. SPU-05-15) – September and October 2005
The reasonableness of IPL's proposed sale of the Duane Arnold Energy Center nuclear plant.

New York State Department of Environmental Conservation (DEC #3-3346-00011/00002) – October 2005
The likely profits that Dynegy will earn from the sale of the energy and capacity of the Danskammer Generating Facility if the plant is converted from once-through to closed-cycle cooling with wet towers or to dry cooling.

Arkansas Public Service Commission (Docket 05-042-U) – July and August 2005
Arkansas Electric Cooperative Corporation's proposed purchase of the Wrightsville Power Facility.

Maine Public Utilities Commission (Docket No. 2005-17) – July 2005
Joint testimony with Peter Lanzalotta and Bob Fagan evaluating Eastern Maine Electric Cooperative's request for a CPCN to purchase 15 MW of transmission capacity from New Brunswick Power.

Federal Energy Regulatory Commission (Docket No. EC05-43-0000) – April and May 2005
Joint Affidavit and Supplemental Affidavit with Bruce Biewald on the market power aspects of the proposed merger of Exelon Corporation and Public Service Enterprise Group, Inc.

Maine Public Utilities Commission (Docket No. 2004-538 Phase II) – April 2005
Joint testimony with Peter Lanzalotta and Bob Fagan evaluating Maine Public Service Company's request for a CPCN to purchase 35 MW of transmission capacity from New Brunswick Power.

Maine Public Utilities Commission (Docket No. 2004-771) – March 2005
Analysis of Bangor Hydro-Electric's Petition for a Certificate of Public Convenience and Necessity to construct a 345 kV transmission line

United States District Court for the Southern District of Ohio, Eastern Division (Consolidated Civil Actions Nos. C2-99-1182 and C2-99-1250)
Whether the public release of company documents more than three years old would cause competitive harm to the American Electric Power Company.

New Jersey Board of Public Utilities (Docket No. EO03121014) – February 2005
Whether the Board of Public Utilities can halt further collections from Jersey Central Power & Light Company's ratepayers because there already are adequate funds in the company's decommissioning trusts for the Three Mile Island Unit No. 2 Nuclear Plant to allow for the decommissioning of that unit without endangered the public health and safety.

Maine Public Utilities Commission (Docket No. 2004-538) – January and March 2005

Analysis of Maine Public Service Company's request to construct a 138 kV transmission line from Limestone, Maine to the Canadian Border.

California Public Utilities Commission (Application No. AO4-02-026) – December 2004 and January 2005
Southern California Edison's proposed replacement of the steam generators at the San Onofre Unit 2 and Unit 3 nuclear power plants and whether the utility was imprudent for failing to initiate litigation against Combustion Engineering due to defects in the design of and materials used in those steam generators.

United States District Court for the Southern District of Indiana, Indianapolis Division (Civil Action No. IP99-1693) – December 2004
Whether the public release of company documents more than three years old would cause competitive harm to the Cinergy Corporation.

California Public Utilities Commission (Application No. AO4-01-009) – August 2004
Pacific Gas & Electric's proposed replacement of the steam generators at the Diablo Canyon nuclear power plant and whether the utility was imprudent for failing to initiate litigation against Westinghouse due to defects in the design of and materials used in those steam generators.

Public Service Commission of Wisconsin (Docket No. 6690-CE-187) – June, July and August 2004
Whether Wisconsin Public Service Corporation's request for approval to build a proposed 515 MW coal-burning generating facility should be granted.

Public Service Commission of Wisconsin (Docket No. 05-EI-136) – May and June 2004
Whether the proposed sale of the Kewaunee Nuclear Power Plant to a subsidiary of an out-of-state holding company is in the public interest.

Connecticut Siting Council (Docket No. 272) – May 2004
Whether there are technically viable alternatives to the proposed 345-kV transmission line between Middletown and Norwalk Connecticut and the length of the line that can be installed underground.

Arizona Corporation Commission (Docket No. E-01345A-03-0437 – February 2004
Whether Arizona Public Service Company should be allowed to acquire and include in rate base five generating units that were built by a deregulated affiliate.

State of Rhode Island Energy Facilities Siting Board (Docket No. SB-2003-1) – February 2004
Whether the cost of undergrounding a relocated 115kV transmission line would be eligible for regional cost socialization.

State of Maine Department of Environmental Protection (Docket No. A-82-75-0-X) – December 2003
The storage of irradiated nuclear fuel in an Independent Spent Fuel Storage Installation (ISFSI) and whether such an installation represents an air pollution control facility.

Rhode Island Public Utility Commission (Docket No. 3564) – December 2003 and January 2004
Whether Narragansett Electric Company should be required to install a relocated 115kV transmission line underground.

New York State Board on Electric Generation Siting and the Environment (Case No. 01-F-1276) – September, October and November 2003
The environmental, economic and system reliability benefits that can reasonably be expected from the proposed 1,100 MW TransGas Energy generating facility in Brooklyn, New York.

Wisconsin Public Service Commission (Case 6690-UR-115209) - September and October 2003
The reasonableness of Wisconsin Public Service Corporation's decommissioning cost collections for the Kewaunee Nuclear Plant.

Oklahoma Corporation Commission (Cause No. 2003-121) – July 2003
Whether Empire District Electric Company properly reduced its capital costs to reflect the write-off of a portion of the cost of building a new electric generating facility.

Arkansas Public Service Commission (Docket 02-248-U) – May 2003
Entergy's proposed replacement of the steam generators and the reactor vessel head at the ANO Unit 1 Steam Generating Station.

Appellate Tax Board, State of Massachusetts (Docket No C258405-406) – May 2003
The physical nature of electricity and whether electricity is a tangible product or a service.

Maine Public Utilities Commission (Docket 2002-665-U) – April 2003
Analysis of Central Maine Power Company's proposed transmission line for Southern York County and recommendation of alternatives.

Massachusetts Legislature, Joint Committees on Government Regulations and Energy – March 2003
Whether PG&E can decide to permanently retire one or more of the generating units at its Salem Harbor Station if it is not granted an extension beyond October 2004 to reduce the emissions from the Station's three coal-fired units and one oil-fired unit.

New Jersey Board of Public Utilities (Docket No. ER02080614) – January 2003
The prudence of Rockland Electric Company's power purchases during the period August 1, 1999 through July 31, 2002.

New York State Board on Electric Generation Siting and the Environment (Case No. 00-F-1356) – September and October 2002 and January 2003
The need for and the environmental benefits from the proposed 300 MW Kings Park Energy generating facility.

Arizona Corporation Commission (Docket No. E-01345A-01-0822) – March 2002
The reasonableness of Arizona Public Service Company's proposed long-term power purchase agreement with an affiliated company.

New York State Board on Electric Generation Siting and the Environment (Case No. 99-F-1627) – March 2002
Repowering NYPA's existing Poletti Station in Queens, New York.

Connecticut Siting Council (Docket No. 217) – March 2002, November 2002, and January 2003
Whether the proposed 345-kV transmission line between Plumtree and Norwalk substations in Southwestern Connecticut is needed and will produce public benefits.

Vermont Public Service Board (Case No. 6545) – January 2002
Whether the proposed sale of the Vermont Yankee Nuclear Plant to Entergy is in the public interest of the State of Vermont and Vermont ratepayers.

Connecticut Department of Public Utility Control (Docket 99-09-12RE02) – December 2001
The reasonableness of adjustments that Connecticut Light and Power Company seeks to make to the proceeds that it received from the sale of Millstone Nuclear Power Station.

Connecticut Siting Council (Docket No. 208) – October 2001
Whether the proposed cross-sound cable between Connecticut and Long Island is needed and will produce public benefits for Connecticut consumers.

New Jersey Board of Public Utilities (Docket No. EM01050308) - September 2001
The market power implications of the proposed merger between Conectiv and Pepco.

Illinois Commerce Commission Docket No. 01-0423 – August, September, and October 2001
Commonwealth Edison Company's management of its distribution and transmission systems.

New York State Board on Electric Generation Siting and the Environment (Case No. 99-F-1627) - August and September 2001
The environmental benefits from the proposed 500 MW NYPA Astoria generating facility.

New York State Board on Electric Generation Siting and the Environment (Case No. 99-F-1191) - June 2001
The environmental benefits from the proposed 1,000 MW Astoria Energy generating facility.

New Jersey Board of Public Utilities (Docket No. EM00110870) - May 2001
The market power implications of the proposed merger between FirstEnergy and GPU Energy.

Connecticut Department of Public Utility Control (Docket 99-09-12RE01) - November 2000
The proposed sale of Millstone Nuclear Station to Dominion Nuclear, Inc.

Illinois Commerce Commission (Docket 00-0361) - August 2000
The impact of nuclear power plant life extensions on Commonwealth Edison Company's decommissioning costs and collections from ratepayers.

Vermont Public Service Board (Docket 6300) - April 2000
Whether the proposed sale of the Vermont Yankee nuclear plant to AmerGen Vermont is in the public interest.

Massachusetts Department of Telecommunications and Energy (Docket 99-107, Phase II) - April and June 2000
The causes of the May 18, 1999, main transformer fire at the Pilgrim generating station.

Connecticut Department of Public Utility Control (Docket 00-01-11) - March and April 2000
The impact of the proposed merger between Northeast Utilities and Con Edison, Inc. on the reliability of the electric service being provided to Connecticut ratepayers.

Connecticut Department of Public Utility Control (Docket 99-09-12) - January 2000
The reasonableness of Northeast Utilities plan for auctioning the Millstone Nuclear Station.

Connecticut Department of Public Utility Control (Docket 99-08-01) - November 1999
Generation, Transmission, and Distribution system reliability.

Illinois Commerce Commission (Docket 99-0115) - September 1999
Commonwealth Edison Company's decommissioning cost estimate for the Zion Nuclear Station.

Connecticut Department of Public Utility Control (Docket 99-03-36) - July 1999
Standard offer rates for Connecticut Light & Power Company.

Connecticut Department of Public Utility Control (Docket 99-03-35) - July 1999
Standard offer rates for United Illuminating Company.

Connecticut Department of Public Utility Control (Docket 99-02-05) - April 1999
Connecticut Light & Power Company stranded costs.

Connecticut Department of Public Utility Control (Docket 99-03-04) - April 1999
United Illuminating Company stranded costs.

Maryland Public Service Commission (Docket 8795) - December 1998
Future operating performance of Delmarva Power Company's nuclear units.

Maryland Public Service Commission (Dockets 8794/8804) - December 1998
Baltimore Gas and Electric Company's proposed replacement of the steam generators at the Calvert Cliffs Nuclear Power Plant. Future performance of nuclear units.

Indiana Utility Regulatory Commission (Docket 38702-FAC-40-S1) - November 1998
Whether the ongoing outages of the two units at the D.C. Cook Nuclear Plant were caused or extended by mismanagement.

Arkansas Public Service Commission (Docket 98-065-U) - October 1998
Entergy's proposed replacement of the steam generators at the ANO Unit 2 Steam Generating Station.

Massachusetts Department of Telecommunications and Energy (Docket 97-120) - October 1998
Western Massachusetts Electric Company's Transition Charge. Whether the extended 1996-1998 outages of the three units at the Millstone Nuclear Station were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 98-01-02) - September 1998
Nuclear plant operations, operating and capital costs, and system reliability improvement costs.

Illinois Commerce Commission (Docket 97-0015) - May 1998
Whether any of the outages of Commonwealth Edison Company's twelve nuclear units during 1996 were caused or extended by mismanagement. Whether equipment problems, personnel performance weaknesses, and program deficiencies could have been avoided or addressed prior to plant outages. Outage-related fuel and replacement power costs.

Public Service Commission of West Virginia (Case 97-1329-E-CN) - March 1998
The need for a proposed 765 kV transmission line from Wyoming, West Virginia, to Cloverdate, Virginia.

Illinois Commerce Commission (Docket 97-0018) - March 1998
Whether any of the outages of the Clinton Power Station during 1996 were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 97-05-12) - October 1997
The increased costs resulting from the ongoing outages of the three units at the Millstone Nuclear Station.

New Jersey Board of Public Utilities (Docket ER96030257) - August 1996
Replacement power costs during plant outages.

Illinois Commerce Commission (Docket 95-0119) - February 1996
Whether any of the outages of Commonwealth Edison Company's twelve nuclear units during 1994 were caused or extended by mismanagement. Whether equipment problems, personnel performance weaknesses, and program deficiencies could have been avoided or addressed prior to plant outages. Outage-related fuel and replacement power costs.

Public Utility Commission of Texas (Docket 13170) - December 1994
Whether any of the outages of the River Bend Nuclear Station during the period October 1, 1991, through December 31, 1993, were caused or extended by mismanagement.

Public Utility Commission of Texas (Docket 12820) - October 1994
Operations and maintenance expenses during outages of the South Texas Nuclear Generating Station.

Wisconsin Public Service Commission (Cases 6630-CE-197 and 6630-CE-209) - September and October 1994
The reasonableness of the projected cost and schedule for the replacement of the steam generators at the Point Beach Nuclear Power Plant. The potential impact of plant aging on future operating costs and performance.

Public Utility Commission of Texas (Docket 12700) - June 1994
Whether El Paso Electric Company's share of Palo Verde Unit 3 was needed to ensure adequate levels of system reliability. Whether the Company's investment in Unit 3 could be expected to generate cost savings for ratepayers within a reasonable number of years.

Arizona Corporation Commission (Docket U-1551-93-272) - May and June 1994
Southwest Gas Corporation's plastic and steel pipe repair and replacement programs.

Connecticut Department of Public Utility Control (Docket 92-04-15) - March 1994
Northeast Utilities management of the 1992/1993 replacement of the steam generators at Millstone Unit 2.

Connecticut Department of Public Utility Control (Docket 92-10-03) - August 1993
Whether the 1991 outage of Millstone Unit 3 as a result of the corrosion of safety-related plant piping systems was due to mismanagement.

Public Utility Commission of Texas (Docket 11735) - April and July 1993
Whether any of the outages of the Comanche Peak Unit 1 Nuclear Station during the period August 13, 1990, through June 30, 1992, were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 91-12-07) - January 1993 and August 1995
Whether the November 6, 1991, pipe rupture at Millstone Unit 2 and the related outages of the Connecticut Yankee and Millstone units were caused or extended by mismanagement. The impact of environmental requirements on power plant design and operation.

Connecticut Department of Public Utility Control (Docket 92-06-05) - September 1992
United Illuminating Company off-system capacity sales.

Public Utility Commission of Texas (Docket 10894) - August 1992
Whether any of the outages of the River Bend Nuclear Station during the period October 1, 1988, through September 30, 1991, were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 92-01-05) - August 1992
Whether the July 1991 outage of Millstone Unit 3 due to the fouling of important plant systems by blue mussels was the result of mismanagement.

California Public Utilities Commission (Docket 90-12-018) - November 1991, March 1992, June and July 1993
Whether any of the outages of the three units at the Palo Verde Nuclear Generating Station during 1989 and 1990 were caused or extended by mismanagement. Whether equipment problems, personnel performance weaknesses and program deficiencies could have been avoided or addressed prior to outages. Whether specific plant operating cost and capital expenditures were necessary and prudent.

Public Utility Commission of Texas (Docket 9945) - July 1991
Whether El Paso Electric Company's share of Palo Verde Unit 3 was needed to ensure adequate levels of system reliability. Whether the Company's investment in the unit could be expected to generate cost savings for ratepayers within a reasonable number of years. El Paso Electric Company's management of the planning and licensing of the Arizona Interconnection Project transmission line.

Arizona Corporation Commission (Docket U-1345-90-007) - December 1990 and April 1991
Arizona Public Service Company's management of the planning, construction and operation of the Palo Verde Nuclear Generating Station. The costs resulting from identified instances of mismanagement.

New Jersey Board of Public Utilities (Docket ER89110912J) - July and October 1990
The economic costs and benefits of the early retirement of the Oyster Creek Nuclear Plant. The potential impact of the unit's early retirement on system reliability. The cost and schedule for siting and constructing a replacement natural gas-fired generating plant.

Public Utility Commission of Texas (Docket 9300) - June and July 1990
Texas Utilities management of the design and construction of the Comanche Peak Nuclear Plant. Whether the Company was prudent in repurchasing minority owners' shares of Comanche Peak without examining the costs and benefits of the repurchase for its ratepayers.

Federal Energy Regulatory Commission (Docket EL-88-5-000) - November 1989
Boston Edison's corporate management of the Pilgrim Nuclear Station.

Connecticut Department of Public Utility Control (Docket 89-08-11) - November 1989
United Illuminating Company's off-system capacity sales.

Kansas State Corporation Commission (Case 164,211-U) - April 1989
Whether any of the 127 days of outages of the Wolf Creek generating plant during 1987 and 1988 were the result of mismanagement.

Public Utility Commission of Texas (Docket 8425) - March 1989
Whether Houston Lighting & Power Company's new Limestone Unit 2 generating facility was needed to provide adequate levels of system reliability. Whether the Company's investment in Limestone Unit 2 would provide a net economic benefit for ratepayers.

Illinois Commerce Commission (Dockets 83-0537 and 84-0555) - July 1985 and January 1989
Commonwealth Edison Company's management of quality assurance and quality control activities and the actions of project contractors during construction of the Byron Nuclear Station.

New Mexico Public Service Commission (Case 2146, Part II) - October 1988
The rate consequences of Public Service Company of New Mexico's ownership of Palo Verde Units 1 and 2.

United States District Court for the Eastern District of New York (Case 87-646-JBW) - October 1988
Whether the Long Island Lighting Company withheld important information from the New York State Public Service Commission, the New York State Board on Electric Generating Siting and the Environment, and the U.S. Nuclear Regulatory Commission.

Public Utility Commission of Texas (Docket 6668) - August 1988 and June 1989
Houston Light & Power Company's management of the design and construction of the South Texas Nuclear Project. The impact of safety-related and environmental requirements on plant construction costs and schedule.

Federal Energy Regulatory Commission (Docket ER88-202-000) - June 1988
Whether the turbine generator vibration problems that extended the 1987 outage of the Maine Yankee nuclear plant were caused by mismanagement.

Illinois Commerce Commission (Docket 87-0695) - April 1988
Illinois Power Company's planning for the Clinton Nuclear Station.

North Carolina Utilities Commission (Docket E-2, Sub 537) - February 1988
Carolina Power & Light Company's management of the design and construction of the Harris Nuclear Project. The Company's management of quality assurance and quality control activities. The impact of safety-related and environmental requirements on construction costs and schedule. The cost and schedule consequences of identified instances of mismanagement.

Ohio Public Utilities Commission (Case 87-689-EL-AIR) - October 1987
Whether any of Ohio Edison's share of the Perry Unit 2 generating facility was needed to ensure adequate levels of system reliability. Whether the Company's investment in Perry Unit 1 would produce a net economic benefit for ratepayers.

North Carolina Utilities Commission (Docket E-2, Sub 526) - June 1987
Fuel factor calculations.

New York State Public Service Commission (Case 29484) - May 1987
The planned startup and power ascension testing program for the Nine Mile Point Unit 2 generating facility.

Illinois Commerce Commission (Dockets 86-0043 and 86-0096) - April 1987
The reasonableness of certain terms in a proposed Power Supply Agreement.

Illinois Commerce Commission (Docket 86-0405) - March 1987
The in-service criteria to be used to determine when a new generating facility was capable of providing safe, adequate, reliable and efficient service.

Indiana Public Service Commission (Case 38045) - December 1986
Northern Indiana Public Service Company's planning for the Schaefer Unit 18 generating facility. Whether the capacity from Unit 18 was needed to ensure adequate system reliability. The rate consequences of excess capacity on the Company's system.

Superior Court in Rockingham County, New Hampshire (Case 86E328) - July 1986
The radiation effects of low power testing on the structures, equipment and components in a new nuclear power plant.

New York State Public Service Commission (Case 28124) - April 1986 and May 1987
The terms and provisions in a utility's contract with an equipment supplier. The prudence of the utility's planning for a new generating facility. Expenditures on a canceled generating facility.

Arizona Corporation Commission (Docket U-1345-85) - February 1986
The construction schedule for Palo Verde Unit No. 1. Regulatory and technical factors that would likely affect future plant operating costs.

New York State Public Service Commission (Case 29124) - January 1986
Niagara Mohawk Power Corporation's management of construction of the Nine Mile Point Unit No. 2 nuclear power plant.

New York State Public Service Commission (Case 28252) - October 1985
A performance standard for the Shoreham nuclear power plant.

New York State Public Service Commission (Case 29069) - August 1985
A performance standard for the Nine Mile Point Unit No. 2 nuclear power plant.

Missouri Public Service Commission (Cases ER-85-128 and EO-85-185) - July 1985
The impact of safety-related regulatory requirements and plant aging on power plant operating costs and performance. Regulatory factors and plant-specific design features that will likely affect the future operating costs and performance of the Wolf Creek Nuclear Plant.

Massachusetts Department of Public Utilities (Case 84-152) - January 1985
The impact of safety-related regulatory requirements and plant aging on power plant operating costs and performance. Regulatory factors and plant-specific design features that will likely affect the future operating costs and performance of the Seabrook Nuclear Plant.

Maine Public Utilities Commission (Docket 84-113) - September 1984
The impact of safety-related regulatory requirements and plant aging on power plant operating costs and performance. Regulatory factors and plant-specific design features that will likely affect the future operating costs and performance of the Seabrook Nuclear Plant.

South Carolina Public Service Commission (Case 84-122-E) - August 1984
The repair and replacement strategy adopted by Carolina Power & Light Company in response to pipe cracking at the Brunswick Nuclear Station. Quantification of replacement power costs attributable to identified instances of mismanagement.

Vermont Public Service Board (Case 4865) - May 1984
The repair and replacement strategy adopted by management in response to pipe cracking at the Vermont Yankee nuclear plant.

New York State Public Service Commission (Case 28347) -January 1984
The information that was available to Niagara Mohawk Power Corporation prior to 1982 concerning the potential for cracking in safety-related piping systems at the Nine Mile Point Unit No. 1 nuclear plant.

New York State Public Service Commission (Case 28166) - February 1983 and February 1984
Whether the January 25, 1982, steam generator tube rupture at the Ginna Nuclear Plant was caused by mismanagement.

U.S. Nuclear Regulatory Commission (Case 50-247SP) - May 1983
The economic costs and benefits of the early retirement of the Indian Point nuclear plants.

REPORTS, ARTICLES, AND PRESENTATIONS

Conservation and Renewable Energy Should be the Cornerstone for Meeting Future Natural Gas Needs. Presentation to the Global LNG Summit, June 1, 2004. Presentation given by Cliff Chen.

Comments on natural gas utilities' Phase I Proposals for pre-approved full cost recovery of contracts with liquid natural gas (LNG) suppliers and the costs of interconnecting their systems with LNG facilities. Comments in California Public Utilities Commission Rulemaking 04-01-025. March 23, 2004.

The 2003 Blackout: Solutions that Won't Cost a Fortune, The Electricity Journal, November 2003, with David White, Amy Roschelle, Paul Peterson, Bruce Biewald, and William Steinhurst.

The Impact of Converting the Cooling Systems at Indian Point Units 2 and 3 on Electric System Reliability. An Analysis for Riverkeeper, Inc. November 3, 2003.

The Impact of Converting Indian Point Units 2 and 3 to Closed-Cycle Cooling Systems with Cooling Towers on Energy's Likely Future Earnings. An Analysis for Riverkeeper, Inc. November 3, 2003.

Entergy's Lost Revenues During Outages of Indian Point Units 2 and 3 to Convert to Closed-Cycle Cooling Systems. An Analysis for Riverkeeper, Inc. November 3, 2003.

Power Plant Repowering as a Strategy for Reducing Water Consumption at Existing Electric Generating Facilities. A presentation at the May 2003 Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. May 6, 2003.

Financial Insecurity: The Increasing Use of Limited Liability Companies and Multi-tiered Holding Companies to Own Electric Generating Plants. A presentation at the 2002 NASUCA Annual Meeting. November 12, 2002.

Determining the Need for Proposed Overhead Transmission Facilities. A Presentation by David Schlissel and Paul Peterson to the Task Force and Working Group for Connecticut Public Act 02-95. October 17, 2002.

Future PG&E Net Revenues From The Sale of Electricity Generated at its Brayton Point Station. An Analysis for the Attorney General of the State of Rhode Island. October 2, 2002.

PG&E's Net Revenues From The Sale of Electricity Generated at its Brayton Point Station During the Years 1999-2002. An Analysis for the Attorney General of the State of Rhode Island. October 2, 2002.

Financial Insecurity: The Increasing Use of Limited Liability Companies and Multi-Tiered Holding Companies to Own Nuclear Power Plants. A Synapse report for the STAR Foundation and Riverkeeper, Inc., by David Schlissel, Paul Peterson, and Bruce Biewald, August 7, 2002.

Comments on EPA's Proposed Clean Water Act Section 316(b) for Cooling Water Intake Structures at Phase II Existing Facilities, on behalf of Riverkeeper, Inc., by David Schlissel and Geoffrey Keith, August 2002.

The Impact of Retiring the Indian Point Nuclear Power Station on Electric System Reliability. A Synapse Report for Riverkeeper, Inc. and Pace Law School Energy Project. May 7, 2002.

Preliminary Assessment of the Need for the Proposed Plumtree-Norwalk 345-kV Transmission Line. A Synapse Report for the Towns of Bethel, Redding, Weston, and Wilton Connecticut. October 15, 2001.

ISO New England's Generating Unit Availability Study: Where's the Beef? A Presentation at the June 29, 2001 Restructuring Roundtable.

Clean Air and Reliable Power: Connecticut Legislative House Bill HB6365 will not Jeopardize Electric System Reliability. A Synapse Report for the Clean Air Task Force. May 2001.

Room to Breathe: Why the Massachusetts Department of Environmental Protection's Proposed Air Regulations are Compatible with Reliability. A Synapse Report for MASSPIRG and the Clean Water Fund. March 2001.

Generator Outage Increases: A Preliminary Analysis of Outage Trends in the New England Electricity Market, a Synapse Report for the Union of Concerned Scientists, January 7, 2001.

Cost, Grid Reliability Concerns on the Rise Amid Restructuring, with Charlie Harak, Boston Business Journal, August 18-24, 2000.

Report on Indian Point 2 Steam Generator Issues, Schlissel Technical Consulting, Inc., March 10, 2000.

Preliminary Expert Report in Case 96-016613, Cities of Wharton, Pasadena, et al v. Houston Lighting & Power Company, October 28, 1999.

Comments of Schlissel Technical Consulting, Inc. on the Nuclear Regulatory Commission's Draft Policy Statement on Electric Industry Economic Deregulation, February 1997.

Report to the Municipal Electric Utility Association of New York State on the Cost of Decommissioning the Fitzpatrick Nuclear Plant, August 1996.

Report to the Staff of the Arizona Corporation Commission on U.S. West Corporation's telephone cable repair and replacement programs, May, 1996.

Nuclear Power in the Competitive Environment, NRRI Quarterly Bulletin, Vol. 16, No. 3, Fall 1995.

Nuclear Power in the Competitive Environment, presentation at the 18th National Conference of Regulatory Attorneys, Scottsdale, Arizona, May 17, 1995.

The Potential Safety Consequences of Steam Generator Tube Cracking at the Byron and Braidwood Nuclear Stations, a report for the Environmental Law and Policy Center of the Midwest, 1995.

Report to the Public Policy Group Concerning Future Trojan Nuclear Plant Operating Performance and Costs, July 15, 1992.

Report to the New York State Consumer Protection Board on the Costs of the 1991 Refueling Outage of Indian Point 2, December 1991.

Preliminary Report on Excess Capacity Issues to the Public Utility Regulation Board of the City of El Paso, Texas, April 1991.

Nuclear Power Plant Construction Costs, presentation at the November, 1987, Conference of the National Association of State Utility Consumer Advocates.

Comments on the Final Report of the National Electric Reliability Study, a report for the New York State Consumer Protection Board, February 27, 1981.

OTHER SIGNIFICANT INVESTIGATIONS AND LITIGATION SUPPORT WORK

Reviewed the salt deposition mitigation strategy proposed for Reliant Energy's repowering of its Astoria Generating Station. October 2002 through February 2003.

Assisted the Connecticut Office of Consumer Counsel in reviewing the auction of Connecticut Light & Power Company's power purchase agreements. August and September, 2000.

Assisted the New Jersey Division of the Ratepayer Advocate in evaluating the reasonableness of Atlantic City Electric Company's proposed sale of its fossil generating facilities. June and July, 2000.

Investigated whether the 1996-1998 outages of the three Millstone Nuclear Units were caused or extended by mismanagement. 1997 and 1998. Clients were the Connecticut Office of Consumer Counsel and the Office of the Attorney General of the Commonwealth of Massachusetts.

Investigated whether the 1995-1997 outages of the two units at the Salem Nuclear Station were caused or extended by mismanagement. 1996-1997. Client was the New Jersey Division of the Ratepayer Advocate.

Assisted the Associated Industries of Massachusetts in quantifying the stranded costs associated with utility generating plants in the New England states. May through July, 1996

Investigated whether the December 25, 1993, turbine generator failure and fire at the Fermi 2 generating plant was caused by Detroit Edison Company's mismanagement of fabrication, operation or maintenance. 1995. Client was the Attorney General of the State of Michigan.

Investigated whether the outages of the two units at the South Texas Nuclear Generating Station during the years 1990 through 1994 were caused or extended by mismanagement. Client was the Texas Office of Public Utility Counsel.

Assisted the City Public Service Board of San Antonio, Texas in litigation over Houston Lighting & Power Company's management of operations of the South Texas Nuclear Generating Station.

Investigated whether outages of the Millstone nuclear units during the years 1991 through 1994 were caused or extended by mismanagement. Client was the Office of the Attorney General of the Commonwealth of Massachusetts.

Evaluated the 1994 Decommissioning Cost Estimate for the Maine Yankee Nuclear Plant. Client was the Public Advocate of the State of Maine.

Evaluated the 1994 Decommissioning Cost Estimate for the Seabrook Nuclear Plant. Clients were investment firms that were evaluating whether to purchase the Great Bay Power Company, one of Seabrook's minority owners.

Investigated whether a proposed natural-gas fired generating facility was need to ensure adequate levels of system reliability. Examined the potential impacts of environmental regulations on the unit's expected construction cost and schedule. 1992. Client was the New Jersey Rate Counsel.

Investigated whether Public Service Company of New Mexico management had adequately disclosed to potential investors the risk that it would be unable to market its excess generating capacity. Clients were individual shareholders of Public Service Company of New Mexico.

Investigated whether the Seabrook Nuclear Plant was prudently designed and constructed. 1989. Clients were the Connecticut Office of Consumer Counsel and the Attorney General of the State of Connecticut.

Investigated whether Carolina Power & Light Company had prudently managed the design and construction of the Harris nuclear plant. 1988-1989. Clients were the North Carolina Electric Municipal Power Agency and the City of Fayetteville, North Carolina.

Investigated whether the Grand Gulf nuclear plant had been prudently designed and constructed. 1988. Client was the Arkansas Public Service Commission.

Reviewed the financial incentive program proposed by the New York State Public Service Commission to improve nuclear power plant safety. 1987. Client was the New York State Consumer Protection Board.

Reviewed the construction cost and schedule of the Hope Creek Nuclear Generating Station. 1986-1987. Client was the New Jersey Rate Counsel.

Reviewed the operating performance of the Fort St. Vrain Nuclear Plant. 1985. Client was the Colorado Office of Consumer Counsel.

WORK HISTORY

2000 - Present: Senior Consultant, Synapse Energy Economics, Inc.

1994 - 2000: President, Schlissel Technical Consulting, Inc.

1983 - 1994: Director, Schlissel Engineering Associates

1979 - 1983: Private Legal and Consulting Practice

1975 - 1979: Attorney, New York State Consumer Protection Board

1973 - 1975: Staff Attorney, Georgia Power Project

EDUCATION

1983-1985: Massachusetts Institute of Technology
Special Graduate Student in Nuclear Engineering and Project Management,

1973: Stanford Law School,
Juris Doctor

1969: Stanford University
Master of Science in Astronautical Engineering,

1968: Massachusetts Institute of Technology
Bachelor of Science in Astronautical Engineering,

PROFESSIONAL MEMBERSHIPS

- New York State Bar since 1981
- American Nuclear Society
- National Association of Corrosion Engineers
- National Academy of Forensic Engineers (Correspondent Affiliate)

EXHIBIT DAS-2

Exhibit___DAS-2
Schedule 1

Palo Verde Unit 1 Decommissioning Contribution Analysis for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs, Escalation Rates, and Decommissioning Schedule

With 5.73 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					196,369
2006	3,851	6.43%	12,627	0	212,847
2007	6,170	5.73%	12,196	0	231,213
2008	6,170	5.73%	13,248	0	250,631
2009	6,170	5.73%	14,361	0	271,162
2010	6,170	5.73%	15,538	0	292,870
2011	6,170	5.73%	16,781	0	315,821
2012	6,170	5.73%	18,097	0	340,088
2013	6,170	5.73%	19,487	0	365,745
2014	6,170	5.73%	20,957	0	392,872
2015	6,170	5.73%	22,512	0	421,554
2016	6,170	5.73%	24,155	0	451,879
2017	6,170	5.73%	25,893	0	483,941
2018	6,170	5.73%	27,730	0	517,841
2019	6,170	5.73%	29,672	1	553,682
2020	6,170	5.33%	29,511	141	589,223
2021	6,170	5.12%	30,168	250	625,311
2022	6,170	4.93%	30,828	260	662,049
2023	6,170	4.73%	31,315	1,477	698,057
2024	6,170	4.53%	31,622	2,427	733,422
2025		4.53%	33,224	15,244	751,402
2026		4.53%	34,038	106,550	678,890
2027		4.53%	30,754	217,646	491,998
2028		4.53%	22,288	161,301	352,984
2029		4.53%	15,990	107,492	261,483
2030		4.53%	11,845	114,646	158,682
2031		4.53%	7,188	101,857	64,013
2032		4.53%	2,900	9,515	57,398
2033		4.53%	2,600	7,517	52,481
2034		4.53%	2,377	8,998	45,860
2035		4.53%	2,077	14,091	33,847
2036		4.53%	1,533	13,690	21,690
2037		4.53%	983	12,780	9,893
2038		4.53%	448	696	9,645
2039		4.53%	437	720	9,362
2040		4.53%	424	745	9,041
2041		4.53%	410	771	8,679
2042		4.53%	393	797	8,275
2043		4.53%	375	825	7,825
2044		4.53%	354	854	7,326
2045		4.53%	332	884	6,774
2046		4.53%	307	914	6,167
2047		4.53%	279	946	5,500
2048		4.53%	249	980	4,769
2049		4.53%	216	4,665	320

Exhibit___DAS-2
Schedule 2

Palo Verde Unit 2 Decommissioning Contribution Analysis for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs, Escalation Rates, and Decommissioning Schedule

With 5.73 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					199,267
2006	4,390	6.43%	12,813	0	216,470
2007	6,935	5.73%	12,404	0	235,809
2008	6,935	5.73%	13,512	0	256,255
2009	6,935	5.73%	14,683	0	277,874
2010	6,935	5.73%	15,922	0	300,731
2011	6,935	5.73%	17,232	0	324,898
2012	6,935	5.73%	18,617	0	350,450
2013	6,935	5.73%	20,081	0	377,465
2014	6,935	5.73%	21,629	0	406,029
2015	6,935	5.73%	23,265	0	436,230
2016	6,935	5.73%	24,996	0	468,161
2017	6,935	5.73%	26,826	0	501,921
2018	6,935	5.73%	28,760	0	537,616
2019	6,935	5.73%	30,805	0	575,357
2020	6,935	5.73%	32,968	0	615,260
2021	6,935	5.33%	32,793	0	654,988
2022	6,935	5.12%	33,535	0	695,458
2023	6,935	4.93%	34,286	0	736,679
2024	6,935	4.73%	34,845	0	778,459
2025	6,935	4.53%	35,264	301	820,357
2026		4.53%	37,162	81,050	776,470
2027		4.53%	35,174	218,878	592,766
2028		4.53%	26,852	231,550	388,068
2029		4.53%	17,579	90,793	314,855
2030		4.53%	14,263	96,736	232,381
2031		4.53%	10,527	101,772	141,136
2032		4.53%	6,393	88,353	59,177
2033		4.53%	2,681	7,776	54,081
2034		4.53%	2,450	9,345	47,186
2035		4.53%	2,138	14,558	34,766
2036		4.53%	1,575	14,120	22,221
2037		4.53%	1,007	13,227	10,000
2038		4.53%	453	706	9,747
2039		4.53%	442	731	9,458
2040		4.53%	428	756	9,130
2041		4.53%	414	783	8,761
2042		4.53%	397	810	8,348
2043		4.53%	378	839	7,887
2044		4.53%	357	868	7,376
2045		4.53%	334	899	6,812
2046		4.53%	309	931	6,189
2047		4.53%	280	964	5,505
2048		4.53%	249	998	4,757
2049		4.53%	215	4,843	129

Exhibit___DAS-2
Schedule 3

Palo Verde Unit 3 Decommissioning Contribution Analysis

for SCE Ratepayers
SCE Cost Estimate, Low Level Radioactive Waste Costs, Escalation Rates, and Decommissioning Schedule
With 5.73 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	EOY Balance
2005				213,468
2006	3,315	6.43%	13,726	230,509
2007	4,945	5.73%	13,208	248,662
2008	4,945	5.73%	14,248	267,855
2009	4,945	5.73%	15,348	288,149
2010	4,945	5.73%	16,511	309,605
2011	4,945	5.73%	17,740	332,290
2012	4,945	5.73%	19,040	356,275
2013	4,945	5.73%	20,415	381,635
2014	4,945	5.73%	21,868	408,447
2015	4,945	5.73%	23,404	436,796
2016	4,945	5.73%	25,028	466,770
2017	4,945	5.73%	26,746	498,461
2018	4,945	5.73%	28,562	531,967
2019	4,945	5.73%	30,482	567,394
2020	4,945	5.73%	32,512	604,851
2021	4,945	5.73%	34,658	644,454
2022	4,945	5.73%	36,927	686,326
2023	4,945	5.33%	36,581	727,852
2024	4,945	5.12%	37,266	770,063
2025	4,945	4.93%	37,964	812,694
2026	4,945	4.73%	38,440	831,270
2027	4,945	4.53%	37,657	840,429
2028		4.53%	38,071	771,802
2029		4.53%	34,963	572,479
2030		4.53%	25,933	409,073
2031		4.53%	18,531	318,533
2032		4.53%	14,430	217,160
2033		4.53%	9,837	108,151
2034		4.53%	4,899	56,916
2035		4.53%	2,578	39,996
2036		4.53%	1,812	22,189
2037		4.53%	1,005	9,984
2038		4.53%	452	9,726
2039		4.53%	441	9,432
2040		4.53%	427	9,098
2041		4.53%	412	8,722
2042		4.53%	395	8,302
2043		4.53%	376	7,834
2044		4.53%	355	7,315
2045		4.53%	331	6,740
2046		4.53%	305	6,107
2047		4.53%	277	5,413
2048		4.53%	245	4,652
2049		4.53%	211	410

EXHIBIT DAS-3

Exhibit___DAS-3
Schedule 1

Palo Verde Unit 1 Decommissioning Contribution Analysis for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.53 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					196,369
2006	3,851	6.43%	12,627		212,847
2007	2,145	5.53%	11,770		226,762
2008	2,145	5.53%	12,540		241,447
2009	2,145	5.53%	13,352		256,944
2010	2,145	5.53%	14,209		273,298
2011	2,145	5.53%	15,113		290,556
2012	2,145	5.53%	16,068		308,769
2013	2,145	5.53%	17,075		327,989
2014	2,145	5.53%	18,138		348,272
2015	2,145	5.53%	19,259		369,676
2016	2,145	5.53%	20,443		392,264
2017	2,145	5.53%	21,692		416,101
2018	2,145	5.53%	23,010		441,257
2019	2,145	5.53%	24,402		467,803
2020	2,145	5.53%	25,870		495,818
2021	2,145	5.53%	27,419		525,382
2022	2,145	5.53%	29,054		556,580
2023	2,145	5.53%	30,779		589,504
2024	2,145	5.53%	32,600		624,249
2025		5.53%	34,521		658,770
2026		5.53%	36,430		695,200
2027		5.53%	38,445		733,644
2028		5.53%	40,571		774,215
2029		5.53%	42,814		817,029
2030		5.53%	45,182		862,210
2031		5.53%	47,680		909,891
2032		5.53%	50,317		960,208
2033		5.53%	53,099		1,013,307
2034		5.53%	56,036		1,069,343
2035		5.53%	59,135		1,128,478
2036		5.53%	62,405		1,190,882
2037		5.53%	65,856		1,256,738
2038		5.53%	69,498		1,326,236
2039		5.53%	73,341	2	1,399,574
2040		5.33%	74,597	340	1,473,832
2041		5.12%	75,460	603	1,548,689
2042		4.93%	76,350	627	1,624,412
2043		4.73%	76,835	3,562	1,697,685
2044		4.53%	76,905	5,853	1,768,737
2045		4.53%	80,124	36,764	1,812,096
2046		4.53%	82,088	256,968	1,637,216
2047		4.53%	74,166	524,900	1,186,482
2048		4.53%	53,748	389,012	851,218
2049		4.53%	38,560	259,240	630,538
2050		4.53%	28,563	276,493	382,608
2051		4.53%	17,332	245,650	154,290
2052		4.53%	6,989	22,947	138,332
2053		4.53%	6,266	18,129	126,470
2054		4.53%	5,729	21,701	110,498
2055		4.53%	5,006	33,983	81,520
2056		4.53%	3,693	33,016	52,197
2057		4.53%	2,365	30,822	23,740
2058		4.53%	1,075	1,679	23,136
2059		4.53%	1,048	1,736	22,448
2060		4.53%	1,017	1,797	21,668
2061		4.53%	982	1,859	20,790
2062		4.53%	942	1,922	19,810
2063		4.53%	897	1,990	18,718
2064		4.53%	848	2,060	17,506
2065		4.53%	793	2,132	16,167
2066		4.53%	732	2,204	14,695
2067		4.53%	666	2,281	13,080
2068		4.53%	593	2,363	11,309
2069		4.53%	512	11,251	570

Palo Verde Unit 2 Decommissioning Contribution Analysis for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.53 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					199,267
2006	4,390	6.43%	12,813		216,470
2007	2,862	5.53%	11,971		231,303
2008	2,862	5.53%	12,791		246,956
2009	2,862	5.53%	13,657		263,474
2010	2,862	5.53%	14,570		280,906
2011	2,862	5.53%	15,534		299,303
2012	2,862	5.53%	16,551		318,716
2013	2,862	5.53%	17,625		339,203
2014	2,862	5.53%	18,758		360,823
2015	2,862	5.53%	19,954		383,638
2016	2,862	5.53%	21,215		407,716
2017	2,862	5.53%	22,547		433,124
2018	2,862	5.53%	23,952		459,938
2019	2,862	5.53%	25,435		488,235
2020	2,862	5.53%	26,999		518,096
2021	2,862	5.53%	28,651		549,609
2022	2,862	5.53%	30,393		582,864
2023	2,862	5.53%	32,232		617,959
2024	2,862	5.53%	34,173		654,994
2025	2,862	5.53%	36,221		694,077
2026		5.53%	38,382		732,459
2027		5.53%	40,505		772,964
2028		5.53%	42,745		815,709
2029		5.53%	45,109		860,818
2030		5.53%	47,603		908,421
2031		5.53%	50,236		958,657
2032		5.53%	53,014		1,011,671
2033		5.53%	55,945		1,067,616
2034		5.53%	59,039		1,126,655
2035		5.53%	62,304		1,188,959
2036		5.53%	65,749		1,254,709
2037		5.53%	69,385		1,324,094
2038		5.53%	73,222		1,397,316
2039		5.53%	77,272		1,474,588
2040		5.53%	81,545		1,556,133
2041		5.33%	82,942		1,639,074
2042		5.12%	83,921		1,722,995
2043		4.93%	84,944		1,807,939
2044		4.73%	85,516		1,893,454
2045		4.53%	85,773	726	1,978,502
2046		4.53%	89,626	195,469	1,872,659
2047		4.53%	84,831	527,871	1,429,619
2048		4.53%	64,762	558,432	935,948
2049		4.53%	42,398	218,967	759,380
2050		4.53%	34,400	233,300	560,480
2051		4.53%	25,390	245,445	340,425
2052		4.53%	15,421	213,082	142,764
2053		4.53%	6,467	18,753	130,478
2054		4.53%	5,911	22,537	113,851
2055		4.53%	5,157	35,110	83,899
2056		4.53%	3,801	34,053	53,646
2057		4.53%	2,430	31,900	24,176
2058		4.53%	1,095	1,703	23,569
2059		4.53%	1,068	1,763	22,874
2060		4.53%	1,036	1,823	22,086
2061		4.53%	1,001	1,888	21,199
2062		4.53%	960	1,953	20,205
2063		4.53%	915	2,023	19,097
2064		4.53%	865	2,093	17,869
2065		4.53%	809	2,168	16,510
2066		4.53%	748	2,245	15,013
2067		4.53%	680	2,325	13,368
2068		4.53%	606	2,407	11,567
2069		4.53%	524	11,680	411

Exhibit___DAS-3
Schedule 3

Palo Verde Unit 3 Decommissioning Contribution Analysis
for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.53 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					213,468
2006	3,315	6.43%	13,726		230,509
2007	1,250	5.53%	12,747		244,506
2008	1,250	5.53%	13,521		259,277
2009	1,250	5.53%	14,338		274,865
2010	1,250	5.53%	15,200		291,315
2011	1,250	5.53%	16,110		308,675
2012	1,250	5.53%	17,070		326,995
2013	1,250	5.53%	18,083		346,328
2014	1,250	5.53%	19,152		366,730
2015	1,250	5.53%	20,280		388,260
2016	1,250	5.53%	21,471		410,981
2017	1,250	5.53%	22,727		434,958
2018	1,250	5.53%	24,053		460,261
2019	1,250	5.53%	25,452		486,963
2020	1,250	5.53%	26,929		515,142
2021	1,250	5.53%	28,487		544,880
2022	1,250	5.53%	30,132		576,262
2023	1,250	5.53%	31,867		609,379
2024	1,250	5.53%	33,699		644,328
2025	1,250	5.53%	35,631		681,209
2026	1,250	5.53%	37,671		720,130
2027	1,250	5.53%	39,823		761,203
2028		5.53%	42,095		803,297
2029		5.53%	44,422		847,720
2030		5.53%	46,879		894,599
2031		5.53%	49,471		944,070
2032		5.53%	52,207		996,277
2033		5.53%	55,094		1,051,371
2034		5.53%	58,141		1,109,512
2035		5.53%	61,356		1,170,868
2036		5.53%	64,749		1,235,617
2037		5.53%	68,330		1,303,947
2038		5.53%	72,108		1,376,055
2039		5.53%	76,096		1,452,151
2040		5.53%	80,304		1,532,455
2041		5.53%	84,745		1,617,200
2042		5.53%	89,431		1,706,631
2043		5.33%	90,963		1,797,594
2044		5.12%	92,037		1,889,631
2045		4.93%	93,159	670	1,982,119
2046		4.73%	93,754	59,835	2,016,039
2047		4.53%	91,327	80,653	2,026,713
2048		4.53%	91,810	257,327	1,861,195
2049		4.53%	84,312	565,028	1,380,479
2050		4.53%	62,536	456,634	986,381
2051		4.53%	44,683	263,048	768,016
2052		4.53%	34,791	279,281	523,526
2053		4.53%	23,716	286,625	260,617
2054		4.53%	11,806	135,379	137,043
2055		4.53%	6,208	47,024	96,228
2056		4.53%	4,359	47,315	53,271
2057		4.53%	2,413	31,859	23,826
2058		4.53%	1,079	1,712	23,193
2059		4.53%	1,051	1,773	22,471
2060		4.53%	1,018	1,835	21,654
2061		4.53%	981	1,900	20,734
2062		4.53%	939	1,968	19,705
2063		4.53%	893	2,035	18,563
2064		4.53%	841	2,108	17,296
2065		4.53%	783	2,185	15,894
2066		4.53%	720	2,262	14,352
2067		4.53%	650	2,342	12,660
2068		4.53%	574	2,426	10,808
2069		4.53%	490	10,739	558

Exhibit___DAS-3
Schedule 4

Palo Verde Unit 1 Decommissioning Contribution Analysis
for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.73 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					196,369
2006	3,851	6.43%	12,627		212,847
2007	878	5.73%	12,196		225,921
2008	878	5.73%	12,945		239,744
2009	878	5.73%	13,737		254,359
2010	878	5.73%	14,575		269,812
2011	878	5.73%	15,460		286,150
2012	878	5.73%	16,396		303,425
2013	878	5.73%	17,386		321,689
2014	878	5.73%	18,433		341,000
2015	878	5.73%	19,539		361,417
2016	878	5.73%	20,709		383,004
2017	878	5.73%	21,946		405,828
2018	878	5.73%	23,254		429,960
2019	878	5.73%	24,637		455,475
2020	878	5.73%	26,099		482,452
2021	878	5.73%	27,644		510,974
2022	878	5.73%	29,279		541,131
2023	878	5.73%	31,007		573,016
2024	878	5.73%	32,834		606,728
2025		5.73%	34,765		641,493
2026		5.73%	36,758		678,251
2027		5.73%	38,864		717,114
2028		5.73%	41,091		758,205
2029		5.73%	43,445		801,650
2030		5.73%	45,935		847,585
2031		5.73%	48,567		896,151
2032		5.73%	51,349		947,501
2033		5.73%	54,292		1,001,793
2034		5.73%	57,403		1,059,195
2035		5.73%	60,692		1,119,887
2036		5.73%	64,170		1,184,057
2037		5.73%	67,846		1,251,903
2038		5.73%	71,734		1,323,637
2039		5.73%	75,844	2	1,399,479
2040		5.33%	74,592	340	1,473,731
2041		5.12%	75,455	603	1,548,583
2042		4.93%	76,345	627	1,624,302
2043		4.73%	76,829	3,562	1,697,569
2044		4.53%	76,900	5,853	1,768,616
2045		4.53%	80,118	36,764	1,811,970
2046		4.53%	82,082	256,968	1,637,084
2047		4.53%	74,160	524,900	1,186,344
2048		4.53%	53,741	389,012	851,073
2049		4.53%	38,554	259,240	630,387
2050		4.53%	28,557	276,493	382,450
2051		4.53%	17,325	245,650	154,125
2052		4.53%	6,982	22,947	138,159
2053		4.53%	6,259	18,129	126,289
2054		4.53%	5,721	21,701	110,310
2055		4.53%	4,997	33,983	81,323
2056		4.53%	3,684	33,016	51,991
2057		4.53%	2,355	30,822	23,524
2058		4.53%	1,066	1,679	22,911
2059		4.53%	1,038	1,736	22,213
2060		4.53%	1,006	1,797	21,422
2061		4.53%	970	1,859	20,533
2062		4.53%	930	1,922	19,541
2063		4.53%	885	1,990	18,437
2064		4.53%	835	2,060	17,212
2065		4.53%	780	2,132	15,860
2066		4.53%	718	2,204	14,374
2067		4.53%	651	2,281	12,744
2068		4.53%	577	2,363	10,958
2069		4.53%	496	11,251	204

Palo Verde Unit 2 Decommissioning Contribution Analysis for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.73 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					199,267
2006	4,390	6.43%	12,813		216,470
2007	1,542	5.73%	12,404		230,416
2008	1,542	5.73%	13,203		245,160
2009	1,542	5.73%	14,048		260,750
2010	1,542	5.73%	14,941		277,233
2011	1,542	5.73%	15,885		294,661
2012	1,542	5.73%	16,884		313,087
2013	1,542	5.73%	17,940		332,568
2014	1,542	5.73%	19,056		353,167
2015	1,542	5.73%	20,236		374,945
2016	1,542	5.73%	21,484		397,971
2017	1,542	5.73%	22,804		422,317
2018	1,542	5.73%	24,199		448,058
2019	1,542	5.73%	25,674		475,274
2020	1,542	5.73%	27,233		504,049
2021	1,542	5.73%	28,882		534,473
2022	1,542	5.73%	30,625		566,640
2023	1,542	5.73%	32,468		600,651
2024	1,542	5.73%	34,417		636,610
2025	1,542	5.73%	36,478		674,630
2026		5.73%	38,656		713,286
2027		5.73%	40,871		754,157
2028		5.73%	43,213		797,370
2029		5.73%	45,689		843,060
2030		5.73%	48,307		891,367
2031		5.73%	51,075		942,442
2032		5.73%	54,002		996,444
2033		5.73%	57,096		1,053,541
2034		5.73%	60,368		1,113,908
2035		5.73%	63,827		1,177,735
2036		5.73%	67,484		1,245,220
2037		5.73%	71,351		1,316,571
2038		5.73%	75,440		1,392,010
2039		5.73%	79,762		1,471,772
2040		5.73%	84,333		1,556,105
2041		5.33%	82,940		1,639,045
2042		5.12%	83,919		1,722,965
2043		4.93%	84,942		1,807,907
2044		4.73%	85,514		1,893,421
2045		4.53%	85,772	726	1,978,467
2046		4.53%	89,625	195,469	1,872,622
2047		4.53%	84,830	527,871	1,429,580
2048		4.53%	64,760	558,432	935,908
2049		4.53%	42,397	218,967	759,338
2050		4.53%	34,398	233,300	560,436
2051		4.53%	25,388	245,445	340,379
2052		4.53%	15,419	213,082	142,716
2053		4.53%	6,465	18,753	130,428
2054		4.53%	5,908	22,537	113,799
2055		4.53%	5,155	35,110	83,844
2056		4.53%	3,798	34,053	53,589
2057		4.53%	2,428	31,900	24,117
2058		4.53%	1,092	1,703	23,506
2059		4.53%	1,065	1,763	22,808
2060		4.53%	1,033	1,823	22,018
2061		4.53%	997	1,888	21,127
2062		4.53%	957	1,953	20,131
2063		4.53%	912	2,023	19,019
2064		4.53%	862	2,093	17,788
2065		4.53%	806	2,168	16,425
2066		4.53%	744	2,245	14,924
2067		4.53%	676	2,325	13,275
2068		4.53%	601	2,407	11,470
2069		4.53%	520	11,680	309

Exhibit___DAS-3
Schedule 6

Palo Verde Unit 3 Decommissioning Contribution Analysis
for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.73 Percent After-Tax Rate of Return

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					213,468
2006	3,315	6.43%	13,726		230,509
2007	0	5.73%	13,208		243,717
2008	0	5.73%	13,965		257,682
2009	0	5.73%	14,765		272,447
2010	0	5.73%	15,611		288,059
2011	0	5.73%	16,506		304,564
2012	0	5.73%	17,452		322,016
2013	0	5.73%	18,452		340,467
2014	0	5.73%	19,509		359,976
2015	0	5.73%	20,627		380,603
2016	0	5.73%	21,809		402,411
2017	0	5.73%	23,058		425,469
2018	0	5.73%	24,379		449,849
2019	0	5.73%	25,776		475,625
2020	0	5.73%	27,253		502,879
2021	0	5.73%	28,815		531,694
2022	0	5.73%	30,466		562,160
2023	0	5.73%	32,212		594,371
2024	0	5.73%	34,057		628,429
2025	0	5.73%	36,009		664,438
2026	0	5.73%	38,072		702,510
2027	0	5.73%	40,254		742,764
2028		5.73%	42,560		785,324
2029		5.73%	44,999		830,323
2030		5.73%	47,578		877,901
2031		5.73%	50,304		928,205
2032		5.73%	53,186		981,391
2033		5.73%	56,234		1,037,624
2034		5.73%	59,456		1,097,080
2035		5.73%	62,863		1,159,943
2036		5.73%	66,465		1,226,408
2037		5.73%	70,273		1,296,681
2038		5.73%	74,300		1,370,981
2039		5.73%	78,557		1,449,538
2040		5.73%	83,059		1,532,596
2041		5.73%	87,818		1,620,414
2042		5.73%	92,850		1,713,264
2043		5.33%	91,317		1,804,581
2044		5.12%	92,395		1,896,975
2045		4.93%	93,521	670	1,989,826
2046		4.73%	94,119	59,835	2,024,110
2047		4.53%	91,692	80,653	2,035,149
2048		4.53%	92,192	257,327	1,870,014
2049		4.53%	84,712	565,028	1,389,697
2050		4.53%	62,953	456,634	996,017
2051		4.53%	45,120	263,048	778,088
2052		4.53%	35,247	279,281	534,054
2053		4.53%	24,193	286,625	271,622
2054		4.53%	12,304	135,379	148,547
2055		4.53%	6,729	47,024	108,253
2056		4.53%	4,904	47,315	65,841
2057		4.53%	2,983	31,859	36,965
2058		4.53%	1,675	1,712	36,928
2059		4.53%	1,673	1,773	36,828
2060		4.53%	1,668	1,835	36,661
2061		4.53%	1,661	1,900	36,421
2062		4.53%	1,650	1,968	36,103
2063		4.53%	1,635	2,035	35,703
2064		4.53%	1,617	2,108	35,212
2065		4.53%	1,595	2,185	34,623
2066		4.53%	1,568	2,262	33,929
2067		4.53%	1,537	2,342	33,124
2068		4.53%	1,501	2,426	32,198
2069		4.53%	1,459	10,739	22,918

EXHIBIT DAS-4

Exhibit___DAS-4
Schedule 1

SONGS 2 Decommissioning Contribution Analysis for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs, Escalation Rates, and Decommissioning Schedule

With 5.75 Percent After-Tax Rate of Return

Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					821,404
2006	13,392	6.45%	52,981	0	887,777
2007	20,084	5.75%	51,047	0	958,908
2008	20,084	5.75%	55,137	0	1,034,129
2009	20,084	5.75%	59,462	0	1,113,675
2010	20,084	5.75%	64,036	0	1,197,796
2011	20,084	5.75%	68,873	0	1,286,753
2012	20,084	5.75%	73,988	0	1,380,825
2013	20,084	5.75%	79,397	0	1,480,307
2014	20,084	5.75%	85,118	0	1,585,508
2015	20,084	5.75%	91,167	0	1,696,759
2016	20,084	5.75%	97,564	0	1,814,407
2017	20,084	5.75%	104,328	0	1,938,819
2018	20,084	5.25%	101,788	0	2,060,691
2019	20,084	5.14%	105,920	0	2,186,695
2020	20,084	4.94%	108,023	2,844	2,311,957
2021	20,084	4.73%	109,356	3,380	2,438,017
2022	20,084	4.53%	110,442	123,650	2,444,893
2023		4.53%	110,754	163,146	2,392,501
2024		4.53%	108,380	165,425	2,335,456
2025		4.53%	105,796	183,602	2,257,650
2026		4.53%	102,272	192,744	2,167,178
2027		4.53%	98,173	202,429	2,062,922
2028		4.53%	93,450	212,693	1,943,679
2029		4.53%	88,049	223,571	1,808,157
2030		4.53%	81,910	235,117	1,654,949
2031		4.53%	74,969	247,386	1,482,532
2032		4.53%	67,159	260,419	1,289,272
2033		4.53%	58,404	274,252	1,073,424
2034		4.53%	48,626	276,078	845,972
2035		4.53%	38,323	289,432	594,863
2036		4.53%	26,947	307,137	314,673
2037		4.53%	14,255	14,223	314,705
2038		4.53%	14,256	14,719	314,242
2039		4.53%	14,235	15,232	313,245
2040		4.53%	14,190	15,764	311,671
2041		4.53%	14,119	16,315	309,475
2042		4.53%	14,019	16,886	306,608
2043		4.53%	13,889	17,478	303,019
2044		4.53%	13,727	18,092	298,654
2045		4.53%	13,529	23,442	288,741
2046		4.53%	13,080	301,599	222

SONGS 3 Decommissioning Contribution Analysis for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs, Escalation Rates, and Decommissioning Schedule

With 5.75 Percent After-Tax Rate of Return

Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					997,981
2006	5,346	6.45%	64,370	0	1,067,697
2007	13,640	5.75%	61,393	0	1,142,729
2008	13,640	5.75%	65,707	0	1,222,076
2009	13,640	5.75%	70,269	0	1,305,986
2010	13,640	5.75%	75,094	0	1,394,720
2011	13,640	5.75%	80,196	0	1,488,556
2012	13,640	5.75%	85,592	0	1,587,788
2013	13,640	5.75%	91,298	0	1,692,726
2014	13,640	5.75%	97,332	0	1,803,698
2015	13,640	5.75%	103,713	0	1,921,050
2016	13,640	5.75%	110,460	0	2,045,151
2017	13,640	5.75%	117,596	0	2,176,387
2018	13,640	5.25%	114,260	0	2,304,287
2019	13,640	5.14%	118,440	0	2,436,368
2020	13,640	4.94%	120,357	181	2,570,183
2021	13,640	4.73%	121,570	1,127	2,704,266
2022	13,640	4.53%	122,503	22,927	2,817,482
2023		4.53%	127,632	130,947	2,814,167
2024		4.53%	127,482	180,403	2,761,246
2025		4.53%	125,084	188,550	2,697,780
2026		4.53%	122,209	198,068	2,621,922
2027		4.53%	118,773	208,157	2,532,538
2028		4.53%	114,724	218,855	2,428,407
2029		4.53%	110,007	230,202	2,308,212
2030		4.53%	104,562	242,252	2,170,522
2031		4.53%	98,325	255,063	2,013,783
2032		4.53%	91,224	268,679	1,836,329
2033		4.53%	83,186	283,139	1,636,375
2034		4.53%	74,128	338,572	1,371,931
2035		4.53%	62,148	344,536	1,089,544
2036		4.53%	49,356	366,117	772,783
2037		4.53%	35,007	110,463	697,327
2038		4.53%	31,589	14,427	714,489
2039		4.53%	32,366	14,919	731,936
2040		4.53%	33,157	15,429	749,664
2041		4.53%	33,960	15,957	767,667
2042		4.53%	34,775	16,503	785,939
2043		4.53%	35,603	17,070	804,472
2044		4.53%	36,443	17,656	823,259
2045		4.53%	37,294	26,697	833,855
2046		4.53%	37,774	435,879	435,750
2047		4.53%	19,739	455,122	367

EXHIBIT DAS-5

SONGS 2 Decommissioning Contribution Analysis
for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.55 Percent After-Tax Rate of Return

Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					821,404
2006	13,392	6.45%	52,981		887,777
2007	0	5.55%	49,272		937,048
2008	0	5.55%	52,006		989,054
2009	0	5.55%	54,893		1,043,947
2010	0	5.55%	57,939		1,101,886
2011	0	5.55%	61,155		1,163,041
2012	0	5.55%	64,549		1,227,589
2013	0	5.55%	68,131		1,295,721
2014	0	5.55%	71,912		1,367,633
2015	0	5.55%	75,904		1,443,537
2016	0	5.55%	80,116		1,523,653
2017	0	5.55%	84,563		1,608,216
2018	0	5.55%	89,256		1,697,472
2019	0	5.55%	94,210		1,791,681
2020	0	5.55%	99,438		1,891,120
2021	0	5.55%	104,957		1,996,077
2022	0	5.55%	110,782		2,106,859
2023		5.55%	116,931		2,223,790
2024		5.55%	123,420		2,347,210
2025		5.55%	130,270		2,477,480
2026		5.55%	137,500		2,614,980
2027		5.55%	145,131		2,760,112
2028		5.55%	153,186		2,913,298
2029		5.55%	161,688		3,074,986
2030		5.55%	170,662		3,245,648
2031		5.55%	180,133		3,425,781
2032		5.55%	190,131		3,615,912
2033		5.55%	200,683		3,816,595
2034		5.55%	211,821		4,028,416
2035		5.55%	223,577		4,251,993
2036		5.55%	235,986		4,487,979
2037		5.55%	249,083		4,737,062
2038		5.25%	248,696		4,985,757
2039		5.14%	256,268		5,242,025
2040		4.94%	258,956	6,859	5,494,122
2041		4.73%	259,872	8,152	5,745,843
2042		4.53%	260,287	298,208	5,707,921
2043		4.53%	258,569	393,461	5,573,028
2044		4.53%	252,458	398,958	5,426,529
2045		4.53%	245,822	442,796	5,229,555
2046		4.53%	236,899	464,843	5,001,611
2047		4.53%	226,573	488,201	4,739,983
2048		4.53%	214,721	512,955	4,441,749
2049		4.53%	201,211	539,189	4,103,771
2050		4.53%	185,901	567,035	3,722,637
2051		4.53%	168,635	596,624	3,294,648
2052		4.53%	149,248	628,056	2,815,840
2053		4.53%	127,558	661,417	2,281,980
2054		4.53%	103,374	665,821	1,719,532
2055		4.53%	77,895	698,027	1,099,400
2056		4.53%	49,803	740,727	408,476
2057		4.53%	18,504	34,302	392,678
2058		4.53%	17,788	35,498	374,968
2059		4.53%	16,986	36,735	355,219
2060		4.53%	16,091	38,018	333,292
2061		4.53%	15,098	39,347	309,043
2062		4.53%	14,000	40,724	282,319
2063		4.53%	12,789	42,152	252,956
2064		4.53%	11,459	43,633	220,782
2065		4.53%	10,001	56,535	174,248
2066		4.53%	7,893	727,371	-545,229

Exhibit___DAS-5
Schedule 2

SONGS 3 Decommissioning Contribution Analysis
for SCE Ratepayers
SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates
those years
5.55 Percent After-Tax Rate of Return
Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					997,981
2006	5,346	6.45%	64,370		1,067,697
2007	0	5.55%	59,257		1,126,954
2008	0	5.55%	62,546		1,189,500
2009	0	5.55%	66,017		1,255,517
2010	0	5.55%	69,681		1,325,198
2011	0	5.55%	73,549		1,398,747
2012	0	5.55%	77,630		1,476,377
2013	0	5.55%	81,939		1,558,316
2014	0	5.55%	86,487		1,644,803
2015	0	5.55%	91,287		1,736,089
2016	0	5.55%	96,353		1,832,442
2017	0	5.55%	101,701		1,934,143
2018	0	5.55%	107,345		2,041,488
2019	0	5.55%	113,303		2,154,790
2020	0	5.55%	119,591		2,274,381
2021	0	5.55%	126,228		2,400,609
2022	0	5.55%	133,234		2,533,843
2023		5.55%	140,628		2,674,471
2024		5.55%	148,433		2,822,905
2025		5.55%	156,671		2,979,576
2026		5.55%	165,366		3,144,942
2027		5.55%	174,544		3,319,487
2028		5.55%	184,232		3,503,718
2029		5.55%	194,456		3,698,174
2030		5.55%	205,249		3,903,423
2031		5.55%	216,640		4,120,063
2032		5.55%	228,664		4,348,727
2033		5.55%	241,354		4,590,081
2034		5.55%	254,749		4,844,830
2035		5.55%	268,888		5,113,719
2036		5.55%	283,811		5,397,530
2037		5.55%	299,563		5,697,093
2038		5.25%	299,097		5,996,190
2039		5.14%	308,204		6,304,394
2040		4.94%	311,437	437	6,615,395
2041		4.73%	312,908	2,718	6,925,585
2042		4.53%	313,729	55,293	7,184,021
2043		4.53%	325,436	315,807	7,193,650
2044		4.53%	325,872	435,080	7,084,442
2045		4.53%	320,925	454,729	6,950,639
2046		4.53%	314,864	477,683	6,787,819
2047		4.53%	307,488	502,015	6,593,292
2048		4.53%	298,676	527,816	6,364,153
2049		4.53%	288,296	555,181	6,097,267
2050		4.53%	276,206	584,243	5,789,231
2051		4.53%	262,252	615,139	5,436,344
2052		4.53%	246,266	647,977	5,034,634
2053		4.53%	228,069	682,850	4,579,852
2054		4.53%	207,467	816,539	3,970,781
2055		4.53%	179,876	830,922	3,319,735
2056		4.53%	150,384	882,970	2,587,149
2057		4.53%	117,198	266,405	2,437,942
2058		4.53%	110,439	34,794	2,513,587
2059		4.53%	113,865	35,980	2,591,472
2060		4.53%	117,394	37,210	2,671,656
2061		4.53%	121,026	38,484	2,754,198
2062		4.53%	124,765	39,801	2,839,163
2063		4.53%	128,614	41,168	2,926,609
2064		4.53%	132,575	42,581	3,016,603
2065		4.53%	136,652	64,386	3,088,869
2066		4.53%	139,926	1,051,215	2,177,580
2067		4.53%	98,644	1,097,624	1,178,600

SONGS 2 Decommissioning Contribution Analysis
for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.75 Percent After-Tax Rate of Return

Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					821,404
2006	13,392	6.45%	52,981		887,777
2007	0	5.75%	51,047		938,824
2008	0	5.75%	53,982		992,806
2009	0	5.75%	57,086		1,049,892
2010	0	5.75%	60,369		1,110,261
2011	0	5.75%	63,840		1,174,101
2012	0	5.75%	67,511		1,241,612
2013	0	5.75%	71,393		1,313,005
2014	0	5.75%	75,498		1,388,503
2015	0	5.75%	79,839		1,468,341
2016	0	5.75%	84,430		1,552,771
2017	0	5.75%	89,284		1,642,055
2018	0	5.75%	94,418		1,736,474
2019	0	5.75%	99,847		1,836,321
2020	0	5.75%	105,588		1,941,909
2021	0	5.75%	111,660		2,053,569
2022	0	5.75%	118,080		2,171,649
2023		5.75%	124,870		2,296,519
2024		5.75%	132,050		2,428,569
2025		5.75%	139,643		2,568,212
2026		5.75%	147,672		2,715,884
2027		5.75%	156,163		2,872,047
2028		5.75%	165,143		3,037,190
2029		5.75%	174,638		3,211,828
2030		5.75%	184,680		3,396,508
2031		5.75%	195,299		3,591,808
2032		5.75%	206,529		3,798,337
2033		5.75%	218,404		4,016,741
2034		5.75%	230,963		4,247,704
2035		5.75%	244,243		4,491,947
2036		5.75%	258,287		4,750,233
2037		5.75%	273,138		5,023,372
2038		5.25%	263,727		5,287,099
2039		5.14%	271,757		5,558,856
2040		4.94%	274,607	6,859	5,826,604
2041		4.73%	275,598	8,152	6,094,051
2042		4.53%	276,061	298,208	6,071,903
2043		4.53%	275,057	393,461	5,953,499
2044		4.53%	269,694	398,958	5,824,235
2045		4.53%	263,838	442,796	5,645,277
2046		4.53%	255,731	464,843	5,436,165
2047		4.53%	246,258	488,201	5,194,222
2048		4.53%	235,298	512,955	4,916,566
2049		4.53%	222,720	539,189	4,600,097
2050		4.53%	208,384	567,035	4,241,446
2051		4.53%	192,138	596,624	3,836,959
2052		4.53%	173,814	628,056	3,382,717
2053		4.53%	153,237	661,417	2,874,537
2054		4.53%	130,217	665,821	2,338,932
2055		4.53%	105,954	698,027	1,746,859
2056		4.53%	79,133	740,727	1,085,265
2057		4.53%	49,163	34,302	1,100,126
2058		4.53%	49,836	35,498	1,114,463
2059		4.53%	50,485	36,735	1,128,213
2060		4.53%	51,108	38,018	1,141,303
2061		4.53%	51,701	39,347	1,153,657
2062		4.53%	52,261	40,724	1,165,193
2063		4.53%	52,783	42,152	1,175,825
2064		4.53%	53,265	43,633	1,185,457
2065		4.53%	53,701	56,535	1,182,623
2066		4.53%	53,573	727,371	508,825

Exhibit___DAS-5
Schedule 4

SONGS 3 Decommissioning Contribution Analysis
for SCE Ratepayers
SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates
those years
5.75 Percent After-Tax Rate of Return
Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					997,981
2006	5,346	6.45%	64,370		1,067,697
2007	0	5.75%	61,393		1,129,089
2008	0	5.75%	64,923		1,194,012
2009	0	5.75%	68,656		1,262,668
2010	0	5.75%	72,603		1,335,271
2011	0	5.75%	76,778		1,412,049
2012	0	5.75%	81,193		1,493,242
2013	0	5.75%	85,861		1,579,103
2014	0	5.75%	90,798		1,669,902
2015	0	5.75%	96,019		1,765,921
2016	0	5.75%	101,540		1,867,462
2017	0	5.75%	107,379		1,974,841
2018	0	5.75%	113,553		2,088,394
2019	0	5.75%	120,083		2,208,477
2020	0	5.75%	126,987		2,335,464
2021	0	5.75%	134,289		2,469,753
2022	0	5.75%	142,011		2,611,764
2023		5.75%	150,176		2,761,941
2024		5.75%	158,812		2,920,752
2025		5.75%	167,943		3,088,695
2026		5.75%	177,600		3,266,295
2027		5.75%	187,812		3,454,107
2028		5.75%	198,611		3,652,718
2029		5.75%	210,031		3,862,750
2030		5.75%	222,108		4,084,858
2031		5.75%	234,879		4,319,737
2032		5.75%	248,385		4,568,122
2033		5.75%	262,667		4,830,789
2034		5.75%	277,770		5,108,560
2035		5.75%	293,742		5,402,302
2036		5.75%	310,632		5,712,934
2037		5.75%	328,494		6,041,428
2038		5.25%	317,175		6,358,603
2039		5.14%	326,832		6,685,435
2040		4.94%	330,260	437	7,015,259
2041		4.73%	331,822	2,718	7,344,363
2042		4.53%	332,700	55,293	7,621,769
2043		4.53%	345,266	315,807	7,651,228
2044		4.53%	346,601	435,080	7,562,748
2045		4.53%	342,593	454,729	7,450,612
2046		4.53%	337,513	477,683	7,310,442
2047		4.53%	331,163	502,015	7,139,590
2048		4.53%	323,423	527,816	6,935,197
2049		4.53%	314,164	555,181	6,694,180
2050		4.53%	303,246	584,243	6,413,184
2051		4.53%	290,517	615,139	6,088,562
2052		4.53%	275,812	647,977	5,716,397
2053		4.53%	258,953	682,850	5,292,500
2054		4.53%	239,750	816,539	4,715,711
2055		4.53%	213,622	830,922	4,098,411
2056		4.53%	185,658	882,970	3,401,099
2057		4.53%	154,070	266,405	3,288,764
2058		4.53%	148,981	34,794	3,402,951
2059		4.53%	154,154	35,980	3,521,124
2060		4.53%	159,507	37,210	3,643,421
2061		4.53%	165,047	38,484	3,769,984
2062		4.53%	170,780	39,801	3,900,964
2063		4.53%	176,714	41,168	4,036,510
2064		4.53%	182,854	42,581	4,176,782
2065		4.53%	189,208	64,386	4,301,605
2066		4.53%	194,863	1,051,215	3,445,252
2067		4.53%	156,070	1,097,624	2,503,698

SONGS 2 Decommissioning Contribution Analysis
for SCE Ratepayers

SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates

Twenty Year Life Extension with 4.5 Percent Decommissioning Cost Escalation during those years

5.75 Percent After-Tax Rate of Return

Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					821,404
2006	13,392	6.45%	52,981		887,777
2007	22,032	5.75%	51,047		960,856
2008	22,032	5.75%	55,249		1,038,137
2009	22,032	5.75%	59,693		1,119,862
2010	22,032	5.75%	64,392		1,206,286
2011	22,032	5.75%	69,361		1,297,679
2012	22,032	5.75%	74,617		1,394,328
2013	22,032	5.75%	80,174		1,496,534
2014	22,032	5.75%	86,051		1,604,616
2015	22,032	5.75%	92,265		1,718,914
2016	22,032	5.75%	98,838		1,839,783
2017	22,032	5.75%	105,788		1,967,603
2018	22,032	5.75%	113,137		2,102,772
2019	22,032	5.75%	120,909		2,245,713
2020	22,032	5.75%	129,129		2,396,874
2021	22,032	5.75%	137,820		2,556,726
2022	22,032	5.75%	147,012		2,725,770
2023		5.75%	156,732		2,882,502
2024		5.75%	165,744		3,048,246
2025		5.75%	175,274		3,223,520
2026		5.75%	185,352		3,408,872
2027		5.75%	196,010		3,604,882
2028		5.75%	207,281		3,812,163
2029		5.75%	219,199		4,031,362
2030		5.75%	231,803		4,263,166
2031		5.75%	245,132		4,508,298
2032		5.75%	259,227		4,767,525
2033		5.75%	274,133		5,041,658
2034		5.75%	289,895		5,331,553
2035		5.75%	306,564		5,638,117
2036		5.75%	324,192		5,962,309
2037		5.75%	342,833		6,305,142
2038		5.25%	331,020		6,636,162
2039		5.14%	341,099		6,977,260
2040		4.94%	344,677	6,859	7,315,078
2041		4.73%	346,003	8,152	7,652,930
2042		4.53%	346,678	298,208	7,701,399
2043		4.53%	348,873	393,461	7,656,811
2044		4.53%	346,854	398,958	7,604,707
2045		4.53%	344,493	442,796	7,506,404
2046		4.53%	340,040	464,843	7,381,601
2047		4.53%	334,387	488,201	7,227,787
2048		4.53%	327,419	512,955	7,042,251
2049		4.53%	319,014	539,189	6,822,075
2050		4.53%	309,040	567,035	6,564,080
2051		4.53%	297,353	596,624	6,264,809
2052		4.53%	283,796	628,056	5,920,549
2053		4.53%	268,201	661,417	5,527,332
2054		4.53%	250,388	665,821	5,111,899
2055		4.53%	231,569	698,027	4,645,441
2056		4.53%	210,438	740,727	4,115,153
2057		4.53%	186,416	34,302	4,267,267
2058		4.53%	193,307	35,498	4,425,076
2059		4.53%	200,456	36,735	4,588,797
2060		4.53%	207,873	38,018	4,758,651
2061		4.53%	215,567	39,347	4,934,871
2062		4.53%	223,550	40,724	5,117,697
2063		4.53%	231,832	42,152	5,307,376
2064		4.53%	240,424	43,633	5,504,168
2065		4.53%	249,339	56,535	5,696,971
2066		4.53%	258,073	727,371	5,227,673

SONGS 3 Decommissioning Contribution Analysis
for SCE Ratepayers
SCE Cost Estimate, Low Level Radioactive Waste Costs and Escalation Rates
those years
5.75 Percent After-Tax Rate of Return
Thousands of Dollars

Year	Contribution	After Tax ROR	After Tax Return	Withdrawals	EOY Balance
2005					997,981
2006	5,346	6.45%	64,370		1,067,697
2007	15,913	5.75%	61,393		1,145,002
2008	15,913	5.75%	65,838		1,226,753
2009	15,913	5.75%	70,538		1,313,204
2010	15,913	5.75%	75,509		1,404,627
2011	15,913	5.75%	80,766		1,501,306
2012	15,913	5.75%	86,325		1,603,544
2013	15,913	5.75%	92,204		1,711,660
2014	15,913	5.75%	98,420		1,825,994
2015	15,913	5.75%	104,995		1,946,901
2016	15,913	5.75%	111,947		2,074,761
2017	15,913	5.75%	119,299		2,209,973
2018	15,913	5.75%	127,073		2,352,960
2019	15,913	5.75%	135,295		2,504,168
2020	15,913	5.75%	143,990		2,664,070
2021	15,913	5.75%	153,184		2,833,167
2022	15,913	5.75%	162,907		3,011,988
2023		5.75%	173,189		3,185,177
2024		5.75%	183,148		3,368,324
2025		5.75%	193,679		3,562,003
2026		5.75%	204,815		3,766,818
2027		5.75%	216,592		3,983,410
2028		5.75%	229,046		4,212,456
2029		5.75%	242,216		4,454,673
2030		5.75%	256,144		4,710,816
2031		5.75%	270,872		4,981,688
2032		5.75%	286,447		5,268,135
2033		5.75%	302,918		5,571,053
2034		5.75%	320,336		5,891,389
2035		5.75%	338,755		6,230,144
2036		5.75%	358,233		6,588,377
2037		5.75%	378,832		6,967,209
2038		5.25%	365,778		7,332,987
2039		5.14%	376,916		7,709,903
2040		4.94%	380,869	437	8,090,335
2041		4.73%	382,673	2,718	8,470,290
2042		4.53%	383,704	55,293	8,798,701
2043		4.53%	398,581	315,807	8,881,475
2044		4.53%	402,331	435,080	8,848,726
2045		4.53%	400,847	454,729	8,794,844
2046		4.53%	398,406	477,683	8,715,567
2047		4.53%	394,815	502,015	8,608,367
2048		4.53%	389,959	527,816	8,470,511
2049		4.53%	383,714	555,181	8,299,043
2050		4.53%	375,947	584,243	8,090,748
2051		4.53%	366,511	615,139	7,842,119
2052		4.53%	355,248	647,977	7,549,391
2053		4.53%	341,987	682,850	7,208,528
2054		4.53%	326,546	816,539	6,718,535
2055		4.53%	304,350	830,922	6,191,962
2056		4.53%	280,496	882,970	5,589,489
2057		4.53%	253,204	266,405	5,576,288
2058		4.53%	252,606	34,794	5,794,100
2059		4.53%	262,473	35,980	6,020,592
2060		4.53%	272,733	37,210	6,256,114
2061		4.53%	283,402	38,484	6,501,033
2062		4.53%	294,497	39,801	6,755,729
2063		4.53%	306,035	41,168	7,020,595
2064		4.53%	318,033	42,581	7,296,047
2065		4.53%	330,511	64,386	7,562,173
2066		4.53%	342,566	1,051,215	6,853,524
2067		4.53%	310,465	1,097,624	6,066,364