RD&D WORKING GROUP

Working Group Report on Public Interest Research, Development & Demonstration Activities

APPENDICES

Report of the RD&D Working Group

Prepared in Response to the
California Public Utilities Commission
Decision 95-12-063

September 6, 1996

P500-96-010A

Copies of these appendices are available from the California Energy Commission Publications Office

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking on the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry and Reforming Regulation	)	R.94-04-031 (Filed April 20, 1994)
Order Instituting Investigation on the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry and Reforming Regulation	)	I.94-04-032 (Filed April 20, 1994)

APPENDICES

WORKING GROUP REPORT ON PUBLIC INTEREST RD&D ACTIVITIES

Submitted by the RD&D Working Group
Submitted on September 6, 1996

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APPENDIX I: INTRODUCTION

A. RD&D WORKING GROUP PARTICIPANTS

[The following is a list of all parties who expressed interest in the RD&D Working Group process and, at a minimum, requested specific inclusion on this Working Group's mailing list.]

American Wind Energy Association
Appel Consultants, Inc.
California Energy Commission
Calpine Corporation
City of Santa Clara
City of San Jose
Conkling, Roger L.
Consumers Utility Brokerage, Inc.
California Air Resources Board
California Large Electric Consumers Association
California Municipal Utilities Association
DeCuir & Somach
Department of Water Resources
Division of Ratepayer Advocates (CPUC)
Electric Power Research Institute
Foster Associates, Inc.
IEM
Industrial Economics, Inc.
Insulation Contractors Association
JBS Energy, Inc.
Los Angeles Dept. of Water and Power
Little Hoover Commission
Livestock Systems Management
Metropolitan Water District of Southern CA
ML Consulting Group
NEOS Corporation
Natural Resources Defense Council
New York State Energy R&D Authority
Olsen, Ken S.
P.A.C. Net
Pacific Gas & Electric
Pacific Enterprises
Pacific Lumber Company
RDC, Inc.
R. W. Bech, Inc.
Regional Economic Research, Inc.
Regulatory & Cogeneration Services, Inc.
Resource Management Intl, Inc.
Resource Dynamics Corporation
Sacramento Municipal Utility District
San Diego Gas & Electric
Seden Associates
Site Data Services
Solar Turbines, Inc.
Solec International, Inc.
South Coast Air Quality Management District
Southern California Edison
Southern California Gas Company
Union of Concerned Scientists
United States Department of Energy
University of California
Weinberg Associates

APPENDIX I: INTRODUCTION

B. RD&D WORKING GROUP MINUTES

The following documents are RD&D Working Group meeting summaries, in chronological order, beginning with the first meeting on March 27, 1996 through the August 23, 1996 meeting. The final meeting to approve the Working Group report was held on September 4, 1996. A summary of each meeting was distributed to the Working Group in advance of the upcoming meeting and reviewed as an early agenda item at that meeting. While the Working Group did review and approve most of the meeting summaries, it did not revise and correct all meeting summary content when the direction was to modify text of the report. Rather, the Working Group chose to focus its discussion time on changes in the report text itself. The summaries, therefore, provide an accurate account of the discussion and progress at each meeting, but not a detailed accounting of specifics of report text.

SUMMARY OF RD&D RESTRUCTURING WORKING GROUP
MARCH 27, 1996 MEETING

After brief introductions and a background discussion of the previous activities of the CEC RD&D Advisory Group and the relevant CPUC restructuring decisions, the group reached the following conclusions:

Ground Rules:

Decision making process
The group agreed that decisions will be made by consensus. Consensus is defined as a decision that all the organizations within the group can live with (silence is implied consent). When consensus cannot be reached, a discussion of the options with pros and cons will be developed for parties to sign off on.

Group sharing of work-load
All present agreed to share the work.

Implementation issues and solutions focus
The group will focus on the solutions and options for the implementation issues associated with the CPUC orders.

Breadth of participation
The group will continue to maintain broad participation of stakeholders. It was recognized that approximately 1,400 individuals were notified about the meeting. Some members felt it appropriate to further solicit potential stakeholders. Mike Batham (CEC) and Bob Wichert (SMUD) will contact the California Municipal Utility Association, and Vick Kasasjian (DRW) will contact WAPA and California water agencies before the next meeting to further encourage their participation. The group agreed that they will not foreclose anyone from attending future meetings; however, the group might reconsider this decision at a later date.

Logistics
It was decided that the Energy Commission will perform general administrative functions for the group. These functions include: providing a general summary of the meetings, maintaining mailing lists, and providing appropriate postings of information on the internet (via the CEC and CPUC homepages). It was also decided to coordinate the dates and locations of the group's meetings with the other working groups (Energy Efficiency and Renewables).

Facilitation
It was decided that an outside facilitator for the meeting is not necessary at this time. The chair will be rotated among persons in the group. The chair will be neutral and will not advocate specific positions.

Letter of Recognition:

Because RD&D involves distinct stakeholders and different issues than the other working groups, the group decided to send a letter to the Coordinating Commissioner (President Fessler) and Commissioner Neeper (other commissioners will be carbon copied) requesting recognition from the CPUC as the RD&D Working Group. This letter will be drafted by Betsy Krieg (PG&E) and Katie McCormack (PG&E) and will respond to the issues raised in the CPUC Roadmap Decision. The draft letter will be sent by fax or e-mail by 3/29/96 to individuals in the group for comments. Comments will be returned by close of business 4/1/96. The letter will state the need for close coordination. In addition the letter will include statements regarding:

- a report timeline that agrees with the CPUC orders.
- the group's decision making process.
- broad participation and open meetings.
- the need to define various types of RD&D.
- the surcharge coverage, level, and administration.

The final letter will be sent the middle of the week of 4/1/96.

Mission Statement:

The group agreed to a draft mission statement. This draft mission statement will be attached to the draft letter that will be distributed on 3/29/96 for the group's comments. Comments on the draft letter and mission statement are due to Betsy Krieg (PG&E) by close of business 4/1/96. The draft or a final mission statement will be attached to the final letter to the Coordinating Commissioner.

Implementation Issues for 12/20 Decision:

PG&E presented a packet outlining the major implementation issues. These issues fell into three categories: boundaries, funding/costs for public goods RD&D, and the independent administrator. These issues need to address the role for natural gas and municipal utilities. The group decided that interested persons should clarify, and/or expand the details of the issues, especially the boundary issues. The group additionally decided to fax these comments on the draft issues list to Mike DeAngelis (CEC) @ 916-654-4676 by 4/3/96. Carl Bloomstein (UC), Betsy Krieg (PG&E), and Rod Lighthipe (SDG&E) will incorporate the draft issues packet with the provided comments into a draft report outline prior to 4/10/96 and circulate to members for comment.

Meeting Schedule:

The next meeting will be on April 16, 1996 from 10:00 to 4:30 in Sacramento. The third meeting is tentatively scheduled for May 2, 1996 from 10:00 to 4:30. The third meeting may be designed as a joint session with the other working groups.

SUMMARY OF RD&D RESTRUCTURING WORKING GROUP
APRIL 16, 1996 MEETING

After brief introductions, Mike Messenger, the Coordinator for the proposed Energy Services Working Group-Energy Efficiency (ESWG-EE), summarized that their group responded to the CPUC Joint Assigned Commissioners' Ruling (JACR) with a statement of issues and a proposal to file one ESWG-EE report on August 1. Marwan Masri, the Coordinator for the Ad Hoc Renewables Working Group (RWG), said his group also responded to the JACR indicating that they would file one report on July 1, 1996, as directed in the CPUC Roadmap.

Listed below are the decisions that the proposed RD&D Restructuring Working Group (RD&D WG) agreed on:

Coordination with the ESWG-EE and the RWG

Since CEC staff members coordinate or have an active role in all three working groups, the R&D Working Group decided that all three CEC staff should begin the coordination process between RD&D, Energy Efficiency and Renewables. The RD&D Working Group also decided that now it is too early to decide how to integrate the three reports but that a coordination committee(s) with the three groups be established in the future.

RD&D WG input to the CPUC April 22, 1996 Scoping Workshop

It was decided that Mike DeAngelis will represent the RD&D WG at the scoping workshop but others will also attend and may represent their company's/organization's broader interest in restructuring. The group decided on an accelerated schedule and a single final report to be filed on September 6, 1996, with a status report due on July 1, 1996; that we recognize the importance of, and will continue to, coordinate reports with the ESWG-EE and RWGs; that we will invite Commissioner Neeper and the CPUC liaison to attend our future meetings; and that we follow an open meeting process and have already conducted an outreach effort but we are still attempting to expand our membership with additional representatives from consumer, environmental, and industry stakeholders (DRA will contact TURN; SDG&E will contact UCAN; The Insulation Contractors Association will contact CMA; UC will contact CLECA; CEC will contact EDF, CARB, SCAQMD and possible R&D industry representatives; and SCG will contact Kern and other natural gas pipeline companies. Each of these organizations will be added to the RD&D WG mailing list).

Boundary Issues and Definitions

The RD&D working group decided that precise boundaries between competitive regulated and public good/benefit RD&D were not appropriate, but the group would strive for

broad definitions with as much clarity as possible. A sub-group will develop broad definitions with governing principles/criteria for competitive, regulated, and public good RD&D. This sub-group will consist of Tod O'Connor (Tod will take the lead for drafting guiding principles), Carl Blumstein (Carl will take the lead on the broad definition with some supportive text), Max Sherman, Marvin Lieberman, Betsy Krieg, Katie McCormack, Mike DeAngelis, Alec Jenkins and Ron Kukulka. All sub-group members will FAX to each other their draft suggestion of definitions etc. by COB Thursday April 18, and will then participate in a conference call on Tuesday, April 23rd at 10:30 a.m. (916-657-4103) to finalize their work so it can be presented to the RD&D WG at its May 2 meeting. Mike DeAngelis will make the arrangements for the conference call.

RD&D WG Report Outline

All members will review the draft report outline and will discuss it again at the May 2 meeting.

RD&D WG Meeting Schedule

The group decided to hold open the following dates for future meetings: May 2 at the Oakland Airport Hilton Hotel starting at 9:30 a.m. (SDG&E will make the arrangements), May 16 in San Francisco starting at 10 a.m. (PG&E will make the arrangements), June 4, June 18, July 9, July 23, August 6, August 20, and September 4.

Next there was a presentation by Bob Aldrich of the Energy Commission on how the RD&D WG activities and products will be listed on the Internet with links to the CPUC home page. Internet access to the RD&D WG's home page (with links to the CPUC home page) can be made through: http://www.energy.ca.gov/energy/restructuring/.

SUMMARY OF RD&D RESTRUCTURING WORKING GROUP
MAY 2, 1996 MEETING

After brief introductions, Mike DeAngelis, the facilitator for this meeting of the Group, summarized his impressions of the Scoping Workshop. The expected JACR subsequent to the Scoping Workshop will not be released by the CPUC until May 10th at the earliest. Appropriate portions of the JACR will be mailed to the Working Group by the CEC after it is released. Commissioner Knight also inquired at the Scoping Workshop about RD&D in the areas of nuclear decommissioning and global climate change. Marvin Lieberman agreed to follow-up with Commissioner Knight to better understand his inquiry.

The schedule for the proposed RD&D Working Group to meet the deadline of an RD&D Report filed with the CPUC on September 6 was discussed and minor changes were made.

Overall goal and governing principles of RD&D in restructuring: The Group suggested revisions to the draft goal statement and four governing principles for the final report on Public Purpose RD&D. It was agreed that these will be incorporated into Chapter I, and a committee was formed to provide a draft of the chapter.

In a related discussion, the Group agreed that the draft report outline can be changed by the writers as the need arises to make adjustments in the text.

Boundary definitions: Draft definitions were discussed, revised, and adopted for competitive, regulated and public purpose RD&D, in addition to definitions for RD&D, research, development, demonstration and commercialization. These will be incorporated into the second draft of Chapter II. It was also agreed to discuss commercialization activities in the report as a continuum of overlapping activities from R, D, D and finally C. For the next meeting, the CEC agreed to provide to the group a copy of the Efficiency Working Group definition of market transformation for discussion.

During the discussion of regulated RD&D, it was agreed to include in the report areas of disagreement (i.e., to be helpful to the CPUC) such as utility owned generation and distributed generation (i.e., as examples of that type of RD&D). Jeanne Hallman agreed to report at the next meeting whether the Working Group assumption that Performance Based Ratemaking (PBR) without balancing accounts is an accurate assumption for the RD&D Report.

Max Sherman provided a rough draft of Chapter II for the Group. He asked for comments by COB Monday (5/2) for a group conference call to be held on 5/9, and a revised draft to be mailed out to the Group on 5/10. The CEC will send mailing labels to Max for his mailing and the CEC will schedule the conference call.

Foundation discussion on the public purpose RD&D charge: The Group heard and discussed a presentation on approaches to estimate the size of the public purpose charge for RD&D. A committee was formed which will draft Chapter III on the public purpose charge and an expanded outline for the chapter will be drafted and mailed to the working group on May 9. The Group agreed that the chapter should present all points of view on the determination of the charge. CEC staff were tasked to pull together the data for a first draft of the chapter.

Foundation discussion on the "Independent Administrator": Issues concerning governance regarding the Independent Administrator were discussed. These will be incorporated into Chapter IV, and a committee was formed to draft the chapter. An expanded outline for this chapter also will be drafted and mailed to the Working Group on May 9.

RD&D Working Group meeting schedule: The next meeting of the Group will be held on May 16 at PG&E, 245 Market Street, Conference Room 1417, starting at 10:00 AM.

SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
MAY 16, 1996 MEETING

Listed below are the decisions that resulted from the May 16, 1996, RD&D Working Group meeting held in San Francisco.

Meeting Schedule: For now the Group decided that two day meetings were not necessary but individual writing committees could hold other meetings or conference calls as needed. The group's next meeting (fifth) will be held in Burbank on June 4. Southern California Edison and Southern California Gas Companies will co-host and either Betsy Krieg (PG&E) or Mike DeAngelis (CEC) will facilitate. The sixth meeting will be on June 18 in Sacramento with SMUD as the host.

Coordination: Coordination with the other Working Groups continues to be an important issue. Mike DeAngelis agreed to expand the intra working group coordination effort to include the facilators for the Renewables Working Group, Ryan Wiser and/or Brent Haddad.

Jeanne Hallman (DRA) agreed to report to the Group at the next meeting on the status of the possibility of the investor-owned utilities (IOUs) being precluded from funding RD&D generation activities effective 1/1/97 versus 1/1/98.

Chapter II (Boundary Categories of RD&D): The RD&D Working Group discussed and agreed that there is a problem in moving technologies from RD&D into the marketplace. In addition the group does not want to have the Independent Administrator prohibited from having the flexibility of using surcharge funds to help remove technology introduction market barriers that are not addressed by the Energy Efficiency and Renewables Working Groups. It was agreed that the CEC would prepare a draft description of the problem of moving technologies from RD&D and into the market. This description will also include possible options to address the problem and possible roles for the Independent Administrator on market transformation/commercialization activities. Carl Blumstein (UC) and Rod Lighthipe (SDG&E) agreed to assist in reviewing this draft. This definition and examples will be discussed at the next Working Group meeting and may be added to Chapter II.

Katie McCormack (PG&E) prepared and discussed two graphics showing the technology innovation continuum from initial research through commercial market implementation. Since these graphics help explain the process that science and technology follows as it develops, it was decided that some form of this explanation would be included in the Group's report to the CPUC. However the group decided to delay the decision on the number of stages on the continuum and on the definition of terms. It was also agreed that there is a need for a discussion in the report on scope, including the issue of "commercialization" and technology types and fuel types.

"Public Interest" is the term that will be used instead of "public Goods" in the Group's report to the CPUC. A footnote will be included in the report explaining why this new term is being used.

The Group discussed and agreed to minor edits regarding the definitions of competitive, regulated and

public interest RD&D. Any last comments will be provided to Max Sherman (UC) so he can finalize these definitions.

Max also will condense and move the bullet examples of market barriers that might inhibit RD&D from section A.4.b. to section D.

David Abelson (CEC) and Carl Blumstein (UC) will rewrite sections A.2. and 3., and state the group's assumptions that the IOUs will have PBR's without balancing accounts and that public interest benefits from regulated RD&D will occur only as spill-overs. They will also note that transmission and distribution RD&D is only a small part of past utility RD&D activities, and therefore these activities will provide minimal public goods regardless of whether there are balancing accounts or not. Dave and Carl will also modify section A (Overview) to explain that some spill-over of benefits will occur between public interest, regulated and competitive RD&D.

Any further comments on Chapter II are to be sent to Max so he can revise the draft. It was agreed to have no major discussions of Chapter II at the next meeting.

Chapter III (Public Purpose RD&D Funding): Alec Jenkins (CEC) will reorder the Chapter and move section B. (Historical spending for each category) to an appendix. Sections C. (Competitive RD&D) and section D. (Regulated RD&D) will be made much shorter and may be moved into section A. (Introduction). Old section E., now new section B., (Public Purpose RD&D) may be split into new subsections.

Comments from the Group are due to Alec by the end of Friday May, 17. Likewise anyone interested in helping Alec rewrite this Chapter should contact him on Friday May 17.

The first draft of Chapter III will be circulated to the Group prior to the June 4 meeting for discussion at that meeting.

Chapter IV (Independent Administrator): Comments on the Chapter IV outline were due to Carl Blumstein by the end of Tuesday May 21. Carl will try to redo the outline and send it to the Group before the next meeting so it can be discussed at that meeting.

SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
JUNE 4, 1996 MEETING

Listed below is a brief summary and the decisions that resulted from the RD&D Working Group's fifth meeting held in Burbank on June 4, 1996.

Meeting Schedule:

The group decided to hold its next meeting as originally planned on June 18, 1996, in Sacramento at SMUD's Headquarter Building, 6201 S Street. The following meeting will be held in downtown San Francisco at the Pacific Energy Center on July 7, 1996. A notices of these and future meetings will be mailed to everyone on the RD&D Working Group mailing list and posted on the Energy Commission's web site (Access Energy) at:

http://www.energy.ca.gov/restructuring/research

This information is also linked to the CPUC's web site. Tentative dates for future meetings are: July 23, August 6 and 20, and September 4, 1996.

Mike DeAngelis (CEC) informed the group that the Energy Commission is planning two workshops on restructuring; energy efficiency on June 18, 1996; and RD&D on June 26, 1996. Both of these workshops will be held at the Energy Commission in Sacramento starting at 10 am. The group decided that Mike DeAngelis should represent the RD&D Working Group at the Energy Commission's June 26 workshop. Mike DeAngelis will prepare draft bullets following the format of the groups draft July 1, 1996, Status Report to the CPUC, for review at our next meeting.

Coordination:

Coordination with the other Working Groups continues to be an important issue. Mike DeAngelis briefly summarized the ongoing coordination efforts and indicated that the Renewables Working Group sees the need to closely coordinate, especially on commercialization/market transformation issues. Some parties in the Renewables Working Group assume that the RD&D Working Group will be handling the commercialization/market transformation issues. Mike DeAngelis agreed to continue to meet with Marwan Masri, Ryan Wiser, and Mike Messenger, the coordinators of the Renewables and Energy Efficiency Working Groups, and report to the RD&D group at the next meeting.

Chapter 2 (Boundary Categories of RD&D):

Max Sherman (UC) handed out the slightly revised outline of Chapter 2 and indicated that additional comments could be sent to him.

Mike Batham (CEC) summarized the handout on Moving Technologies From RD&D Into The Marketplace. The group confirmed its decision from the last meeting that there is a problem of moving technologies from RD&D into the marketplace and the term to be used to describe this process is market transformation. The group agreed that this problem must be addressed in the final report to the CPUC and Chapter 2 may be the appropriate location. Specifically the group decided that the Independent Administrator should focus on RD&D. However, the Independent Administrator's RD&D program should be connected to the market, and therefore, the Independent Administrator is expected to undertake market transformation activities primarily for technologies in the Independent Administrator's RD&D program. The issue of how much funding should be included in the Public Goods Surcharge for non-energy efficiency market transformation activities and whether this funding should be used for low, or low and high cost non-energy efficiency market transformation activities is still undecided. This issue will be discussed as part of Chapter 3 at the groups next meeting.

Chapter 3 (Public Purpose RD&D Funding):

Alec Jenkins (CEC) summarized the revised draft of Chapter 3. Alec also summarized the various analysis methods (gap, 740.1, and project-by-project) that the CEC staff had used in arriving at the funding figures in the draft write-up. As requested by some Chapter 3 writing committee members, Alec presented and explained the raw data tables and charts that were used in these analyses. The group decided that Alec should continue with the analyses and incorporate both the new data provided by the investor owned utilities (from the utilities 1995 Annual RD&D Reports) and the data on Energy Commission RD&D program funding.

Alec then presented the material prepared by Dan Whitney (Dan could not attend the meeting) on the issue of should a municipal, or any, utility be allowed to collect and spend Public Good Surcharge funds on their own RD&D programs, instead of allowing the Independent Administrator to decide how the funds should be spent. Frank Spasaro (SCG) and Tod O'Connor (SCE) summarized both sides of the issue of whether there should be a natural gas Public Goods Surcharge. The group decided that since Dan was not at the meeting and that further discussion is necessary of the issue of whether a municipal, or any, utility should be allowed to use Public Goods Surcharge funds to directly fund their own RD&D programs, Alec, Dan and possibly other interested utilities will discuss the issue before the next group meeting. The group further decided that Frank and Tod should work together on how to reach agreement on the natural gas/electricity surcharge issue (Alec will assist/facilitate if requested). Alec will discuss the results of these discussions at the Working Groups' next meeting.

There was also a discussion about how the group might move to decisions about the Public Goods Charge funding levels. The group decided that two paths should be followed. First, the group decided that the Energy Commission should conduct an informal poll of each organization at the meeting to determine, if possible, what funding level that organization could support and what activities should be included in that funding number. It was agreed that the name of the organization would not be associated with the funding numbers and that the results of the survey

would be presented at the next group meeting. Second, the group decided that Katie McCormack (PG&E) and CEC staff would prepare a scoping matrix that will help in determining how the surcharge should be calculated. The members agreed to fill out the matrix and return it to the CEC before the next RD&D Working Group meeting.

Mark Stout (UCS) will work with CEC staff to refine the socially optimal approach to determining an appropriate surcharge rate. This approach will be presented for consideration by the group at its next meeting.

Chapter 4 (Independent Administrator):

Carl Blumstein (UC) presented the revised Chapter 4 outline. It was suggested that the outline should be expanded to further flush out the options for the Independent Administer and that the writing committee needs to have a rough draft available for the Working Group to discuss. Therefore, the group decided to follow three parallel paths. First, comments on the current outline should be a sent to Carl by the end of Friday (June 7); second, Carl will start writing what he can based on the suggestions provided during the meeting and new comments; and third, the Chapter 4 writing committee should prepare a list of critical path decisions. The revised outline and text along with the critical decisions will be presented to the RD&D Working Group at their next meeting.

July 1, 1996 Draft Status Report to the CPUC: Katie McCormack presented a working draft as a suggestion for the group's July 1, 1996 status report to the CPUC. The group decided that the draft was the appropriate level of detail and that members should send comments and a brief section on Chapter 3 to Katie by the end of Wednesday (June 12) so she can prepare an actual draft for approval at the next RD&D Working Group meeting. Katie will also prepare an updated outline of the final report (to be submitted to the CPUC on September 6, 1996) to be attached to the Status Report.

SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
JUNE 18, 1996 MEETING

Listed below are the decisions that resulted from the June 18, 1996, RD&D Working Group meeting held in Sacramento.

Meeting Schedule: The next (seventh) meeting will be held on July 9, 1996, at Pacific Gas and Electric Company's Energy Center, located at 851 Howard Street in San Francisco. The following meeting will be held in Sacramento on July 23, 1996. Notices of these and future meetings will be mailed to everyone on the RD&D RD&D Working Group mailing list and posted on the Energy Commission's web site (Access Energy) at:

http://www.energy.ca.gov/restructuring/research

This information is also linked to the CPUC's web site. Tentative dates for future meetings are: August 6 and 20, and September 4, 1996. The possibility of additional meetings was also discussed, but no new dates or locations were established.

JACR: The CPUC's Joint Assigned Commissioners' Ruling (JACR) was discussed and the group decided that even though the JACR directs the RD&D Working Group to integrate the recommendations from the Energy Efficiency and Renewables Working Groups into the RD&D final report (due to the CPUC on September 6, 1996), that the group must first resolve the RD&D issues, with recommendations, before report integration can be effectively started. The group realized that if the JACR schedule is followed, most of the month of August will no longer be available for RD&D issue resolution but instead would be used for report integration activities. The group decided that this does create a timing problem but remains reluctantly optimistic that both activities can be completed on time. The group recognizes that additional meetings may need to be scheduled during August with the Energy Efficiency and Renewables Working Groups to complete the required coordination and report integration activities.

July 1 Status Report: The group discussed the draft Status Report prepared by Katie McCormack (PG&E) and agreed that it was a good draft and that the revised Final Report outline should be attached to the July 1 Status Report. The group agreed that PG&E should redraft the report and send it via fax or e-mail by June 24 to the group for final review of its contents. Members will have until June 26 to provide Katie with any final comments, and until June 28 to decide if they want their organization to be listed on the report before it is submitted to the CPUC on July 1, 1996.

Chapter III (Funding Issues): After lengthy discussions on whether or not natural gas and municipal utility customers should be included in the surcharge, and the results from the surcharge funding matrix survey, the group decided that: the RD&D public good surcharge should be broad-based, non-bypassable, equitably collected and distributed, and eliminate free riders; that SCG and SCE will continue to work to develop a specific proposal by July 5 that will discuss if and how natural gas will be included in the surcharge (this proposal will be presented to the group at the July 9 meeting); that transportation is important but until the CPUC's directions on LEVs changes that it is inappropriate for the public good surcharge funds to be used for transportation RD&D; that we do not want to tie the hands of the Independent Administrator (IA) but that the IA should focus on RD&D on renewable, end-use, and environmental (health & safety, natural resources, and air quality) technologies; and since there is a gap in high cost market transformation activities, and this gap will continue, that if the IA does not conduct high cost market transformation activities that these activities will not be adequately done.

Based on the high cost market transformation issue discussion, the group also agreed that pros and cons of this issue should be prepared. Also, there was discussion that if the IA is responsible for these activities, the public good surcharge should be increased accordingly. Members agreed to send to the CEC their listing of the pro and cons on this issue by June 21 so the CEC can compile a list for the July 9 meeting.

SMUD and LADWP agreed that muni customers should also pay an RD&D surcharge if the munis, (and possibly other utilities) are allowed the opportunity to self-direct their portion of the surcharge to their own public interest RD&D programs. There was also interest by the investor-owned utilities in this concept, and several expressed that they may also want to self-direct their portion of the RD&D surcharge. Several issues were discussed on how this would be implemented including: the role of the IA, how to determine if the utility has credible public interest programs, whether these programs are consistent with statewide policy objectives, and the possible need for a watch dog agent to insure the funds are being used for public interest RD&D. The group decided that these and other issues would be addressed in Chapter IV (governance).

Chapter IV (Governance): Not much time was spent on governance issues; however, the CEC staff agreed to prepare a summary of the pros and cons for having various existing, new, and hybrid organizations being the IA. Finally, there was a brief discussion on the CEC's June 26 Workshop to discuss the activities of the RD&D Working Group. It was mentioned that since the date for this workshop conflicted with various members' schedules, that few members would attend the CEC workshop. The group decided that Mike DeAngelis present a progress report on the RD&D Working Group at the CEC workshop.

DRAFT SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
July 9, 1996 MEETING

Listed below are the decisions that resulted from the July 9, 1996 RD&D Working Group meeting held in San Francisco.

Meeting Schedule: The next (eighth) meeting will be held on July 23, 1996, in Sacramento. The following meeting will be held on August 6, 1996, in Burbank. Tentative dates for future meetings are: August 20 and September 4, 1996. Notices of these meetings and draft products will be mailed to everyone on the RD&D Working Group mailing list and will be posted on the Energy Commission's web site (Access Energy) at:

http://www.energy.ca.gov/restructuring/research

This information is also linked to the CPUC's web site.

General: CPUC staff clarified the CACD June 20, 1996 memorandum and indicated that they would like the working groups to reach consensus on decisions and recommendations when possible but that the working group reports should also include the issues and options (including detailed pros and cons) that were considered by the groups in the process of reaching consensus. The group agreed that when there was not consensus on a particular item the group also would summarize in the report "the sense of the group" by describing the stakeholders or types of organizations that support each option. The group agreed not to list the specific positions of each organization because parties will have the opportunity to submit testimony to the CPUC after the report is completed.

Mike DeAngelis summarized the CEC's June 26, Workshop and indicated that the CEC's ER Committee would like to have parties file answers to the questions contained in the ER Committee notice.

Chapter III (Funding Issues): Some of the high cost market transformation language in the draft summary of the last RD&D Working Group meeting (June 18, 1996) did not accurately explain the decisions reached by the group. Therefore, it was decided to modify that summary be eliminating the phrase "and since there is a gap in high cost market transformation activities, and this gap will continue, that if the IA does not conduct high cost market transformation activities that these activities will not be adequately done."

There was no consensus reached on funding levels for public interest RD&D. The Working Group agreed to include optional funding levels in the report and the writing committee for Chapter III would have a conference call before the next meeting to determine how to characterize the "sense of the group" on funding levels in the report.

Jeanne Hallman presented a draft DRA estimate that the RD&D surcharge should be approximately $11 million. This position has not been approved by DRA management, however. Jeanne expects to have DRA's position documented in writing by July 18 so it can be sent to the group for discussion at the group's July 23 meeting.

The group agreed that since the CPUC has recommended that a non-bypassable public good charge (PGC) be created, the PGC for public interest RD&D should be energy based (including electricity and natural gas) with the specific details on assessment, collection method, and adjustments for inflation to be handled as integration issues. The group further agreed that the PGC should include investor-owned and municipal utility customers, cogenerators, independent power producers, and natural gas pipelines customers. The PGC should also eliminate the possibility of double counting. The group decided to let the chapter III writing committee describe the electricity/natural gas issue in the report and to summarize the funding levels advocated by the Working Group members. This committee (including Frank, Tod, Alec, Katie, Bob, and Jeanne) will redraft chapter III, including options with pros and cons, for review at the July 23 meeting.

Chapter IV (Governance Issues): After a brief discussion by Dan Whitney on the SMUD proposal, it was decided that this proposal with pros and cons will be presented in Chapter IV. Next, after a long discussion of the responses to the Independent Administrator (IA) Issue Matrix, the group has consensus that: the IA should serve the broad public interest (item 1); the IA should support energy policy (item 2); the IA should address the needs of both electric and natural gas customers if the PGC includes both electric and natural gas customers (items 3 and 4); item 5 will be changed to accommodate short term needs while planning for potential long term objectives (Tod will finalize this language); item 6 was approved if the write-up includes that decisions should be made by the board with stakeholder participation; items 7 and 8 were approved; item 9 should include public accountability; item 10 should include encouraging collaboration among the state's RD&D institutions and others; item 11 should be deleted but "being responsive to changing technological needs" is to be combined with items 3 and 4; item 12 should be deleted and the concept of supporting the goal of equatable distribution of benefits would be added to item 1; and item 13 would be deleted and the concept of adding the goal of eliminating conflict of interest would also be added to item 1.

Regarding "Roles and Functions" the group decided that the IA focus should be to contract for RD&D activities rather than to do RD&D itself. However, in rare or special cases the staff of the IA may conduct RD&D with the approval of its governing board. The group decided to delete function 3. Functions 4 and 5 will be presented again when the group discusses the structure of the IA in more detail. Function 6 was approved as "undertake energy technology assessment for RD&D planning purposes." Functions 7 and 8 were also approved but Betsy and Katie agreed to do a write-up on function 7 to provide a balance on IA planning.

The group decided that the "Criteria/Goals" and "Roles and Functions" listed on the matrix should be rewritten as both concise goals and objectives for the IA and governing board, and also to determine those appropriate as criteria for selecting the IA. Rewriting these items will be the responsibility of the Chapter IV writing committee (Carl, Max, Dan, Betsy, Katie, Mike, and possibly Jeanne and Mark). The writing committee will present a revised Chapter IV to the group at the July 23 meeting.

SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
July 23, 1996 MEETING

Listed below are the decisions that resulted from the July 23, 1996, RD&D Working Group meeting held at the Sacramento Municipal Utility District (SMUD). If you have any questions or corrections, please contact Mike Batham (CEC) at (916) 654-4548 or fax at (916) 653-6010 by August 5, 1996.

Meeting Schedule: The next (ninth) meeting will be held on August 6, 1996, at the Burbank Airport Hilton Hotel, 2500 Hollywood Way, Burbank, (818) 843-6000. Two new meeting dates were identified: August 16 in San Francisco (PG&E will host at the Pacific Energy Center), and August 23 in Sacramento (at the CEC). The August 20 meeting is cancelled. The next meeting will be on September 4 in Berkeley (UC will host). Notices of these and any other meetings will be mailed to everyone on the RD&D Working Group mailing list and posted on the Energy Commission's web site (Access Energy) at:

http://www.energy.ca.gov/restructuring/research

This information is also linked to the CPUC's web site.

Letter to the CPUC: Dave Abelson summarized a July 9, 1996 meeting between David Gamson (Commissioner Neeper's Advisor), Michelle Cooke (CACD), Michael DeAngelis (representing the RD&D Working Group, and Michael Messenger (representing the EE Working Group) held on July 9, 1996. At this meeting, the representatives of the working groups indicated that additional time would be needed to prepare the integration portion of the Working Group reports. It was decided that the Working Groups would send letters to Commissioner Neeper requesting that the integration portion of these reports be delayed until the first week in October (October 4).

After a brief discussion of a draft letter that Dave Abelson prepared, the Working Group agreed that they would give Dave any additional comments on the draft letter by noon, July 24. Dave would then finalize the letter and send it to Commissioner Neeper and members of the Working Group.

Chapter III (Funding Issues): There is still some uncertainty about The Gas Company's position on natural gas in the public goods surcharge. It was agreed that since Frank Spasaro could not attend this meeting, David Berokoff would confirm with Frank the position of The Gas Company and relate that position to both Tod O'Conner and either Mike Batham or Bob Huffaker. David and/or Tod will also provide any corrections or modifications to the July 9 meeting summary and Chapter III text on Fuel Resource Scope.

The CEC will incorporate suggestions from the group regarding clarification language on surcharge funding of transportation RD&D. The revised text will be discussed at the August 6 meeting. Comments on Chapter III are due to Bob Huffaker by Monday, July 29.

Chapter IV (Governance): The group agreed to move the lessons from Other Organizations section to the report appendix. The group agreed to prepare suggested changes to the draft Chapter IV text, and consider at the August 6 meeting whether to include the Research Organization Selection Process in Chapter IV or Chapter V: Transition and Implementation.

The group agreed to condense the goals, functions and criteria sections into a single section. The group also agreed to refer back to these sections in the description and analysis of administrative options. The description will be based on the research organization functions, and the pros and cons will be based on the goals and criteria for the organization. After some review of the July 18 drafts, the CEC agreed to use suggested revisions to re-draft the goals and criteria text, and CEC, UC and PG&E agreed to re-draft the functions section. This outline was sent to the Working Group on July 26.

PG&E agreed to prepare drafts of Executive Agency and RFP-type organizations; SMUD agreed to draft a muni/IOU self administration option, and CEC agreed to draft one or more version(s) of a classic administrative option. Other Working Group participants were encouraged to provide text describing other administration options. Input, following the outline issued on July 26, is due to Bob Huffaker by noon, Wednesday, July 31.

Chapter V: The group agreed to provide comments to the CEC on topics or text for a first draft of Chapter V by Wednesday, July 31.

DOE:

Art Rosenfeld attended the meeting on behalf of DOE. He noted that DOE can be expected to collaborate and do significant cost sharing with the new public interest RD&D organization. He provided some statistics regarding RD&D investment in the US and abroad, which he agreed to share with the Group (included in July 26 mailing).

Report Review and Preparation:

The group agreed that the report should include text summarizing the discussion that produced its consensus positions - broad or unresolved issues will be included in the body of the chapter; more subtle issues will be described in footnotes.

The current drafts of Chapters III, IV and V, including input and comments received by Wednesday, July 31, will be posted on the CEC RD&D Working Group internet web site by Friday, August 2. Parties who do not have access to the internet, or who would prefer to receive hard copies, should contact Mike Batham at the CEC.

SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
August 6, 1996 MEETING

Listed below are the decisions that resulted from the August 6, 1996, RD&D Working Group meeting held at the Burbank Airport Hilton Hotel.

Meeting Schedule: The next (tenth) meeting will be held on August 16, 1996, at the Pacific Energy Center, 851 Howard Street, San Francisco. The following meeting will be held on August 23 at the Energy Commission, 1516 Ninth Street, Hearing Room B. The August 20 meeting is cancelled. The following meeting will be on September 4 in Berkeley (UC will host). Notices of these and any other meetings will be mailed to everyone on the RD&D Working Group mailing list and posted on the Energy Commission's web site (Access Energy) at:

http://www.energy.ca.gov/restructuring/research

This information is also linked to the CPUC's web site.

General: The July 23 draft meeting summary was approved by the group. In response to the Energy Efficiency and RD&D Working Group's letters requesting a time extension for completing the integration section of our reports to October 4, 1996, Commissioner Neeper sent a letter dated July 25, 1996, to Mike Messenger indicating that the time extension would not represent an undue delay. A copy of the Neeper letter was sent to the RD&D Working Group on August 13, 1996.

Betsy Krieg presented a draft list of RD&D Working Group consensus points on Chapters 2, 3, and 4. After some discussion, the group agreed to eliminate the word "advanced" from "advanced generation" in the consensus points and throughout the report. The group also agreed to move the selection process discussion for the Research Organization (RO) to Chapter 5 (Transition). Dave Abelson (CEC) agreed to draft Chapter 1 (Introduction) before the next group meeting. The group further decided that PG&E should make the wording changes discussed, and should contact Sheryl Carter (NRDC) regarding alternate wording for low and high cost market transformation and then revise the draft consensus point. The revised draft will be sent to the group and may be used as part of the report executive summary.

Chapter IV (Goverance): All page and section references are to the August 1, 1996 draft of Chapter IV. After a lengthy discussion, the group decided to modify the wording of the last part of section B.1.b. (Support state energy policies) and move it to the bottom of B.1.c. (Address the needs of consumers) on page 2. Carl Blumstein and Frank Spasaro will prepare a footnote explaining why RD&D does not include technical assistance.

Section C on page 5 will discuss three categories of RO options: Integrated Agency, Classic or Single Purpose Independent Entity, and Utility Administered. Within these three categories there

may be more than one specific organization option presented. Each specific option will have a discussion of pros and cons. In addition there should be a discussion of the connection of the RO to state government and the relationship between the governing board, executive director, and staff. There should also be a discussion of the size of the board, stakeholder vs. disinterested board members, part-time vs. full-time board, who appoints the board, how the board makes decisions, relationship of decision making to the staff, small vs. large board and staff, expert vs. lay staff, how the staff is hired, and whether the RO is profit or non-profit. The current RFP option will be the guide for the general level of detail to be used in the report for the other options. The CEC will draft the first paragraph of this section plus the integrated RO, and a specific state agency and Joint Powers Agreement option. PG&E will draft the classic or single purpose RO option. PG&E and SMUD will draft the utility RO option. Carl Blumstein will modify his single purpose option to be consistent with the agreed upon report format. There should also be a clarification of the energy policy-making function of the RO; for example, does energy RD&D policy mean overall state energy RD&D policy or program implementing policy for the RO? Does this policy include technology assessment which could be used to determine preferred or opportunity technologies for the state or the RO? The RD&D definition should be moved out of the Chapter IV text and into the overview section.

Katie McCormack briefly discussed a Summary of Public Interest RD&D Organization Options table (draft 8/5/96) which helps identify the main features of the various RO options listed in Chapter IV. It was agreed that this summary table is a good idea and should be included in the report. Additional specific comments on the table should be given to Katie by Friday so it could also be posted on the net.

Chapter V (Transition): The group agreed to strongly recommend that the RO be in place by January 1, 1998; otherwise, some valuable current RD&D programs will be eliminated. Dave Abelson will draft an introduction write-up on the transition and implementation process with reference to the need for legislation for full implementation of the RO. Carl Blumstein will draft the RO selection process section.

Chapter III (Funding Issues): All page and section references are to the August 5, 1996 draft of Chapter III. PG&E also prepared a one pager of alternate wording for section C. (Funding Sources). It was agreed that, with modifications, most of pages 8-11 of the draft Chapter III, will be replaced with this one pager. These modifications include adding the last sentence of the first paragraph of Section C on page 8 to the first paragraph of the one pager. Also, in the first paragraph of the one pager, add a brief discussion of SMUD's position as a lead-in to the consensus of having the municipal utilities as a surcharge funding source. Add to paragraph two of the one pager, the third to the last sentence on page 10. (If utilities are given...). Move most of paragraph two of the one pager to Chapter IV. Move the third paragraph of the one pager to section F.2. on page 25. Also in Chapter III the group decided to delete section C on pages 22 and 23 (Historical Approach: Modified Gap #2). Also to be deleted is the Fuel Resource Scope row in Table 3.1, on page 24. Cheryl, Bob, Mark, and Frank will do a conference call to resolve how the group should address transportation RD&D on page 6.

Comments on the current drafts of Chapter III, IV, and V are due to the CEC staff by Friday (8/9/96) at noon. By 2:00 p.m. Monday (8/12/96), text revisions will be placed on the internet with specific comments due back to the CEC on noon Wednesday (8/14/96). The CEC will post the revised draft Chapters, including Chapter 3, on the internet by noon Thursday (8/15/96) and these revised drafts will be the documents to be discussed during the group's Friday (8/16/96) meeting in San Francisco. It was further agreed that the August 16 meeting will be the last opportunity for the group to give substantive comments and significant re-writes on the draft report.

DRAFT SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
August 16, 1996 Meeting

Listed below are the decisions that resulted from the August 16, 1996, RD&D Working Group meeting held at PG&E's Pacific Energy Center.

Meeting Schedule: The next (eleventh) meeting will be held on Friday, August 23, 1996, at the California Energy Commission, Hearing Room B, 1516 Ninth Street, Sacramento. This meeting will be the final opportunity for discussion of substantive changes to the report. The final (twelfth) meeting of the RD&D Working Group will be held Wednesday, September 4, 1996, at the Clark Kerr campus of UC Berkeley. Notices of these meetings will be mailed to everyone on the RD&D Working Group mailing list and posted on the Energy Commission's web site (Access Energy) at:

http://www.energy.ca.gov/restructuring/research

This information is also linked to the CPUC's web site.

Other Restructuring Activities: Today (8/16) is the deadline for filing the Renewables and Energy Efficiency Working Group reports -- the Energy Efficiency report will be filed today, the Renewables Group has asked for a one-week extension. The legislature conference committee is working on draft restructuring legislation, including provisions for public interest RD&D. The language and debate are moving swiftly. The Group will review updated information at the next meeting.

Working Group Report: The Group reviewed working drafts of all report chapters, and made a variety of editorial and substantive revisions. Key areas of change and/or agreement are:

- Surcharge options -- make titles more descriptive, include municipal funding and administrative costs in each surcharge level determination, and provide documentation of methodology for report appendix
- Administration options -- prepare new text describing the key features of the three generic administration models, provide information to aid in distinguishing between the two single purpose administrator options, revise descriptions to limit advocacy language, and write pros/cons on a comparative basis

The CEC agreed to integrate additional comments on the report received by noon, Tuesday, August 20, into the report, which will be posted on the internet site by Thursday, August 22.

DRAFT SUMMARY OF THE RD&D RESTRUCTURING WORKING GROUP
August 23, 1996 Meeting

Listed below are the decisions that resulted from the August 23, 1996, RD&D Working Group meeting held at the California Energy Commission's Hearing Room B.

Meeting Schedule: The final (twelfth) meeting of the full Working Group will be held on Wednesday, September 4, 1996, at the Conference Center at the Clark Kerr campus of UC Berkeley. This meeting will be the final opportunity for revisions of the report prior to the filing deadline (September 6, 1996) -- participants will be asked to approve the report for filing. A writing team will meet on Thursday, August 29, 1996 at the CEC to make any changes required for the final draft of the report.

Notices of these meetings will be mailed to everyone on the RD&D Working Group mailing list and posted on the Energy Commission's web site (Access Energy) at:

http://www.energy.ca.gov/restructuring/research

This information is also linked to the CPUC's web site.

Other Restructuring Activities: The Renewables Working Group report will be filed today or Monday. The legislature conference committee continues to work on draft restructuring legislation, including provisions for public interest RD&D. The language and debate are moving swiftly. The Group noted that current language is not wholly consistent with the recommendations of the Working Group and agreed to include in the RD&D Working Group report a recommendation that the legislature consider the findings of the Working Group in its deliberations. The Group also agreed to share updated information at the next meeting. Mike DeAngelis agreed to talk with the coordinators of the Renewables and Energy Efficiency Working Groups about scheduling discussions to begin preparation of the integration report.

Working Group Report: The Group reviewed working drafts of all report chapters and of the executive summary, and made numerous editorial and substantive revisions.

The Group agreed to include all meeting summaries as an appendix to the Working Group report, recognizing that, in some cases, the summaries do not reflect the final determination regarding report language. This is because the Group agreed to make the changes in the report, rather than devoting Group discussion time to modifying the meeting summaries.

The CEC will integrate comments and revisions into the report by Wednesday, August 28. The writing team will use this draft of the report to prepare a final report for consideration by the full Working Group on September 4.

APPENDIX TO CHAPTER II

APPENDIX II: DEFINING THE BOUNDARIES FOR RD&D ACTIVITIES

A. PROPOSED MODIFICATIONS TO THE FERC DEFINITION OF RD&D

"Regulated Research, Development and Demonstration (RD&D) means expenditures incurred by public utilities (electric and/or natural gas) and licensees either directly or through another person or organization (such as research institute, industry association, foundation, university, engineering company, or similar contractor) in pursuing research, development, and demonstration activities including experiment, design, installation, construction, or operation. This definition includes expenditures for the implementation or development of new and/or existing concepts until technically feasible and commercially feasible operations are verified. Such research, development, and demonstration cost should be reasonably related to the functions of the regulated ~~existing or future~~ utility business, broadly defined, ~~of the public utility or licensee or in the environment in which it operates or expects to operate. The term includes, but is not limited to: all such costs incidental to the design, development, or implementation of an experimental facility, a plant process, a product, a formula, an invention, a system, or similar items, and the improvement of already existing items of a like nature; amounts expended in connection with the proposed development and/or proposed delivery of alternate sources of electricity and substitute or synthetic gas supplies (alternate fuel sources, for example and experimental coal gasification plant or an experimental plant synthetically producing gas from liquid hydrocarbons); and the costs of obtaining its own patent; such as attorney's fees expended in making and perfecting a patent application. The term includes preliminary investigations and detailed planning of specify projects for securing for customers non-conventional electric power supplies and non-conventional pipeline gas supplies that rely on technology that has not been verified previously to be feasible. The term does not include expenditures for efficiency surveys; studies of management, management techniques; and organization; consumer surveys, advertising, promotions, or items of a like nature~~.

B. PROPOSED MODIFICATIONS TO THE CPUC EXCLUSIONS TO THE FERC DEFINITION OF RD&D

The term "regulated research, development, and demonstration" does not include environmental, siting or seismic studies and assessments performed in conjunction with the design construction, or operation of plant or facilities used for the commercial production, transmission, or distribution of natural gas and/or electricity, ~~nor does it encompass the development of business or engineering data processing materials, software or hardware, provided that nothing shall limit such studies, assessments, or development which are an integral part of an otherwise qualified RD&D project.~~

C. PROPOSED REPEAL OF PUBLIC UTILITIES CODE SECTION 740.1

~~"The commission shall consider the following guidelines in evaluating the research, development, and demonstration programs proposed by electrical and gas corporations:~~

~~(a) Projects should offer a reasonable probability of providing benefits to ratepayers.~~
~~(b) Expenditures on projects which have a low probability for success should be minimized.~~
~~(c) Projects should be consistent with the corporation's resource plan.~~
~~(d) Projects should not unnecessarily duplicate research currently, previously, or imminently undertaken by other electrical or gas corporations or research organizations.~~
~~(e) Each project should also support one or more of the following objectives:~~
~~(1) Environmental improvement.~~
~~(2) Public and employee safety.~~
~~(3) Conservation by efficient resource use or by reducing or shifting system load.~~
~~(4) Development of new resources and processes, particularly renewable resources and processes which further supply technologies.~~

D. MOVING TECHNOLOGIES FROM RD&D INTO THE MARKETPLACE

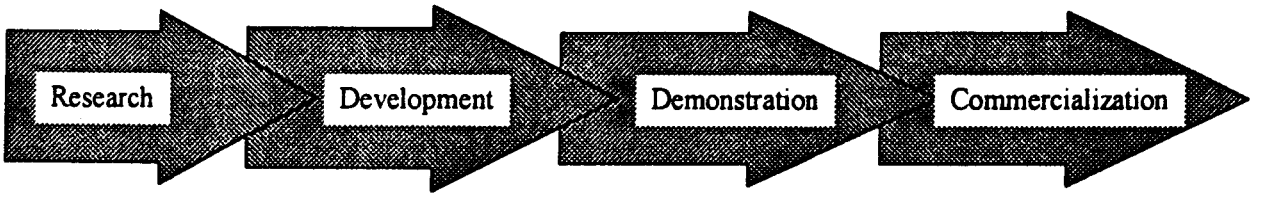
[The following information was prepared by the staff of the California Energy Commission (CEC) for consideration by the RD&D Working Group (WG) and readers of this report when considering the nature and scope of appropriate public interest commercialization activities. The WG did not attempt to reach consensus on the contents of this appendix item.]

1. Problem

The process of moving innovative technology concepts through research, development, and demonstration (RD&D) into the competitive marketplace is an involved process that can take many years. After a technology has been demonstrated to have reliable and predictable performance through RD&D, it may be ready for the competitive marketplace. Despite this, it will often encounter resistance to widespread adoption. There are many terms used to describe the commercialization activities used to overcome resistance in the marketplace, including: "market development," "market transformation," "technology transfer," etc. None of these terms have standard definitions that are widely recognized. Figure II.1 shows the major overlapping steps that a technology follows as it proceeds through the technology innovation continuum.

FIGURE II.1

The Technology Innovation Continuum



The last stage in the technology innovation continuum includes defining the barriers (including market failures, regulatory barriers, private sector risks and education), removing the barriers, educating the market forces, and addressing possible market failures. Without clear authority for the Research Organization (RO) to fund activities that address this last stage of the continuum, the RD&D activities funded with the Public Goods Charge may either be slow to enter the marketplace, or may not enter the marketplace at all. Examples of barriers which create resistance to the adoption of a new technology in the market are included below.

a. Consumer Information/Protection Barriers

Major incentives in the 1970's and 1980's led to a significant increase in the number of solar water heater manufacturers and distributors. Conflicting claims by the manufacturers, however, caused consumer confusion. In addition, many solar collectors could not meet ordinary construction standards, and failed in the early installations. These two factors inhibited market development and threatened to result in a backlash against the new technology.

To resolve these barriers to market growth, a testing, rating and labeling program for solar water heaters was implemented and required for incentives eligibility in California. This program was later adopted at the national level by a not-for-profit industry support organization.

b. Building Code Barriers

Geothermal heat pumps use piping buried up to several hundred feet in the ground to exchange heat with the constant earth temperatures at these depths. The building approval process in California treats these heat exchangers as water wells including concrete capping and other requirements, substantially increasing the costs of this technology so that it is rarely used in the state. Based on collaborative discussions with the geothermal heat pump industry, utilities and building code officials, a bill was recently introduced in the legislature to reduce the cost of this energy-saving technology within California.

c. Legal/Regulatory Barriers

During the past several years, electric utilities and the solar industry have been interested in working together to expand markets for photovoltaics which would lead to increased production and decreased costs for the technology. However, a state law passed in the late 1970's added Section 2775.5 to the

Public Utilities Code requiring significant regulatory review of any investor-owned utility solar energy development program. In order to reduce the time, legal cost and other regulatory barriers, a collaborative was formed of stakeholders to logically mitigate these barriers. Since that time, utility PV programs have been approved and implemented through the regulatory process.

d. Public Confidence Barriers

In the early 1980's the newly formed wind industry was having trouble obtaining the necessary siting permits to install new projects largely because the public and local governments were not convinced that this technology was truly an energy producing technology. In addition, this California industry wanted to further expand by exporting its technology to other states and countries, but it needed independent documentation of its performance. To counter this barrier and to help the California wind industry increase its credibility worldwide, the Energy Commission, in cooperation with the wind industry, implemented the wind performance reporting system program to independently document the electricity produced by wind projects in California. This report was immediately used around the world and was the basis for the wind industry's rapid growth during the 1980's and 1990's.

2. Commercialization Activities and the Role of the Research Organization

Commercialization activities may be defined as "the process of increasing the value or decreasing the cost of a new service or product, often accomplished by determining and addressing key barriers in a competitive market." Figure II.2 shows the various stages of technology maturity in the market commercialization process for innovative technologies, including a classification of prospective purchasers.

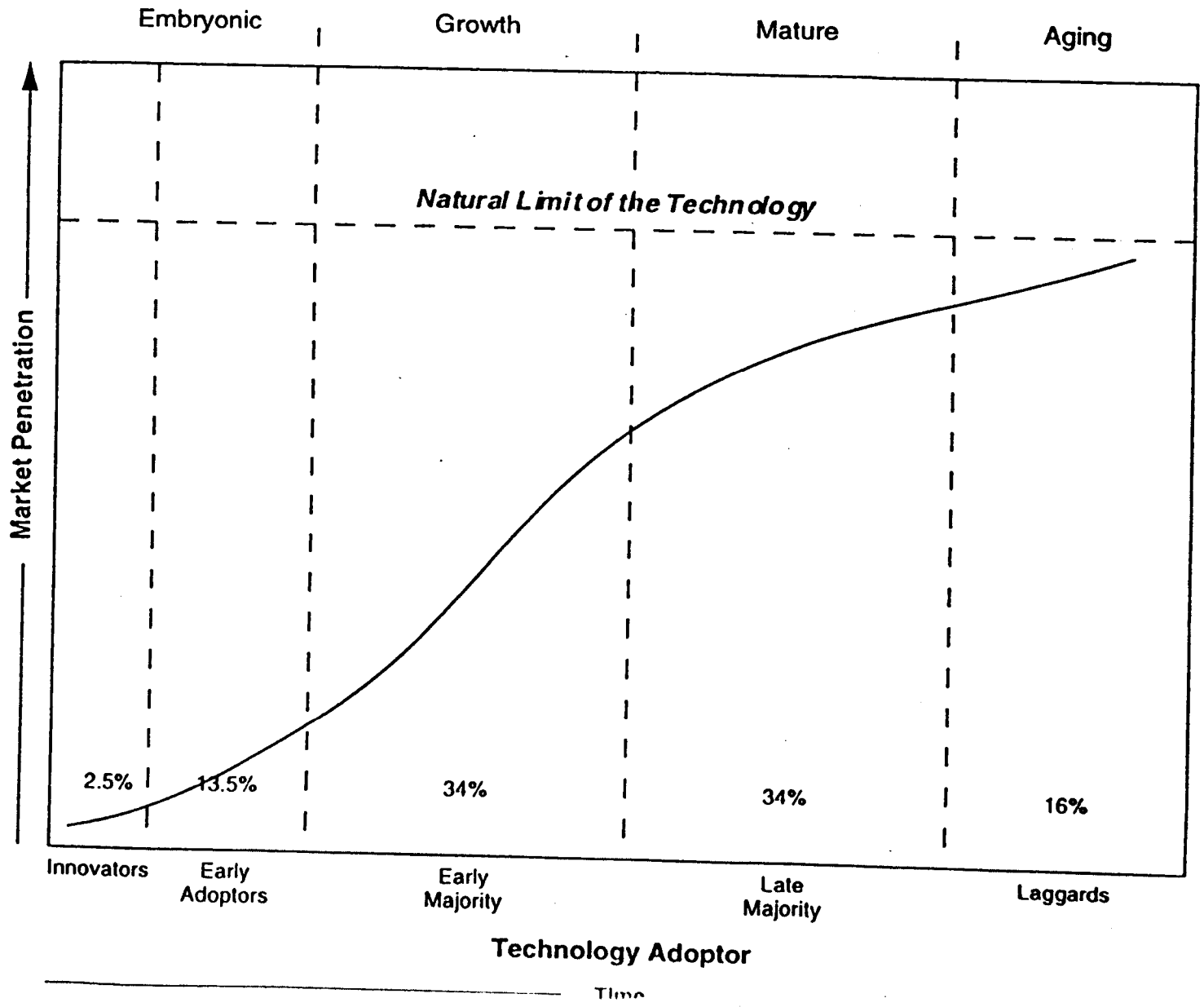
Technologies or products emerging from RD&D demonstrate a "life cycle" of market maturation that may be approximated by four broad phases of development. During the first phase, or embryonic phase, technologies or products enter the market as a "new good." Because these new goods still have market barriers, they may never move up the market acceptance curve and become commercialized. If the market barriers for these products are reduced, the first people to use the new good, or innovators, will start to adopt the technology. Once the market receives feedback from the innovators on the product's benefits, and prices decline due to production volume and learning curve benefits, the "early majority buyers" will start to enter the market and buy the product. When this happens, typically other manufactures begin to produce the product, which increases competition and lowers the price. At this point, the product acceptance is accelerating and the late majority, and ultimately the laggards, will also adopt the technology.

There are many approaches to advancing a technology or product along the market penetration curve, including adding external market benefits such as incentives to purchase the product. These actions will encourage new buyers to use the product, thereby jump-starting it along the market acceptance curve. Figure II.2 is important in order to distinguish between the role of the RO and the role of competing firms in the market. In general, CEC staff recommend that the role of the RO is to work with all competing firms in the market only at the "innovator" and "early adopter" stages of the market

FIGURE II.2

TECHNOLOGY TRANSFORMATION PROCESS

Stages of Technology Maturity



to ensure that socially beneficial energy technologies, which have been supported through RD&D stages, become self-sustaining without public supported in the competitive market.

Commercialization activities to accelerate the technology adoption process can be low cost or high cost. The Energy Commission currently has low cost active programs that address the market barriers for some technologies that will not be implemented by private actions alone. These programs and technologies include: the OTCOM Collaboratives for PV, Geothermal Heat Pumps, Biomass, Evaporative Cooling, Passive Solar, etc.

In addition, this state has historically been involved in some market transformation activities that are much higher costs, including tax incentives for wind and solar technologies, standard offer 4 contracts for small power producers, and requirements for large energy efficiency programs within utilities. While low cost market transformation activities can provide significant benefits, these higher cost market transformation activities have a much greater impact on accelerating the market adoption of new technologies. In particular, the higher cost incentives create an early large market for consumers which can create production economies to further reduce costs.

These low and high cost market transformation programs effectively help technologies bridge the gap to the commercial market. These successful activities are an important reason why California is now the worlds leader in energy technology development.

4. Options for Addressing the Commercialization Issue

The RD&D Working Group recognizes that there is a problem in moving energy technologies from RD&D into the marketplace. Based on the CPUC's Restructuring Decision the CEC staff has identified at least three options to address this problem.

a. Option One -Increase RD&D Funding to Cover Public Interest Commercialization Activities

Historically, utility RD&D budgets have included little, if any, funding for commercialization activities of any type. Hence, commercialization activities by utilities were limited, or non-existent. Since the WG recognizes the need to connect public interest RD&D activities to the market, one option for achieving this would be to increase the total funding available for public interest RD&D activities so that the RO could engage in appropriate and necessary public interest commercialization activities. In determining the level of such a funding increase, it is important to recognize that public interest commercialization activities can be of either limited-scale (e.g., simple information dissemination), larger-scale (e.g., public purpose launch orders), or a combination of both.

b. Option Two - Fund Commercialization Activities Through Other Public Purpose Programs

In this option, public interest commercialization activities would be primarily assigned to, and funded by, the public interest Energy Efficiency program and/or the Renewables program. The various public purpose working groups will need to determine the extent to which, under this proposal, other public purpose program budgets should be increased. In addition, if this option is selected, close coordination

between the RD&D program and the other public purpose programs will be essential to ensure that the results of the public interest RD&D activities are connected to the public interest commercialization activities.

c. Option Three - Do Nothing

This option would not address the public interest commercialization issue at all. The "do nothing" option runs the real risk of rendering significant portions of the public interest RD&D program ineffective in delivering benefits to California citizens.

APPENDIX TO CHAPTER III

APPENDIX III: FUNDING OF PUBLIC INTEREST RD&D ACTIVITIES

A. BASIC HISTORICAL DATA

1. Total RD&D Expenditure

The total historical spending levels on RD&D were compiled to obtain an overall understanding of the RD&D spending trends. This section shows the total RD&D expenditures for IOUs, municipal utilities, and research agencies. The operating revenues of the IOUs, SMUD and LADWP, as well as a spreadsheet detailing IOU research contributions are also included.

The data were obtained from the IOU annual RD&D reports to the CPUC, SMUD's Advanced and Renewable Technologies (ART) summaries, the annual RD&D project reports from the Electric Power Research Institute (EPRI) and the Gas Research Institute (GRI), and conversations with company employees. The data have been altered only in that transportation funding is excluded, where possible. This exclusion was made since the California Public Utilities Commission (CPUC) has a separate proceeding to handle transportation RD&D activities.

2. Total IOU RD&D Expenditures by 740.1 Categories

This section also provides total RD&D spending information. After gaining an understanding of overall RD&D spending trends, it is helpful to understand how the spending within various categories of RD&D changed over time. Therefore, the total expenditures are broken down into the spending within each of the five California Public Utilities Code Section 740.1 categories. (The CPUC Code 740.1 requires the IOU's to report RD&D spending in these categories.) Once again, the data is taken directly from the IOU annual RD&D reports, and transportation research is excluded. Funding for municipal utilities and research agencies are not included in this section, since they do not categorize their projects using the 740.1 categories.

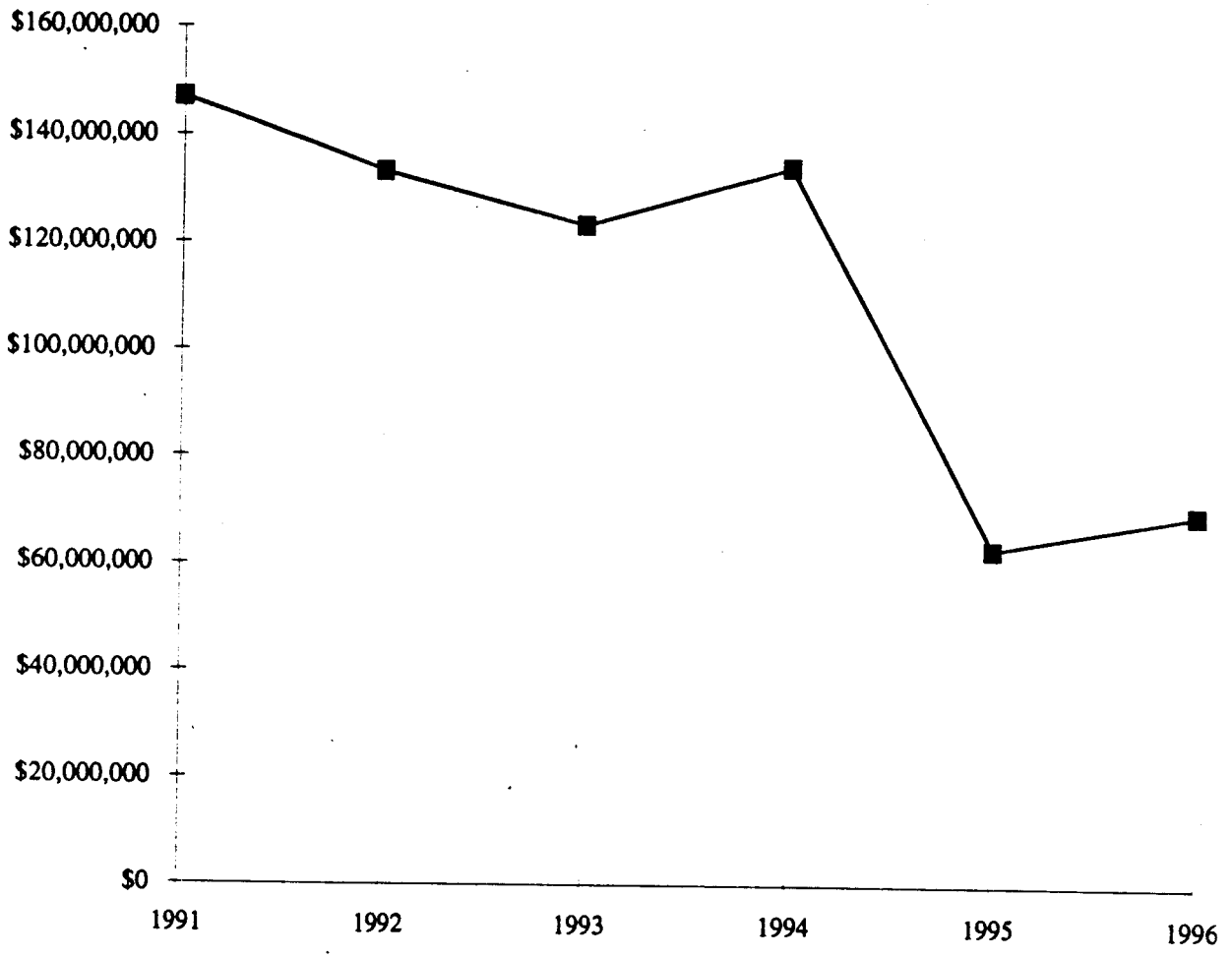
APPENDIX III: FUNDING OF PUBLIC INTEREST RD&D ACTIVITIES

A. BASIC HISTORICAL DATA

1. Total RD&D Expenditures

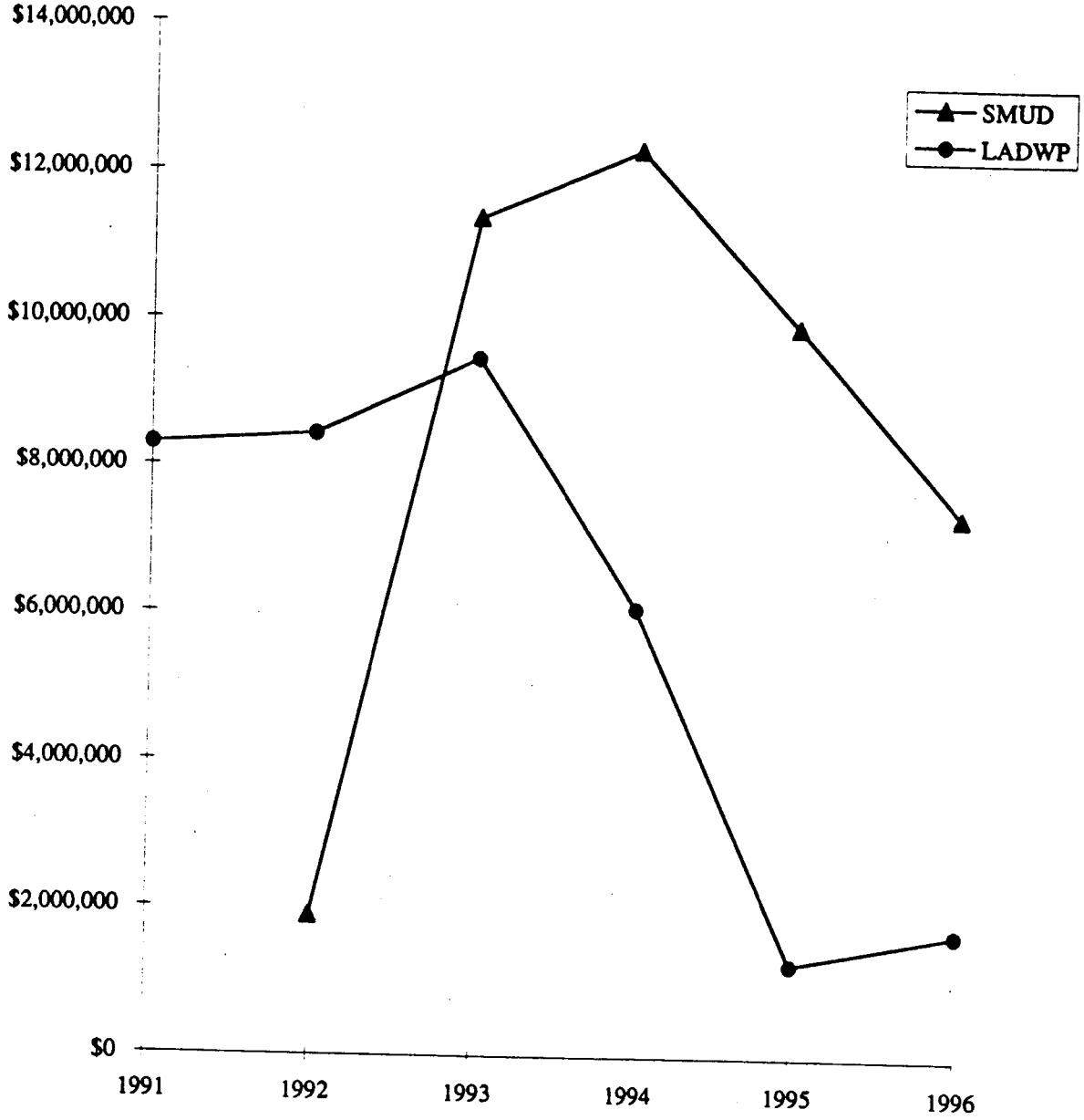
- Chart: Total RD&D Expenditures by CA IOUs (1996$)
- Chart: Total RD&D Expenditures by SMUD & LADWP (1996$)
- Chart: GRI and EPRI Total R&D Expenditures
- Total IOU RD&D Expenditures (Excluding Transportation)
- IOU Operating Revenues and RD&D Expenditures as a percent of Operating Revenues
- LADWP and SMUD Total RD&D Expenditures
- SMUD and LADWP Operating Revenues, DOE RD&D Expenditures in California, and CIEE RD&D Expenditures
- EPRI and GRI Total R&D Spending
- EPRI R&D Expenditures for California
- GRI R&D Expenditures for California
- IOU Research Contributions to EPRI, GRI, and CIEE

Total RD&D Expenditures By California IOUs
1996$



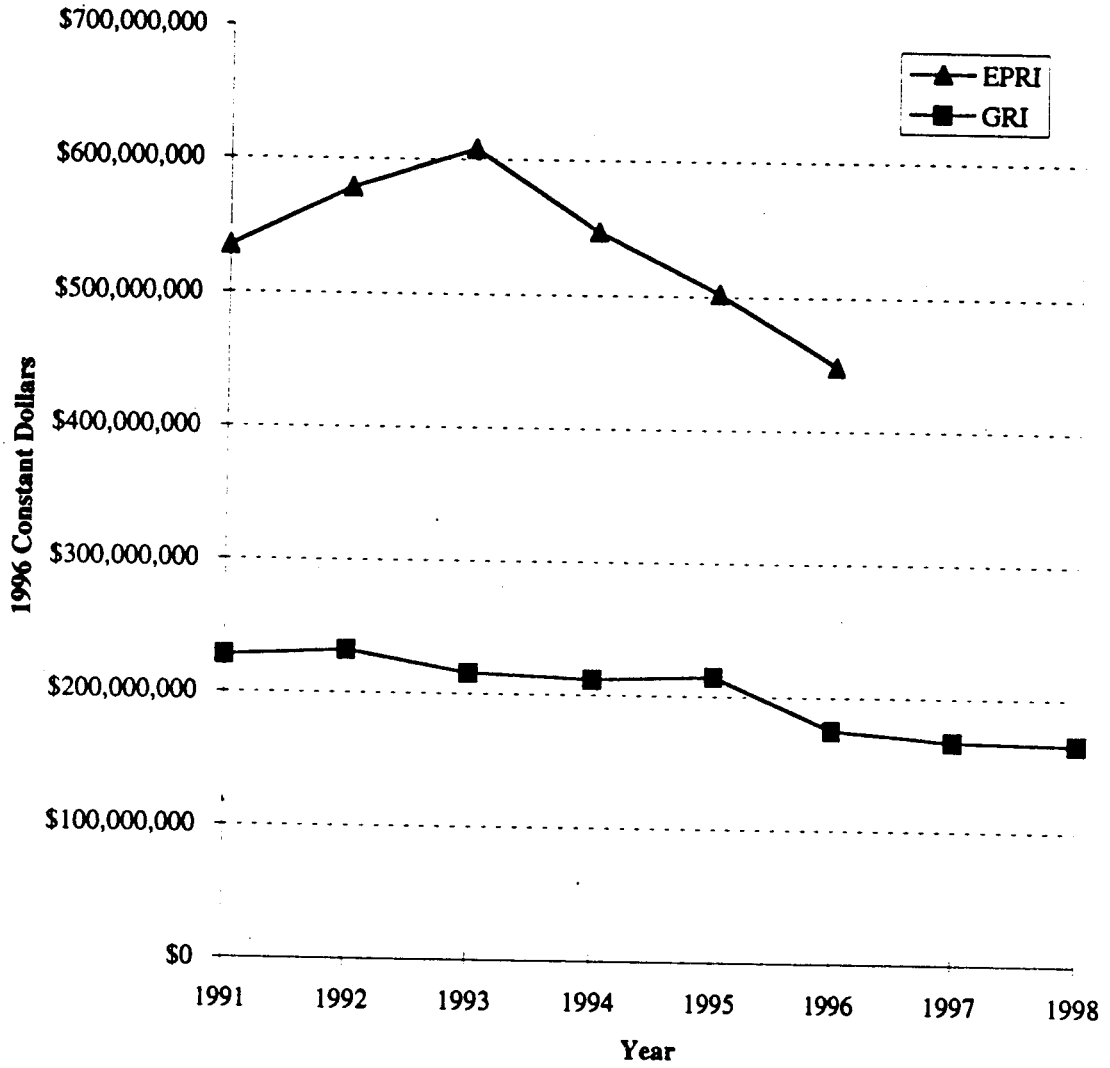
Source: Utility Annual R&D Reports. 1996 figure is utility planned spending.
Transportation RD&D excluded. IOUs include PG&E, SCE, SDG&E & SCG.

Total RD&D Expenditures by SMUD & LADWP
1996$



Sources: LADWP figures provided by John Schumann of LADWP.
SMUD data based on ART summaries. SMUD R&D Program began in mid-1992.
Transportation RD&D excluded.

GRI and EPRI Total R&D Expenditures



Note: Transportation Included. GRI Sources: GRI R&D Plans 1992, 1995 and 1996, and GRI Staff Ron Edelstein. All figures are approved or planned spending. EPRI Sources: EPRI R&D Plans 1992 and 1993, and EPRI Staff Bob Sherman. 1993 and 1996 figures are planned spending.

Basic Historical Data
Total RD+D Expenditures

Total IOU RD&D Expenditures (Excluding Transportation)
Nominal $

	1991	1992	1993	1994	1995	1996
PG&E	$49,396,000	$48,483,000	$49,454,000	$45,961,000	$22,756,000	$31,653,000
SCE	$65,878,000	$51,666,000	$47,527,000	$61,474,000	$24,336,000	$23,026,000
SDG&E	$3,415,000	$6,119,000	$6,684,000	$7,193,000	$7,203,000	$6,762,000
Gas Company	$11,350,000	$16,047,000	$11,429,000	$13,152,000	$7,344,000	$8,247,000
Total (no Gas Co.)	$118,689,000	$106,268,000	$103,665,000	$114,628,000	$54,295,000	$61,441,000
Total (with Gas Co.)	$130,039,000	$122,315,000	$115,094,000	$127,780,000	$61,639,000	$69,688,000

Source: Utility Annual R&D Reports.
1996 figures are utility planned spending.

Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1

Total IOU RD&D Expenditures (Excluding Transportation)
1996$

	1991	1992	1993	1994	1995	1996
PG&E	$55,817,480	$52,846,470	$52,965,234	$48,259,050	$23,211,120	$31,653,000
SCE	$74,442,140	$56,315,940	$50,901,417	$64,547,700	$24,822,720	$23,026,000
SDG&E	$3,858,950	$6,669,710	$7,158,564	$7,552,650	$7,347,060	$6,762,000
Gas Company	$12,825,500	$17,491,230	$12,240,459	$13,809,600	$7,490,880	$8,247,000

	1991	1992	1993	1994	1995	1996
Total Electric IOUs	$134,118,570	$115,832,120	$111,025,215	$120,359,400	$55,380,900	$61,441,000
Total R&D (Including SCG)	$146,944,070	$133,323,350	$123,265,674	$134,169,000	$62,871,780	$69,688,000

Source: Utility Annual R&D Reports.
1996 figures are utility planned spending.

Basic Historical Data
Total RD+D Expenditures

IOU Operating Revenues (nominal $)	1991	1992	1993	1994	1995	1996
PG&E	$9,778,000,000	$10,296,000,000	$10,582,408,000	$10,447,351,000	$10,447,351,000	$10,447,351,000
SCE	$7,298,000,000	$7,722,000,000	$7,397,000,000	$7,799,000,000	$7,799,000,000	$7,799,000,000
SDG&E	$1,789,000,000	$1,870,900,000	$1,980,115,000	$1,982,037,000	$1,982,037,000	$1,982,037,000
Gas Company	$2,928,000,000	$2,839,924,387	$2,811,073,534	$2,587,000,000	$2,280,000,000	$2,280,000,000
Total	$21,793,000,000	$22,728,824,387	$22,770,596,534	$22,815,388,000	$22,508,388,000	$22,508,388,000
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1

IOU Operating Revenues 1996$	1991	1992	1993	1994	1995	1996
PG&E	$11,049,140,000	$11,222,640,000	$11,323,176,560	$10,969,718,550	$10,656,298,020	$10,447,351,000
SCE	$8,246,740,000	$8,416,980,000	$7,914,790,000	$8,188,950,000	$7,954,980,000	$7,799,000,000
SDG&E	$2,021,570,000	$2,039,281,000	$2,118,723,050	$2,081,138,850	$2,021,677,740	$1,982,037,000
Gas Company	$3,308,640,000	$3,095,517,582	$3,007,848,681	$2,716,350,000	$2,325,600,000	$2,280,000,000
Total	$24,626,090,000	$24,774,418,582	$24,364,538,291	$23,956,157,400	$22,958,555,760	$22,508,388,000

Source: Utility Annual Reports;
1996 figures are utility estimates.

Total IOU R&D Expenditures as % of Operating Revenues 1996$	1991	1992	1993	1994	1995	1996
PG&E	0.51%	0.47%	0.47%	0.44%	0.22%	0.30%
SCE	0.90%	0.67%	0.64%	0.79%	0.31%	0.30%
SDG&E	0.19%	0.33%	0.34%	0.36%	0.36%	0.34%
Gas Company	0.39%	0.57%	0.41%	0.51%	0.32%	0.36%
Total	0.60%	0.54%	0.51%	0.56%	0.27%	0.31%

Basic Historical Data
Total RD+D Expenditures

LADWP Total RD&D Expenditures
Source: LADWP figures provided by John Schumann of LADWP.

	1991	1992	1993	1994	1995	1996
EPRI	$5,100,000	$5,200,000	$5,200,000	$2,600,000	$0	$0
R&D	$1,510,000	$1,937,000	$2,637,000	$2,508,000	$1,125,000	$1,574,000
EMF	$672,000	$549,000	$724,000	$600,000	$129,000	$131,000
TP	$60,000	$55,000	$282,000	$82,000	$0	$0
DSM	$0	$511,000	$503,000	$353,000	$19,000	$0
Total (nominal $)	$7,342,000	$8,252,000	$9,346,000	$6,143,000	$1,273,000	$1,705,000
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
Total (1996$)	$8,296,460	$8,994,680	$10,000,220	$6,450,150	$1,298,460	$1,705,000
Not included in our figures						
EV	$4,911,000	$764,000	$875,000	$1,308,000	$1,231,000	$1,442,000
MISC	$228,000	$386,000	$168,000	$0	$0	$0
Subtotal (nomial$)	$5,139,000	$1,150,000	$1,043,000	$1,308,000	$1,231,000	$1,442,000
Spending (All) nominal$	$12,481,000	$9,402,000	$10,389,000	$7,451,000	$2,504,000	$3,147,000

SMUD Total RD&D Expenditures (Transportation Excluded)
Source: SMUD data based on ART summaries. R&D program started in mid-1992. SMUD contact: Bud Beebe.

Category	1991	1992	1993	1994	1995	1996
Solar Programs				$6,303,000	$5,613,000	$4,611,500
Fuel Cell				$2,933,000	$1,581,000	$1,635,000
Biomass				$220,000	$333,000	$213,000
Advanced Turbines				$646,000	$429,000	$90,000
Customer Tech minus Transportation				$1,599,000	$1,758,000	$802,000
Total R&D Spending (nominal $)		$1,737,000	$10,622,000	$11,701,000	$9,714,000	$7,351,500
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
Total R&D Spending (1996 $)		$1,893,330	$11,365,540	$12,286,050	$9,908,280	$7,351,500

Municipals Total RD&D Expenditures Overview (Transportation Excluded)

1996$	1991	1992	1993	1994	1995	1996
SMUD		$1,893,330	$11,365,540	$12,286,050	$9,908,280	$7,351,500
LADWP	$8,296,460	$8,437,690	$9,470,853	$6,079,500	$1,279,080	$1,705,000

Basic Historical Data
Total RD+D Expenditures

SMUD & LADWP Operating Revenues

nominal $	1991	1992	1993	1994	1995	1996
SMUD	$644,393,000	$648,170,000	$617,117,000	$644,342,000	$613,896,000	$613,896,000
LADWP	$1,811,955,000	$1,829,075,000	$2,037,699,000	$1,933,345,000	Not Available	Not Available
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1

1996$	1991	1992	1993	1994	1995	1996
SMUD	$728,164,090	$706,505,300	$660,315,190	$676,559,100	$626,173,920	$613,896,000
LADWP	$2,047,509,150	$1,993,691,750	$2,180,337,930	$2,030,012,250	Not Available	Not Available

Source: SMUD & LADWP Annual Reports

DOE RD&D Expenditures in CA	1991	1992	1993	1994	1995	1996
1996$ (no nuclear)	$649,297,000	$691,237,000	$660,276,000	$682,598,000	$744,560,000	$658,833,000

Source: Deptartment of Energy, *Congressional Budget Obligations-Estimates*, 1991-1996.
*DOE figures include spending in CA on: Energy Supply, General Science, Fossil Energy, Energy Conservation, EIA.
Transportation, Nuclear, and Defense not included.

CIEE RD&D Expenditures	1991	1992	1993	1994	1995	1996
CIEE (Nominal $)	$3,559,200	$5,527,000	$5,885,000	$2,227,000	$2,201,000	$3,775,000
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
CIEE (1996$)	$4,021,896	$6,024,430	$6,296,950	$2,338,350	$2,245,020	$3,775,000

Source: Cindy Polensky of CIEE via Mike Batham of CEC.

Basic Historical Data
Total RD+D Expenditures

EPRI Total R&D Expenditures
(Transportation Included)

	1986	1987	1988	1989	1990
Back Years (Nominal $)	$306,000,000	$340,000,000	$405,000,000	$392,000,000	$412,000,000

	1991	1992	1993	1994	1995	1996
EPRI (nominal $)	$473,000,000	$531,000,000	$568,000,000	$521,000,000	$492,000,000	$448,000,000
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
EPRI 1996$	$534,490,000	$578,790,000	$607,760,000	$547,050,000	$501,840,000	$448,000,000

	2000
Estimated Spending	$340,000,000

Sources:
86-90 data from 1990 Annual Report
1991 data from 1992 Annual Report
1992-1993 data from 1993 Annual Report (1993 figure planned)
1994-1995 data from Table "EPRI 1994-1995 Revenue and Expenditures" (1995 figure made around Oct. of that year)
1996 data from Bob Sherman, EPRI staff.

GRI Total R&D Expenditures
(Transportation Included)

	1991	1992	1993	1994	1995	1996
GRI (nominal $)	$201,800,000	$212,900,000	$201,800,000	$201,800,000	$210,360,000	$175,000,000
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
GRI (1996$)	$228,034,000	$232,061,000	$215,926,000	$211,890,000	$214,567,200	$175,000,000

	1997	1998	2000
GRI (1996$)	$167,217,990	$165,814,973	$165,912,568

Sources:
1991 is Approved spending from 1992 R&D Report
1992 is Planned spending from 1992 Report
1993 is Approved spending from copy sent to CEC by GRI
1994 is Approved spending from 95-96 report
1995 is Approved spending from 96 report
1996-98 data from GRI staff, Ron Edelstein
2000 data from July 27, 1995 Fax from Ron Edelstein

Basic Historical Data
EPRI R+D Expenditures for California

EPRI (Includes Transportation)

	1991	1992	1993	1994	1995	1996
Total Expenditures (1996$)	$534,490,000	$578,790,000	$607,760,000	$547,050,000	$501,840,000	$448,000,000
BTUs used by California for electricity						
Residential			229.8			
Commercial			295.6			
Industrial			191.7			
Total			717.1			
BTUs used Nationally for electricity						
Residential			3394.2			
Commercial			3021.9			
Industrial			3334.0			
Total			9750.1			
California as % of Total			7.35%			
Total EPRI Expenditures for CA	**$39,310,651**	**$42,568,826**	**$44,699,510**	**$40,234,413**	**$36,909,310**	**$32,949,488**

Sources for EPRI data:
86-90 from 1990 Annual Report
1991 from 1992 Annual Report
1992-1993 from 1993 Annual Report (1993 figure planned)
1994-1995 from Table "EPRI 1994-1995 Revenue and Expenditures" (1995 figure made around Oct. of that year)
1996 from Bob Sherman, EPRI staff.

Source for CA electricity use:
State Energy Data Report

Basic Historical Data
GRI R+D Expenditures for California

GRI (Includes Transportation)

	1991	1992	1993	1994	1995	1996
Total R&D Expenditures (1996$)	$228,034,000	$232,061,000	$215,926,000	$211,890,000	$214,567,200	$175,000,000
Gas Used by CA as % of Total	10.34%	10.39%	9.74%	10.23%	10.07%	10.07%
Total R&D Expenditures for CA	**$23,578,716**	**$24,111,138**	**$21,031,192**	**$21,676,347**	**$21,606,917**	**$17,622,500**

Sources for GRI data:
1991 is Approved spending from 1992 R&D Report
1992 is Planned spending from 1992 Report
1993 is Approved spending from copy sent to CEC by GRI
1994 is Approved spending from 95-96 report
1995 is Approved spending from 96 report, confirmed by Ron Edelstein.
1996 data from Ron Edelstein

Source for CA gas use:
Basic Petroleum Data Book

IOU Research Contributions
1996$

Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
Year	1991	1992	1993	1994	1995	1996
PG&E						
EPRI (Membership & Participation)	$15,511,510	$15,691,640	$15,708,670	$15,000,000	$0	$0
GRI (Participation)	$1,524,370	$1,924,940	$926,620	$1,000,000	$1,020,000	$1,000,000
CIEE	$1,695,000	$1,635,000	$1,605,000	$1,000,000	$0	$0
Subtotal	$18,730,880	$19,251,580	$18,240,290	$17,000,000	$1,020,000	$1,000,000
SCE						
EPRI (Membership & Participation)	$0	$0	$9,437,400	$18,519,900	$14,790,000	$14,935,000
GRI (Participation)	$0	$0	$0	$0	$0	$0
CIEE	$0	$1,090,000	$1,070,000	$1,050,000	$0	$0
Subtotal	$0	$1,090,000	$10,507,400	$19,569,900	$14,790,000	$14,935,000
SCG						
EPRI (Membership & Participation)	$0	$0	$0	$0	$0	$0
GRI (Participation)*	$2,486,000	$2,180,000	$3,531,000	$3,150,000	$1,836,000	$1,800,000
CIEE	$665,570	$654,000	$642,000	$630,000	$0	$0
Subtotal	$3,151,570	$2,834,000	$4,173,000	$3,780,000	$1,836,000	$1,800,000
SDG&E						
EPRI (Membership & Participation)	$0	$3,908,740	$3,878,750	$3,786,300	$3,666,900	$2,984,000
GRI (Participation)	$32,770	$23,980	$26,750	$15,750	$21,420	$35,000
CIEE	$0	$389,130	$376,640	$0	$0	$0
Subtotal	$32,770	$4,321,850	$4,282,140	$3,802,050	$3,688,320	$3,019,000
LADWP						
EPRI (Membership & Participation)	$5,100,000	$5,200,000	$5,200,000	$2,600,000	$0	$0
Total No Gas						
EPRI (Membership & Participation)	$20,611,510	$24,800,380	$34,224,820	$39,906,200	$18,456,900	$14,970,000
GRI (Participation)	$1,557,140	$1,948,920	$953,370	$1,015,750	$1,041,420	$3,984,000
CIEE	$1,695,000	$3,114,130	$3,051,640	$2,050,000	$0	$0
Subtotal	$23,863,650	$29,863,430	$38,229,830	$42,971,950	$19,498,320	$18,954,000
Total with Gas						
EPRI (Membership & Participation)	$20,611,510	$24,800,380	$34,224,820	$39,906,200	$18,456,900	$14,970,000
GRI (Participation)	$4,043,140	$4,128,920	$4,484,370	$4,165,750	$2,877,420	$5,784,000
CIEE	$2,360,570	$3,768,130	$3,693,640	$2,680,000	$0	$0
Total	**$27,015,220**	**$32,697,430**	**$42,402,830**	**$46,751,950**	**$21,334,320**	**$20,754,000**

Source: Utility Annual R&D Reports.
*SCG cofunding to GRI is rough estimate from staff David Berekoff.

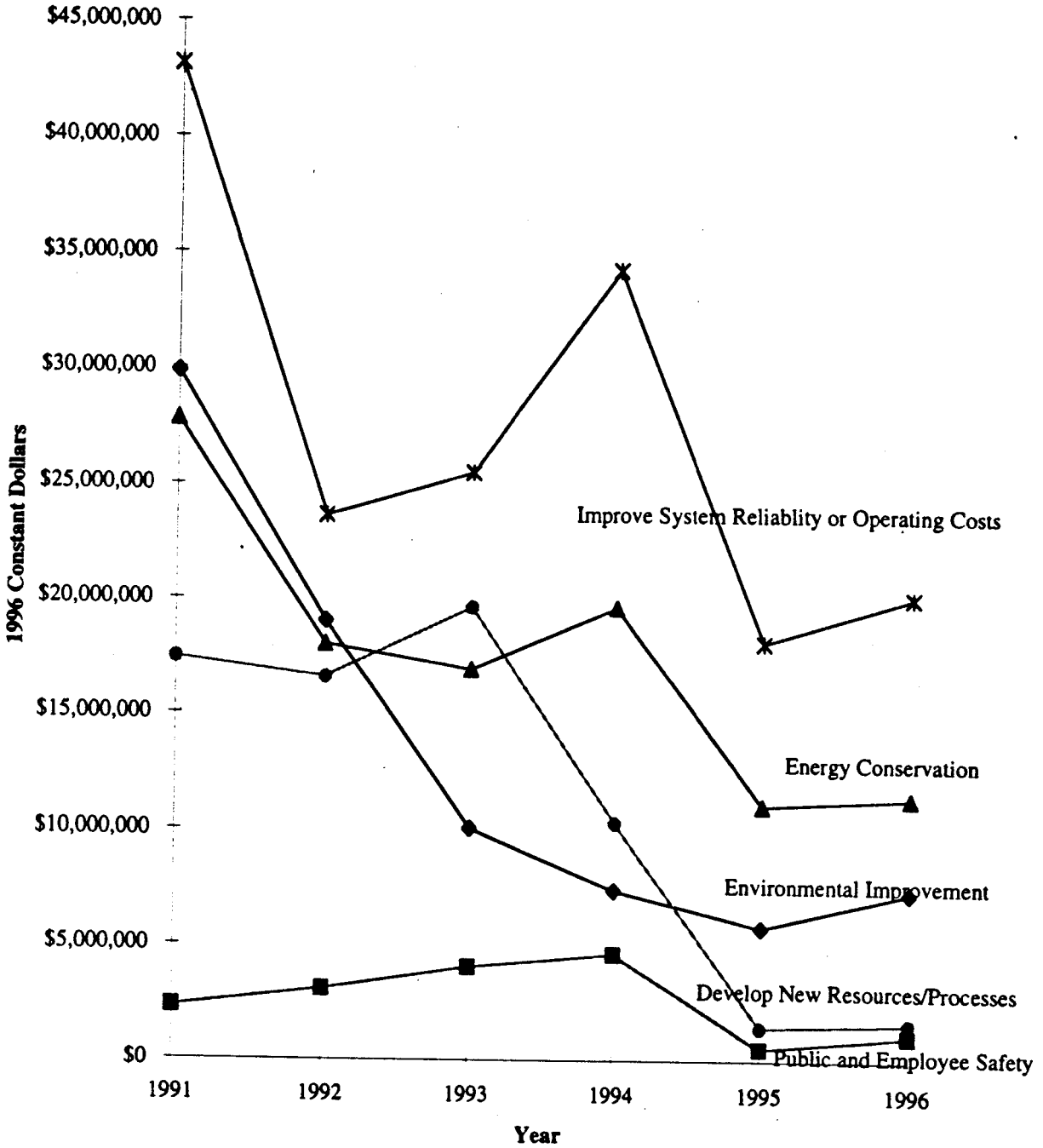
APPENDIX III: FUNDING OF PUBLIC INTEREST RD&D ACTIVITIES

A. BASIC HISTORICAL DATA

2. Total IOU RD&D Expenditures by 740.1 Categories

- Chart: IOU RD&D Spending by 740.1 Categories
- Chart Data: IOU RD&D Spending by 740.1 Categories
- PG&E RD&D Spending by 740.1 Categories
- SCE RD&D Spending by 740.1 Categories
- SDG&E RD&D Spending by 740.1 Categories
- State Electric IOU RD&D Spending by 740.1 Categories
- SCG RD&D Spending by 740.1 Categories
- State IOU RD&D Spending by 740.1 Categories

IOU RD&D Spending by 740.1 Categories



Source: Utility Annual R&D Reports.
1996 figures are utility planned spending.
Transportation RD&D exluded.

Basic Historical Data
IOU RD+D Spending by 740.1 Categories

Total RD&D Spending by PG&E, SCE, SDG&E, and SCG by 740.1 Categories

nominal $	1991	1992	1993	1994	1995	1996
Environmental Improvement	$26,407,000	$17,454,000	$9,408,000	$7,041,000	$5,681,000	$7,313,000
Public and Employee Safety	$2,046,000	$2,824,000	$3,783,000	$4,402,000	$506,000	$1,086,000
Energy Conservation	$24,578,000	$16,536,000	$15,814,000	$18,708,000	$10,850,000	$11,391,000
Development of New Resources or Processes	$15,421,000	$15,237,000	$18,375,000	$9,839,000	$1,424,000	$1,646,000
Improved System Reliablity and/or Reduced Operating Costs	$38,146,000	$21,680,000	$23,839,000	$32,640,000	$17,757,000	$20,111,000
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
1996$	1991	1992	1993	1994	1995	1996
Environmental Improvement	$29,839,910	$19,024,860	$10,066,560	$7,393,050	$5,794,620	$7,313,000
Public and Employee Safety	$2,311,980	$3,078,160	$4,047,810	$4,622,100	$516,120	$1,086,000
Energy Conservation	$27,773,140	$18,024,240	$16,920,980	$19,643,400	$11,067,000	$11,391,000
Development of New Resources or Processes	$17,425,730	$16,608,330	$19,661,250	$10,330,950	$1,452,480	$1,646,000
Improved System Reliablity and/or Reduced Operating Costs	$43,104,980	$23,631,200	$25,507,730	$34,272,000	$18,112,140	$20,111,000

Source: Utility Annual R&D Reports.

Basic Historical Data
IOU RD+D Spending by 740.1 Categories

PG&E
No transportation. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement						
Air Quality Improvement	$2,624,000	$2,187,000	$2,269,000	$3,417,000	$399,000	$500,000
Water Quality Improvement	$0	$57,000	$0	$0	$1,748,000	$2,838,000
Hazardous Waste Prevention	$164,000	$150,000	$336,000	$211,000	$1,204,000	$1,831,000
Environmental Improvement Subtotal	$2,788,000	$2,394,000	$2,605,000	$3,628,000	$8,000	$0
Public and Employee Safety	$535,000	$1,055,000	$974,000	$575,000	$3,359,000	$5,169,000
Energy Conservation	$6,356,000	$6,688,000	$6,475,000	$5,761,000	$76,000	$200,000
					$5,137,000	$5,861,000
Development of New Resources or Processes						
	$800,000	$620,000	$2,680,000	$0	$0	$0
Renewable Resources	$4,320,000	$4,336,000	$3,270,000	$590,000	$576,000	$260,000
Non-Renewable Resources	$1,618,000	$1,845,000	$0	$0	$0	$0
Development of New Resources or Processes Subtotal	$6,738,000	$6,801,000	$5,950,000	$590,000	$576,000	$260,000
Improved System Reliablity and/or Reduced Operating Costs	$10,585,000	$8,484,000	$10,738,000	$12,477,000	$9,577,000	$12,678,000
Contributions						
GRI (Participation)	$1,349,000	$1,766,000	$866,000	$1,000,000	$1,000,000	$1,000,000
EPRI (Membership & Participation)	$13,727,000	$14,396,000	$14,681,000	$15,000,000	$0	$0
CIEE	$1,500,000	$1,500,000	$1,500,000	$1,000,000	$0	$0
Others (ex: IGT, West Associates)	$547,000	$467,000	$174,000	$364,000	$154,000	$3,035,000
Contributions Subtotal	$17,123,000	$18,129,000	$17,221,000	$17,364,000	$1,154,000	$4,035,000
Total Administration	$5,271,000	$4,932,000	$5,903,000	$5,536,000	$2,877,000	$3,450,000
Total RD&D Spending (nominal $)	$49,396,000	$48,483,000	$49,866,000	$45,931,000	$22,756,000	$31,653,000
Inflation Adjuster	1.13	1.09	1.07	1.05	1.02	1
Total RD&D Spending 1996$	**$55,817,480**	**$52,846,470**	**$53,356,620**	**$48,227,550**	**$23,211,120**	**$31,653,000**

Source: Utility Annual RD&D Reports

Basic Historical Data
IOU RD+D Spending by 740.1 Categories

SCE
No transportation. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement						
Air Quality Improvement		$1,375,000	$1,015,000			
Water Quality Improvement	$16,257,000	$4,868,000	$3,484,000	$1,069,000	$545,000	$400,000
Hazardous Waste Prevention		$803,000	$426,000	$272,000	$430,000	$350,000
Environmental Improvement Subtotal	$1,115,000	$658,000	$487,000	$160,000	$0	$0
	$18,764,000	$7,704,000	$5,412,000	$1,501,000	$975,000	$750,000
Public and Employee Safety	$1,420,000	$1,618,000	$2,440,000	$3,682,000	$248,000	$570,000
Energy Conservation	$16,408,000	$7,346,000	$6,428,000	$6,309,000	$1,704,000	$1,200,000
Development of New Resources or Processes						
Renewable Resources		$3,739,000	$1,950,000	$0	$284,000	($154,000)
Non-Renewable Resources	$5,068,000	$4,191,000	$7,128,000	$5,440,000	$196,000	$200,000
Development of New Resources or Processes Subtotal		$0	$283,000	$2,786,000	$99,000	$550,000
	$7,627,000	$7,930,000	$9,361,000	$8,226,000	$579,000	$596,000
Improved System Reliablity and/or Reduced Operating Costs	$25,112,000	$9,969,000	$10,650,000	$16,260,000	$4,788,000	$4,475,000
Contributions						
GRI (Participation)	$0	$0	$0	$0	$0	$0
EPRI (Membership & Participation)	$0	$0	$8,820,000	$17,638,000	$12,000,000	$12,000,000
CIEE	$0	$1,000,000	$1,000,000	$1,000,000	$936,000	$1,000,000
Others (ex: IGT, West Associates)	$0	$37,000	$51,000	$48,000	$0	$0
Contributions Subtotal	$0	$1,037,000	$9,871,000	$18,686,000	$12,936,000	$13,000,000
Total Administration	$0	$2,414,000	$6,209,000	$6,811,000	$3,390,000	$2,281,000
Total RD&D Spending	$69,331,000	$38,018,000	$50,371,000	$61,475,000	$24,620,000	$22,872,000
Inflation Adjuster	1.13	1.09	1.07	1.05	1.02	1
Total RD&D Spending 1996$	**$78,344,030**	**$41,439,620**	**$53,896,970**	**$64,548,750**	**$25,112,400**	**$22,872,000**

Source: Utility Annual RD&D Reports

Basic Historical Data
IOU RD+D Spending by 740.1 Categories

SDG&E
No transportation. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement						
Air Quality Improvement	$216,000	$32,000	$142,000	$240,000	$271,000	$140,000
Water Quality Improvement	$84,000	$12,000	$0	$40,000	$0	$20,000
Hazardous Waste Prevention	$36,000	$5,000	$6,000	$0	$0	$25,000
Environmental Improvement Subtotal	$336,000	$49,000	$148,000	$280,000	$271,000	$185,000
Public and Employee Safety	$91,000	$121,000	$184,000	$62,000	$105,000	$225,000
Energy Conservation	$814,000	$716,000	$211,000	$191,000	$332,000	$346,000
Development of New Resources or Processes		$466,000				
Renewable Resources	$1,009,000	$12,000	$15,000	$16,000	$66,000	$25,000
Non-Renewable Resources	$47,000	$0	$880,000	$1,007,000	$203,000	$765,000
Development of New Resources or Proecesses Subtotal	$1,056,000	$478,000	$895,000	$1,023,000	$269,000	$790,000
Improved System Reliablity and/or Reduced Operating Costs	$360,000	$374,000	$763,000	$1,469,000	$1,805,000	$1,427,000
Contributions						
GRI (Participation)	$29,000	$22,000	$25,000	$15,000	$21,000	$35,000
EPRI (Membership & Participation)	$0	$3,586,000	$3,625,000	$3,606,000	$3,595,000	$2,984,000
CIEE	$357,000	$357,000	$352,000	$0	$0	$0
Others (ex: IGT, West Associates)	$11,000	$18,000	$15,000	$1,000	$105,000	$105,000
Contributions Subtotal	$397,000	$3,983,000	$4,017,000	$3,622,000	$3,721,000	$3,124,000
Total Administration	$361,000	$399,000	$466,000	$546,000	$655,000	$665,000
Total RD&D Spending (nominal $)	$3,415,000	$6,120,000	$6,684,000	$7,193,000	$7,158,000	$6,762,000
Inflation Adjuster	1.13	1.09	1.07	1.05	1.02	1
Total RD&D Spending 1996$	**$3,858,950**	**$6,670,800**	**$7,151,880**	**$7,552,650**	**$7,301,160**	**$6,762,000**

Source: Utility Annual RD&D Reports
Figures adjusted according to SDG&E staff calculations to avoid double counting research contributions.

Basic Historical Data
IOU RD+D Spending by 740.1 Categories

State Electric IOU Totals (no SoCalGas)
No transportation. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement						
Air Quality Improvement	$19,097,000	$7,087,000	$5,895,000	$4,726,000	$2,564,000	$3,378,000
Water Quality Improvement	$84,000	$872,000	$426,000	$312,000	$1,634,000	$2,201,000
Hazardous Waste Prevention	$1,315,000	$813,000	$829,000	$371,000	$8,000	$25,000
Environmental Improvement Subtotal	$21,888,000	$10,147,000	$8,165,000	$5,409,000	$4,605,000	$6,104,000
Public and Employee Safety	$2,046,000	$2,794,000	$3,598,000	$4,319,000	$429,000	$995,000
Energy Conservation	$23,578,000	$14,750,000	$13,114,000	$12,261,000	$7,173,000	$7,407,000
Development of New Resources or Processes						
Renewable Resources	$10,397,000	$8,539,000	$10,413,000	$6,046,000	$838,000	$485,000
Non-Renewable Resources	$1,665,000	$1,845,000	$1,163,000	$3,793,000	$302,000	$1,315,000
Development of New Resources or Processes Subtotal	$15,421,000	$15,209,000	$16,206,000	$9,839,000	$1,424,000	$1,646,000
Improved System Reliablity and/or Reduced Operating Costs	$36,057,000	$18,827,000	$22,151,000	$30,206,000	$16,170,000	$18,580,000
Contributions						
GRI (Participation)	$1,378,000	$1,788,000	$891,000	$1,015,000	$1,021,000	$1,035,000
EPRI (Membership & Participation)	$13,727,000	$17,982,000	$27,126,000	$36,244,000	$15,595,000	$14,984,000
CIEE	$1,857,000	$2,857,000	$2,852,000	$2,000,000	$936,000	$1,000,000
Others (ex: IGT, West Associates)	$558,000	$522,000	$240,000	$413,000	$259,000	$3,140,000
Contributions Subtotal	$17,520,000	$23,149,000	$31,109,000	$39,672,000	$17,811,000	$20,159,000
Total Administration	$5,632,000	$7,745,000	$12,578,000	$12,893,000	$6,922,000	$6,396,000
Total RD&D Spending	$122,142,000	$92,621,000	$106,921,000	$114,599,000	$54,534,000	$61,287,000
Inflation Adjuster	1.13	1.09	1.07	1.05	1.02	1
Total RD&D Spending 1996$	**$138,020,460**	**$100,956,890**	**$114,405,470**	**$120,328,950**	**$55,624,680**	**$61,287,000**

Source: Utility Annual RD&D Reports

Basic Historical Data
IOU RD+D Spending by 740.1 Categories

The Gas Company
No transportation or administration. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement						
Air Quality Improvement	$4,278,000	$6,568,000	$1,113,000	$1,479,000	$1,014,000	$1,034,000
Water Quality Improvement	$35,000	$65,000	$0	$0	$0	$0
Hazardous Waste Prevention	$206,000	$674,000	$130,000	$153,000	$62,000	$175,000
Environmental Improvement Subtotal	$4,519,000	$7,307,000	$1,243,000	$1,632,000	$1,076,000	$1,209,000
Public and Employee Safety	$0	$30,000	$185,000	$83,000	$77,000	$91,000
Energy Conservation	$1,000,000	$1,786,000	$2,700,000	$6,447,000	$3,677,000	$3,984,000
Development of New Resources or Processes						
Renewable Resources						
Non-Renewable Resources						
Development of New Resources or Processes Subtotal	$0	$28,000	$2,169,000	$0	$0	$0
Improved System Reliablity and/or Reduced Operating Costs	$2,089,000	$2,853,000	$1,688,000	$2,434,000	$1,587,000	$1,531,000
Contributions*						
CIEE	$589,000	$600,000	$600,000	$600,000	$0	$0
Contributions Subtotal	$589,000	$600,000	$600,000	$600,000	$0	$0
Total Administration	$1,948,000	$2,673,000	$2,157,000	$2,464,000	$1,376,000	$1,432,000
Total RD&D Spending	$10,145,000	$15,277,000	$10,742,000	$13,660,000	$7,793,000	$8,247,000
Inflation Adjuster	1.13	1.09	1.07	1.05	1.02	1
Total RD&D Spending 1996$	**$11,463,850**	**$16,651,930**	**$11,493,940**	**$14,343,000**	**$7,948,860**	**$8,247,000**

Source: Utility Annual RD&D Reports
*Note: GRI Participation and IGT Contributions distributed within 740.1 Categories.

Basic Historical Data
IOU RD+D Spending by 740.1 Categories

State IOU Totals (Including SoCalGas)
No transportation or administration. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement	$0	$1,375,000	$1,015,000	$0	$399,000	$500,000
Air Quality Improvement	$23,375,000	$13,655,000	$7,008,000	$6,205,000	$3,578,000	$4,412,000
Water Quality Improvement	$119,000	$937,000	$426,000	$312,000	$1,634,000	$2,201,000
Hazardous Waste Prevention	$1,521,000	$1,487,000	$959,000	$524,000	$70,000	$200,000
Environmental Improvement Subtotal	$26,407,000	$17,454,000	$9,408,000	$7,041,000	$5,681,000	$7,313,000
Public and Employee Safety	$2,046,000	$2,824,000	$3,783,000	$4,402,000	$506,000	$1,086,000
Energy Conservation	$24,578,000	$16,536,000	$15,814,000	$18,708,000	$10,850,000	$11,391,000
Development of New Resources or Processes	$800,000	$4,825,000	$4,630,000	$0	$284,000	($154,000)
Renewable Resources	$10,397,000	$8,539,000	$10,413,000	$6,046,000	$838,000	$485,000
Non-Renewable Resources	$1,665,000	$1,845,000	$1,163,000	$3,793,000	$302,000	$1,315,000
Development of New Resources or Processes Subtotal	$15,421,000	$15,237,000	$18,375,000	$9,839,000	$1,424,000	$1,646,000
Improved System Reliablity and/or Reduced Operating Costs	$38,146,000	$21,680,000	$23,839,000	$32,640,000	$17,757,000	$20,111,000
Contributions						
EPRI (Membership & Participation)	$13,727,000	$17,982,000	$27,126,000	$36,244,000	$15,595,000	$14,984,000
GRI (Participation)*	$1,378,000	$1,788,000	$891,000	$1,015,000	$1,021,000	$1,035,000
CIEE	$2,446,000	$3,457,000	$3,452,000	$2,600,000	$936,000	$1,000,000
Others (ex: IGT, West Associates)*	$558,000	$522,000	$240,000	$413,000	$259,000	$3,140,000
Contributions Subtotal	$18,109,000	$5,767,000	$4,583,000	$4,028,000	$2,216,000	$5,175,000
Total Administration	$7,580,000	$10,418,000	$14,735,000	$15,357,000	$8,298,000	$7,828,000
Total RD&D Spending	$132,287,000	$107,898,000	$117,663,000	$128,259,000	$62,327,000	$69,534,000
Inflation Adjuster	1.13	1.09	1.07	1.05	1.02	1
Total RD&D Spending 1996$	**$149,484,310**	**$117,608,820**	**$125,899,410**	**$134,671,950**	**$63,573,540**	**$69,534,000**

Source: Utility Annual RD&D Reports
*Note: Figures do not include SCG Contributions, which are distributed within the 740.1 Categories.

B. SOCIAL INVESTMENT APPROACH

This approach makes the assumption that the ratio of public interest RD&D to total RD&D should remain constant in the restructured electricity market. It is also assumes that a total RD&D spending level of 1% of utility operating revenues is desirable. Using the historical ratios of public to private interest RD&D, the Social Investment Approach calculates the amount of public interest RD&D spending which would be provided if total RD&D spending were increased to 1% of operating revenues. This amount is the recommended level for the public interest surcharge.

- Results
- Sample Calculation
- Calculations

Social Investment Approach
Results

1996$

Parties Included		Using Gap Method % Decline to 2000	Using Project-by-Project Method #1 % Decline	Average of Two Methods
Elec. IOUs (PG&E, SCE, SDG&E)				
So. Cal. Gas				
Municipals				
	Subtotal	$185,810,178	$116,773,163	$151,291,670
CIEE				
	Subtotal	$182,878,404	$144,477,453	**$163,677,929**
GRI (CA prorata share)				
EPRI (CA prorata share)				
	Subtotal	$163,836,999	$144,477,453	$154,157,226
High Cost Mkt. Trans		$60,000,000	$60,000,000	**$60,000,000**
	Total	$223,836,999	$204,477,453	$214,157,226

Recommended Funding Level: **$223,677,929**

Social Investment Approach
Sample Calculation

Public Interest RD&D funding loss from Historical Method / Average RD&D 1991-1994	=	% Project Loss		
Operating Revenues (of gas and electricity sales at the retail level)	*	1%	=	Total RD&D Spending (At a more optimal degree of spending on RD&D.)
% Project Loss	*	Total RD&D Spending	=	Social Investment Public Interest RD&D Spending Level

Therefore:

$107,420,931 / $214,246,900	=	50%		
$28,815,470,447	*	1%	=	$288,154,704
50%	*	$288,154,704	=	$144,477,453

Social Investment Approach Calculations

Average RD&D Spending Between 1991 & 1994

IOU(w/SCG)+Munis:	$148,882,879
+ CIEE	$150,427,701
+ GRI/EPRI (CA prorata share):	$214,246,900

Source: See sources under Appendix III-A, Basic Historical Data

Percent Project Loss by Historical Approach

	Gap Method	Weighting Method	Project-by-Project Method
IOU(w/SCG)+Munis:	64%	39%	41%
plus CIEE:	63%	39%	50%
plus GRI/EPRI (CA prorated):	57%	40%	50%

1994 IOUs/SCG/Muni/Co-op Operating Revenues: $28,815,470,447
(Only includes gas revenues from PG&E/SCE/SDG&E/SCG)

Public Interest RD&D % * Operating Revenues * 1%

	% Public Interest from Gap Method	% Public Interest from Weighting Method	% Public Interest from Project-by-Project #1 Method
IOU(w/SCG)+Munis:	$185,810,178	$113,663,924	$116,773,163
plus CIEE:	$182,878,404	$113,734,667	$144,477,453
plus GRI/EPRI (CA prorated):	$163,836,999	$114,492,214	$144,477,453

C. PROJECT-BY-PROJECT METHOD #1 (TRADITIONAL SCOPE)

The Project-by-Project Method #1 (Traditional Scope) is based on the assumption that only projects which both 1.) are the potential subjects of market barriers (i.e. will not be provided for in the competitive market) and 2.) provide significant benefits to the public should be funded by the public interest surcharge.

A series of questions was developed which are designed to identify specific market barriers and which act as a guide to pin-pointing public interest components. These questions are answered for each individual project listed in the investor-owned utilities' annual RD&D reports for a single pre-restructuring base year. Since the impact of restructuring on utility spending varies according to where the utility is in its General Rate Case cycle, and how aggressive its management is reacting to prospective events, the base years were chosen individually for each utility. For SCE, SDG&E, and SCG a base year of 1993 was chosen. For PG&E a base year of 1994 was used.

The total spending on all projects which met the two criteria of the method was calculated and the percentage of spending on these projects found. This percentage was then multiplied by the average of the total historical spending on all RD&D (1991-1994) to find the suggested public interest surcharge level.

This method yields a total funding level of $67 million for the investor-owned utilities, and $7 million for the two largest municipal utilities (SMUD and LADWP), for a total of $75 million. When $50 million is included for larger scale commercialization activities, the total suggested surcharge level is $125 million.

- Results
- Method to Determine Public Interest RD&D Surcharge Level (A Four Step Process)
- Public and Private RD&D Spending Totals (1996$)
- Public and Private RD&D Spending Totals (nominal$)
- Chart: Breakdown of Historical Public Benefit Utility RD&D (SCE, PG&E, SDG&E and SCG)
- Chart: Breakdown of Historical Public Benefit Utility RD&D (SCE, PG&E, and SDG&E)
- Chart Data
- Categorization of Projects as Public, Private, or Monopoly: SCE, PG&E, SDG&E, and SCG

Project-By-Project #1 (Traditional Scope)
Method Results

1996$	
Parties Included	
Elec. IOUs (PG&E, SCE, SDG&E)	$60,333,996
So. Cal. Gas	$7,065,415
Municipals (LADWP, SMUD)	$7,248,752
Subtotal	$74,648,162
CIEE	$774,556
Subtotal	**$75,422,718**
GRI (CA prorata share)	$11,278,650
EPRI (CA prorata share)	$20,719,562
Subtotal	$107,420,931
DOE in CA	$336,357,473
Subtotal	$443,778,404
High Cost Market Transformation	**$50,000,000**
Total	$493,778,404
Recommended Funding Level:	**$125,422,718**

Project-by-Project Method #1 (Traditional Scope) Questions to Determine Public Interest RD&D Surcharge Level

1. Will this R&D result in any significant social benefits (environmental, economic, security, etc.)? If not, STOP.

2. Will this R&D be adequately conducted by the private sector alone (profit incentive, regulations, customer retention, etc.)? If yes, STOP.

3. If the R&D will not be adequately provided by the private sector, identify which of the market barriers listed below are significant factors.

Market and R&D Barriers:

a. Product only profitable in long term or the R&D is long term (>8 years)(Ex: Solar II).

b. Externalities are not yet internalized by the market (Ex: Greenhouse gas emissions not yet regulated in this country).

c. R&D too risky or high in cost for sole funding by private interests (Ex: Solar dish/Stirling systems).

d. Fragmented market (Ex: Understanding of systemic workings vs. many small, individual component manufacturers with narrow interest in the market).

e. The benefits of the R&D cannot be captured exclusively by the firm making the expenditures. (Ex: Either no intellectual property, or intellectual property quickly emulated by other market participants.)

f. The product resulting from the R&D will have high capital cost.

g. Lack of information for customer choice (Ex: Comparable cost and performance information, "price/unit wt. information for Cheerios at supermarket").

h. Utility is <u>the</u> key player in a collaborative process (Ex: Advanced gas turbine project in which utilities act as the market aggregators; PVUSA in which utilities collaborate to develop a shared database).

4. For those projects which have market barrier(s), determine whether the project has a significant public interest component. Use the following questions as a guide:

a. 1. What is the potential for environmental benefits (ex. reduced emissions or effluent) above and beyond regulations?

2. Will the technology add a significant (in kind or degree) new negative environmental impact if built out to 10% of its technical market potential?

b. 1. What is the potential for public safety benefits (ex. safer PV residential installation practices, safer street excavation in vicinity of gas lines) above and beyond regulations?

2. Will the technology add a significant (in kind or degree) new safety hazard if built out to 10% of its technical market potential?

c. 1. What is the potential for improved diversity of energy supply or increased use of resources indigenous to California (ex. wind power, wave power, solar power)?

2. What is the potential for increased dependency on a single non-renewable fuel source or fuels which are not indigenous to California?

d. 1. What is the potential for efficiency improvements (ex. reduced fuel use, reduced need for new power plants) above and beyond regulations or near-term energy policies?

2. What is the potential for decreased fuel or end-use efficiency (i.e.: increased fuel use)?

e. Are the results of the research generic information which will create a potential for public or private benefits in the long term?

5. The total base year funding for those projects which have one or more market barriers *and* have a significant public interest component are totaled. This is the public interest RD&D conducted during the base year which is expected to decline. This percent decline is multiplied by the average of the annual total spending levels between 1991 and 1994 to obtain the proposed surcharge funding level. This last step is conducted to account for the minor, short-term fluxuations in RD&D spending.

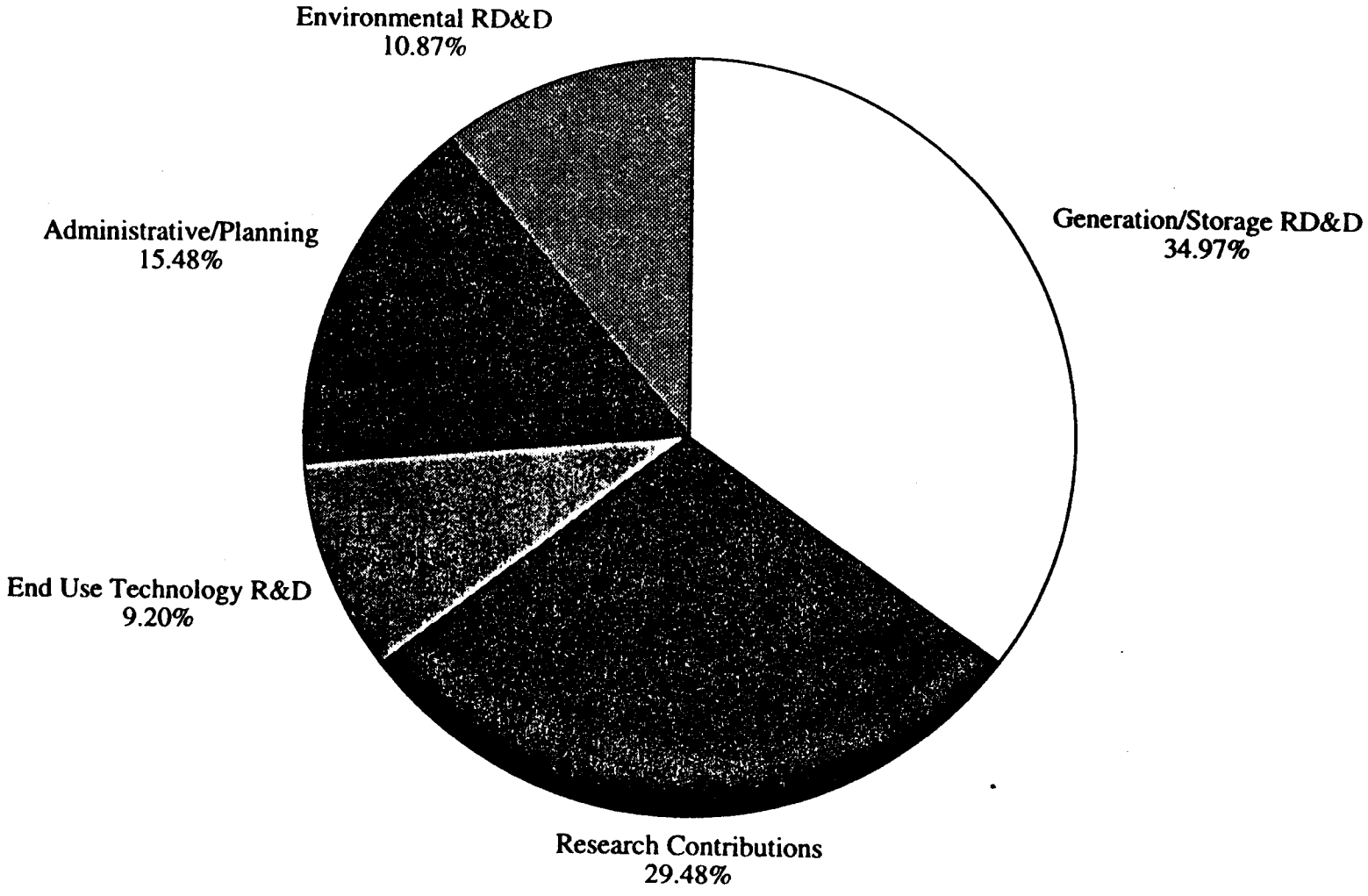
Project-by-Project #1 Totals
1996$

	SCE	PG&E	SDG&E	Subtotals	%	SCG	Totals	%
End Use Technology R&D								
Public Benefit RD&D	$1,597	$3,489	$222	$5,312	77.25%	$583	$5,896	45.39%
Private Benefit RD&D	$615	$929	$21	$1,565	22.75%	$5,530	$7,095	54.62%
Subtotal	$2,212	$4,418	$243	$6,877		$6,112	$12,989	
Generation/Storage RD&D								
Public Benefit RD&D	$12,145	$6,759	$904	$19,826	75.10%	$2,577	$22,404	77.22%
Private Benefit RD&D	$2,957	$3,421	$193	$6,575	24.90%	$34	$6,609	22.78%
Subtotal	$15,102	$10,180	$1,097	$26,401		$2,611	$29,012	
Environmental RD&D								
Public Benefit RD&D	$4,182	$2,520	$257	$6,965	47.75%	$0	$6,965	47.75%
Private Benefit RD&D	$5,259	$2,284	$78	$7,622	52.25%	$0	$7,623	52.26%
Subtotal	$9,441	$4,805	$335	$14,587		$0	$14,587	
Transportation RD&D	*Not included in totals.*							
Public Benefit RD&D	*$2,310*	*$2,517*	*$240*	*$5,072*	*100%*	*$3,324*	*$8,398*	*100%*
Private Benefit RD&D	*$0*	*$0*	*$0*	*$0*	*0.00%*	*$0*	*$0*	*0.00%*
Subtotal	*$2,310*	*$2,517*	*$240*	*$5,072*		*$3,324*	*$8,397*	
Research Contributions								
Public Benefit RD&D	$5,821	$10,025	$2,294	$18,186	52.07%	$696	$18,883	52.93%
Private Benefit RD&D	$4,750	$10,025	$1,924	$16,738	47.93%	$54	$16,792	47.07%
Subtotal	$10,572	$20,050	$4,218	$34,924		$750	$35,674	
Monopoly Function RD&D								
Subtotal	$9,975	$6,280	$636	$16,905		$1,901	$18,806	
Totals w/o Administrative								
Public Benefit RD&D	$23,746	$22,794	$3,677	$50,289	50.44%	$3,856	$54,145	48.75%
Private Benefit RD&D	$13,581	$16,659	$2,216	$32,500	32.60%	$5,617	$38,118	34.32%
Monopoly Function RD&D	$9,975	$6,280	$636	$16,905	16.96%	$1,901	$18,806	16.93%
Subtotal	$47,302	$45,733	$6,529	$99,694		$11,374	$111,068	
Administrative/Planning								
Subtotal	$6,650	$6,322	$489	$13,471		$3,689	$17,160	
Totals w/ Administrative								
Public Benefit RD&D	$27,084	$28,627	$3,952	$59,742	51.64%	$4,319	$64,061	50.14%
Private Benefit RD&D	$15,490	$18,842	$2,382	$36,761	31.78%	$5,031	$41,793	32.71%
Monopoly RD&D	$11,378	$7,103	$684	$19,179	16.58%	$2,736	$21,915	17.15%
Total	$53,952	$54,572	$7,018	$115,682		$12,086	$127,768	
Totals as % of Operating Revenues								
Operating Revenues ($ Millions)	$7,714	$11,323	$1,954	$21,031		$2,811	$22,447	
Public Benefit RD&D %	0.35%	0.25%	0.20%	0.28%		0.15%	0.29%	
Private Benefit RD&D %	0.20%	0.17%	0.12%	0.17%		0.18%	0.19%	
Monopoly RD&D %	0.15%	0.06%	0.03%	0.09%		0.10%	0.10%	
Total RD&D %	0.70%	0.48%	0.36%	0.55%		0.43%	0.57%	

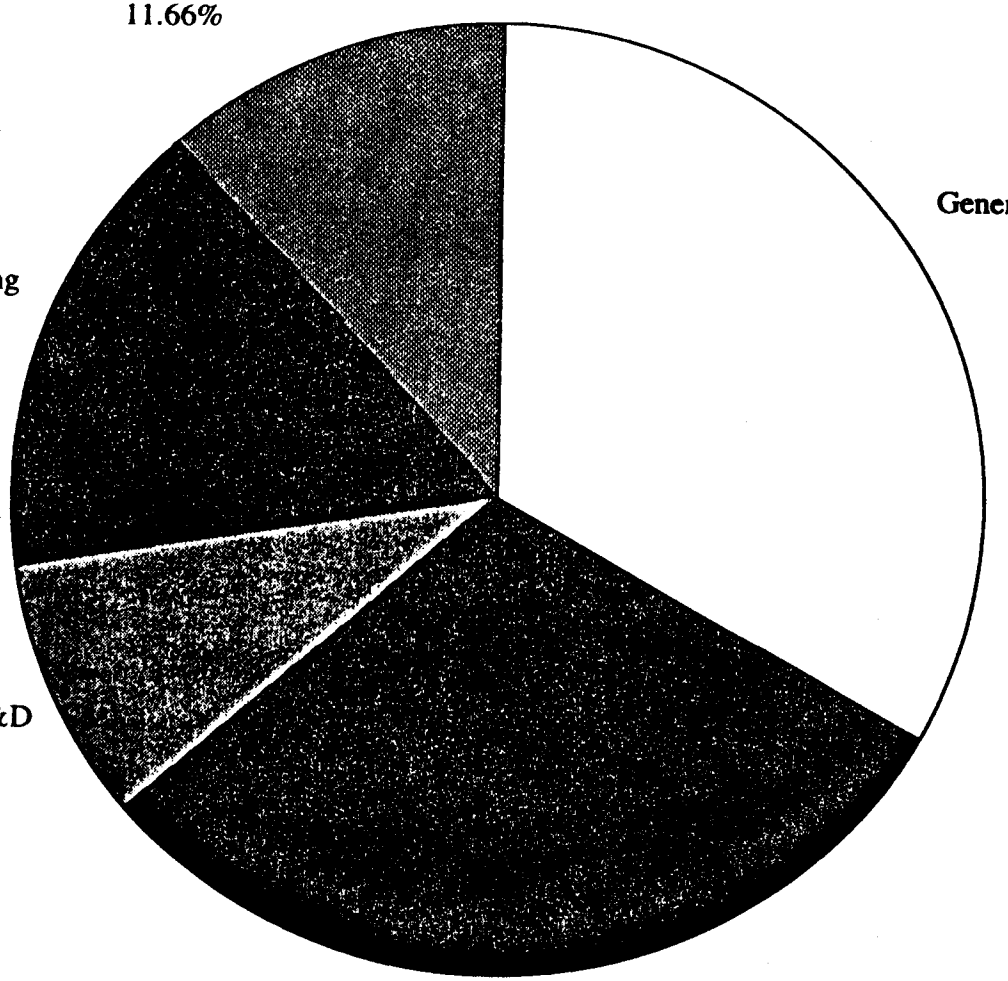
Project-by-Project #1 Totals
Nominal Dollars

	SCE	PG&E	SDG&E	Subtotals	%	SCG	Totals	%
End Use Technology R&D								
Public Benefit RD&D	$1,491	$3,258	$211	$4,960	77.25%	$544	$5,505	45.39%
Private Benefit RD&D	$574	$867	$20	$1,461	22.75%	$5,163	$6,624	54.62%
Subtotal	$2,065	$4,125	$231	$6,421		$5,707	$12,128	
Generation/Storage RD&D								
Public Benefit RD&D	$11,340	$6,311	$861	$18,512	75.10%	$2,406	$20,919	77.22%
Private Benefit RD&D	$2,761	$3,194	$184	$6,139	24.90%	$32	$6,171	22.78%
Subtotal	$14,101	$9,505	$1,045	$24,651		$2,438	$27,089	
Environmental RD&D								
Public Benefit RD&D	$3,905	$2,353	$245	$6,503	47.75%	$0	$6,503	47.75%
Private Benefit RD&D	$4,910	$2,133	$74	$7,117	52.25%	$0	$7,118	52.26%
Subtotal	$8,815	$4,486	$319	$13,620		$0	$13,620	
Transportation RD&D	*Did not include in totals.*							
Public Benefit RD&D	*$2,157*	*$2,350*	*$229*	*$4,736*	*100%*	*$3,104*	*$7,841*	*100%*
Private Benefit RD&D	*$0*	*$0*	*$0*	*$0*	*0.00%*	*$0*	*$0*	*0.00%*
Subtotal	*$2,157*	*$2,350*	*$229*	*$4,736*		*$3,104*	*$7,840*	
Research Contributions								
Public Benefit RD&D	$5,436	$9,361	$2,185	$16,981	52.07%	$650	$17,631	52.93%
Private Benefit RD&D	$4,436	$9,361	$1,833	$15,629	47.93%	$50	$15,679	47.07%
Subtotal	$9,871	$18,721	$4,017	$32,609		$700	$33,309	
Monopoly Function RD&D								
Subtotal	$9,314	$5,864	$606	$15,784		$1,775	$17,559	
Totals w/o Administrative								
Public Benefit RD&D	$22,172	$21,283	$3,502	$46,956	50.44%	$3,600	$50,556	48.75%
Private Benefit RD&D	$12,681	$15,555	$2,111	$30,346	32.60%	$5,245	$35,591	34.32%
Monopoly Function RD&D	$9,314	$5,864	$606	$15,784	16.96%	$1,775	$17,559	16.93%
Subtotal	$44,166	$42,701	$6,218	$93,085		$10,620	$103,705	
Administrative Planning								
Subtotal	$6,209	$5,903	$466	$12,578		$3,444	$16,022	
Totals w/ Administrative								
Public Benefit RD&D	$25,288	$26,729	$3,764	$55,781	51.64%	$4,033	$59,815	50.14%
Private Benefit RD&D	$14,463	$17,593	$2,269	$34,324	31.78%	$4,698	$39,022	32.71%
Monopoly RD&D	$10,623	$6,632	$651	$17,907	16.58%	$2,555	$20,462	17.15%
Totals	$50,375	$50,954	$6,684	$108,013		$11,285	$119,298	
Totals as % of Operating Revenues								
Operating Revenues ($ Millions)	$7,203	$10,572	$1,861	$19,636		$2,811	$22,447	
Public Benefit RD&D %	0.35%	0.25%	0.20%	0.28%		0.14%	0.27%	
Private Benefit RD&D %	0.20%	0.17%	0.12%	0.17%		0.17%	0.17%	
Monopoly RD&D %	0.15%	0.06%	0.03%	0.09%		0.09%	0.09%	
Total RD&D %	0.70%	0.48%	0.36%	0.55%		0.40%	0.53%	

Historical Public Interest RD&D:
Percentage of Dollars Spent in Each Category
(SCE, PG&E, SDG&E and SCG)



Historical Public Interest RD&D:
Percentage of Dollars Spent in Each Category
(SCE, PG&E, SDG&E)



Project-by-Project #1
Chart Data

IOU Public Interest RD&D w/o SCG ($000's)	
Generation/Storage RD&D	$19,826
Research Contributions	$18,186
End Use Technology R&D	$5,312
Administrative/Planning	$9,453
Environmental RD&D	$6,965

IOU Public Interest RD&D w/ SCG ($000's)	
Generation/Storage RD&D	$22,404
Research Contributions	$18,883
End Use Technology R&D	$5,896
Administrative/Planning	$9,916
Environmental RD&D	$6,965

Southern California Edison

	Public Project	1993 Expenses ($000's)
Customer Energy Technologies		
Industrial/Environmental Technologies	N	$574
Advanced Commercial Energy Systems	Y	785
Advanced Residential Systems	Y	492
Conservation/Non-Electric Technologies	Y	214
Subtotal Funding for Public Projects		1,491
Subtotal Funding for Private Projects		574
Category Subtotal		2,065
Customer Air Quality		
NOx Rule Compliance	N	785
ROC and Air Toxic Rule Compliance	N	732
New AQMP Regulations	N	562
Conservation-Based Environmental Compliance	N	31
Subtotal Funding for Public Projects		0
Subtotal Funding for Private Projects		2,110
Category Subtotal		2,110
Electrical and Communication Systems		
NetComm High Speed Communications	MONOPOLY	2,045
T&D Systems Technology	MONOPOLY	4,079
Electronic Controls and Diagnostics	MONOPOLY	301
Integrated Digital Communications	MONOPOLY	2,549
Modular Generation Technologies	Y	6,228
Advanced and Renewable Electrical Concepts	MONOPOLY	340
Subtotal Funding for Public Projects		6,228
Subtotal Funding for Private Projects		0
Subtotal Funding for Monopoly Projects		9,314
Category Subtotal		15,542

Southern California Edison

	Public Project	1993 Expenses ($000's)
System Energy Management		
Generation Improvement	N	$1,859
Emission Control	N	902
Energy Storage	Y	84
Alternative Renewable Energy	Y	5,028
Subtotal Funding for Public Projects		5,112
Subtotal Funding for Private Projects		2,761
Category Subtotal		7,873
Environmental Quality Improvement		
Occupational Health and Injury Prevention	N	739
Air, Land and Water Quality	N	2,061
Natural Habitat Conservation	Y	1,671
Community Environmental Quality	Y	2,234
Subtotal Funding for Public Projects		3,905
Subtotal Funding for Private Projects		2,800
Category Subtotal		6,705
Electric Transportation (Not included in totals.)		
Electric Vehicles	*Y*	*2,055*
Mass Transit	*Y*	*102*
Subtotal Funding for Public Projects		*2,157*
Subtotal Funding for Private Projects		*0*
Category Subtotal		*2,157*

Southern California Edison	Public Project	1993 Expenses ($000's)	%
Research Support			
Research Regulation, Contracts and Valuation	ADMINISTRATIVE	$1,612	
Research Support	ADMINISTRATIVE	4,597	
Subtotal Funding for Public Projects		0	
Subtotal Funding for Private Projects		0	
Subtotal Funding for Administrative Programs		6,209	
Category Subtotal		6,209	
Research Contributions			
EPRI	50%	8,820	
CIEE	100%	1,000	
WEST Associates	50%	51	
Subtotal Funding For Public Projects		5,436	
Subtotal Funding For Private Projects		4,436	
Category Subtotal		9,871	
Total Funding for Public Projects		**22,172**	**50%**
Total Funding for Private Projects		**12,681**	**29%**
Total Funding for Monopoly Projects		**9,314**	**21%**
Total Funding for non-Admin SCE RD&D Projects		**44,166**	**100%**
Administrative and Planning RD&D Funding		**6,209**	
Total SCE RD&D Funding		**50,375**	
Adjustment to Pro-Rate Administrative Funding			
SCE Public Benefit RD&D Funding		**25,288**	**50%**
SCE Private Benefit RD&D Funding		**14,463**	**29%**
SCE Monopoly Function RD&D Funding		**10,623**	**21%**
Total SCE Project Funding		**50,375**	**100%**

Pacific Gas & Electric

Customer Systems	Public Project	1994 Expenses ($000's)
Commercial Energy Efficiency		*$1,234*
Dynamic Buildings	Y	614
Office Technology	Y	140
Office Productivity	Y	110
Lighting & Controls	Y	110
Scanning & Planning	N	60
EE Design Tools	Y	110
Measurement Tools & Process Optimization	Y	50
HVAC	Y	40
Advanced Building Controls & Communications	Y	0
Marriott Moscone Demonstration Project	Y	0
EE, Environmentally Preferred Building Systems Technologies	Y	0
Building Performance Monitoring & Analysis	Y	0
Strategic Planning & Advanced Technology Assessment	N	0
Industrial and Agricultural Energy Efficiency		*950*
Scanning	N	40
Component Development & Field Testing	N	180
Power Electronics/Motors & Systems	Y	275
Power Quality	N	320
Power Electronics	N	135
Residential		*463*
Residential Energy Management	N	40
Building Systems	Y	403
Advanced Appliances	Y	20
Customer Energy Management	N	0
Building Performance Monitoring & Analysis	Y	0
EE Building System Technology	Y	0
Residential Space Conditioning	Y	0
EE Environmentally Preferred Lighting & Appliance Technologies	Y	0
Strategic Planning & Advanced Technology Assessment	N	0

Pacific Gas & Electric

Customer Systems	Public Project	1994 Expenses ($000's)
Transportation Did not include in the Subtotal...		*$2,350*
Clean Air Vehicle Technology Center	*Y*	*300*
OEM NGV/EV Development	*Y*	*50*
NGV/EV Performance Monitoring	*Y*	*650*
Advanced Refueling Evaluation NGV/ & EV	*Y*	*1,250*
Wayside Energy Storage	*Y*	*35*
Advanced Technological Assessment	*Y*	*65*
System Impacts Evaluation	*Y*	*0*
Customer Systems Planning		*92*
Strategic Planning	N	92
Food Service Technology Center		*475*
UTP Development	Y	120
Ancillary Issues	Y	330
EE Warewasher	Y	25
UTP Development	Y	0
Advanced Customer Technology, ACT2		*3261*
Project Management	Y	3,261
ACTT	Y	0
Subtotal Customer Systems Public Project Funding		5,608
Subtotal Customer Systems Private Project Funding		867
Category Subtotal		6,475

Energy Delivery and Control	Public Project	1994 Expenses ($000's)
Electric Distribution		*$2,538*
DA Communications	MONOPOLY	1,343
DA Information & Computing	MONOPOLY	294
DA Sensors	MONOPOLY	152
DA Systems Issues	MONOPOLY	403
Existing Systems, Methods & Equipment	MONOPOLY	346
Integrated Utility Communications	MONOPOLY	0
Dist. Planning & Simulation tools	MONOPOLY	0
Dist Operational Tools	MONOPOLY	0
Dist Maintenance Tools & Diagnostics	MONOPOLY	0
Public & Employee Safety	MONOPOLY	0
Energy System Integration		*1004*
Smart Substation	MONOPOLY	344
GENIUS	MONOPOLY	15
Communication Development	MONOPOLY	20
Sensor Development	MONOPOLY	215
System Modeling	MONOPOLY	410

Pacific Gas & Electric

	Public Project	1994 Expenses ($000's)
Energy Delivery and Control		
Planning and Development		*$434*
Technical Planning & Development	MONOPOLY	200
DSCA Membership	MONOPOLY	50
Enabling Technical Assessment	MONOPOLY	154
EPRI/GRI Handbook	MONOPOLY	30
Gas Systems		*1021*
Pipe Renovation Lining	MONOPOLY	450
Smart Seismic Device	MONOPOLY	100
Energy Meter/Gas Analysis	MONOPOLY	100
Advance Control Systems	MONOPOLY	105
Transmission Construction, Maintenance, & Operations Technologies	MONOPOLY	41
Distribution Construction, Maintenance, & Operations-Adv. Tech.	MONOPOLY	225
Infrastructure Life Extension	MONOPOLY	0
System Operating & Maintenance Efficiency	MONOPOLY	0
Advanced Gas Instrumentation & Measurement	MONOPOLY	0
Electric Transmission Systems		*867*
Dynamic M&O Costs	MONOPOLY	310
Minimize Capital Costs	MONOPOLY	0
System Asset Utilization	MONOPOLY	400
Maintain Service Reliability	MONOPOLY	157
Transmission Grid Operations	MONOPOLY	0
Subtotal Energy Delivery/Control Public Funding		0
Subtotal Energy Delivery/Control Private Funding		0
Subtotal Energy Delivery/Control Monopoly Funding		5,864
Category Subtotal		5,864

Pacific Gas & Electric

	Public Project	1994 Expenses ($000's)
Environment, Health and Safety		
Fossil Emmissions Reduction		*$2,414*
Fossil Emissions	N	1,508
Air & Water Quality	Y	662
Fossil Waste Management	N	244
Air Emissions Control Technologies	N	0
Air Quality Impact Assessment & Modeling	Y	0
Geothermal Abatement		*191*
H2S Abatement	N	99
Waste Minimization	N	92
H2S Emissions Control Technologies	N	0
Waste Management Technologies	N	0
Pollution Management Cost Reduction		*0*
Pollution Management Cost Reduction	N	0
Natural Resources Management		*1313*
Water Quantity and Quality	Y	1,056
Vegetation Management	N	190
Environmental Impact/Mitigation	Y	67
Aquatic Habitat Assessment & Compliance Methods	Y	0
Watershed Effects	Y	0
Improved Techniques for Managing Rights-of-Way and Facilities	N	0
Wildlife Mitigation Methods	Y	0
Health and Safety Research		*492*
EMF	Y	270
Indoor Air Quality	Y	222
EMF Exposure Assessment	Y	0
Indoor Air Quality	Y	0
Seismic Safety	N	0
Occupational Health & Safety	Y	0
Exploratory Research		*76*
Exploratory Research	Y	76
Subtotal Env, Health, Safety Public Funding		2,353
Subtotal Env, Health, Safety Private Funding		2,133
Category Subtotal		4,486

Pacific Gas & Electric

Generation and Storage	Public Project	1994 Expenses ($000's)
Fossil Power Plants		*$2,007*
Improve Power Plant Efficiency Monitoring	N	25
Improve Performance Through Component Replacement or Modificatior	N	614
Improve Plant Controls	N	0
Improve Plant Equipment Condition Assessment	N	747
Automated Equipment Diagnostic Technologies	N	240
Advanced Fossil Plant Maintenance Practices	N	83
Improve Repair Technologies	N	103
Improve Equipment Life Assessment	N	147
Identify Cost-Effective Replacement Equipment	N	48
Advanced Hydro		*735*
Mechanical/Electrical Equipment Condition Assessment Technologies	N	16
Hydro Plant Maintenance Technologies	N	273
Dam Safety	Y	215
Water Conveyance System Safety	Y	71
Water Conveyance System Life Extension	N	63
Hydro Resource Planning Optimization	N	97
Geysers Power Plant		*313*
Mitigate Geysers' Steam Decline & Improve Steam Rate	Y	75
Maximize Geysers' Equipment Life	N	238
Power System Optimization		*500*
Advanced Generation Control and Scheduling	N	0
Resource Planning & Assessment Technologies	N	111
Real-Time Monitoring & Energy Management System Operations	N	46
System Security & Network Optimization Technologies	N	163
Electric Grid Operation Technologies	N	0
Power Merchant Information Technologies	N	0
Short-Term Power Resource Scheduling Technologies	N	180
Distributed Peaking		*3270*
Substation Applications	Y	1,308
Premium Power Supply	Y	0
Customer-Sited Distributed Peaking & Demand-Side Management	Y	0
PVUSA	Y	1,589
PV as a Demand-Side Management Option	Y	120
PV Off-Grid Service Option	Y	253
Technology Scanning & Assessment		*2680*
Technology Scanning & Assessment	Y	2,680
Subtotal Generation & Storage Public Funding		6,311
Subtotal Generation & Storage Private Funding		3,194
Category Subtotal		9,505

Pacific Gas & Electric

	Public Project	1994 Expenses ($000's)	%
Planning and Business Services			
Planning, Regulatory Issues, and Business Services			
Policy, Planning, Management and Administration	ADMIN.	$5,491	
Research Contributions			
EPRI	50%	14,681	
GRI	50%	866	
CIEE	100%	1,500	
Others	50%	174	
EPRI Tailored Collaboration		0	
Analytic Studies			
Distributed Utility Planning	ADMIN.	412	
Subtotal Planning and Business Services Public Funding		9,361	
Subtotal Planning and Business Services Private Funding		9,361	
Subtotal Planning and Business Services Admin. Funding		5,903	
Category Subtotal		24,624	
Total PG&E Public Project Funding		**23,633**	**52%**
Total PG&E Private Project Funding		**15,555**	**35%**
Total PG&E Monopoly Project Funding		**5,864**	**13%**
PG&E Project Funding w/o Admin. and Planning		**45,051**	**100%**
Total PG&E Admin. and Planning Funding		**5,903**	
Total PG&E Project Funding		**50,954**	
Adjustment to Pro-Rate Administrative Funding			
PG&E Public Benefit RD&D Funding		**26,729**	**52%**
PG&E Private Benefit RD&D Funding		**17,593**	**35%**
PG&E Monopoly Function RD&D Funding		**6,632**	**13%**
Total PG&E Project Funding		**50,954**	**100%**

San Diego Gas & Electric

	Public Project	1993 Expenses ($000)
Generation Efficiency		
Fuel Cell Development	Y	$718
Advanced Gas Turbine	Y	124
Energy Storage	Y	4
Alternative Energy Systems	Y	15
Plant Expert Systems	N	63
Shift Worker Productivity	N	39
Asset Management	N	82
Fuel Science	N	0
Super Heat Life Extension	N	0
Distributed Generation/Resources	Y	0
Subtotal funding of Public Projects		861
Subtotal funding of Private Projects		184
Total funding of Generation Efficiency Projects		1,045
Delivery and End-Use		
DSM Technology Development	Y	126
Non-Conductive Structure	MONOPOLY	575
Customer Battery	Y	85
Advanced T&D Systems	MONOPOLY	13
Fuel Planning Models	N	12
Advanced Metering	MONOPOLY	18
Thermal Energy Storage	N	8
Packaged Cogeneration	Y	0
Power Quality	MONOPOLY	0
Energy Technology Center (Only planned)	Y	0
SMES	Y	0
Building Optimal Energy Intelligent	Y	0
Subtotal funding of Public Projects		211
Subtotal funding of Private Projects		20
Subtotal funding of Monopoly Projects		606
Total funding of Delivery and End-Use Projects		837

San Diego Gas & Electric

	Public Project	1993 Expenses ($000)
Environment		
Environmental Research/Support	Y	$44
EMF Research	Y	63
Indoor Air Quality Study	Y	82
Biodegradation	Y	6
75 Ton Chiller	N	14
25 Ton Chiller	N	12
Reverse Osmosis	Y	0
Emissions Monitor	N	10
Low-NOx Burners	N	38
CFC-11	Y	50
Waste Water Utilization	N	0
Subtotal funding of Public Projects		245
Subtotal funding of Private Projects		74
Total funding of Environment Projects		319
Planning, Admin & Tech Transfer		
EPRI Membership	50%	3,546
Technology Transfer	ADMINISTRATIVE	0
EPRI Participation	50%	79
GRI Participation	50%	25
RD&D Coordination	ADMINISTRATIVE	466
WEST Associates	50%	15
CIEE	100%	352
Subtotal funding of Public Projects		2,185
Subtotal funding of Private Projects		1,833
Subtotal funding of Administrative Projects		466
Category Subtotal		4,483

San Diego Gas & Electric	Public Project	1993 Expenses ($000)	%
Clean Air Vehicles (not included in totals)			
Electric Vehicle Demonstration	*Y*	*$133*	
Long-Term NGV Development	*Y*	*3*	
Bi-Polar Battery	*Y*	*18*	
Hybrid Bus	*Y*	*50*	
Hybrid Vehicle Development	*Y*	*25*	
Subtotal funding of Public Projects		*229*	
Subtotal funding of Private Projects		*0*	
Category Subtotal		*229*	
Total Funding of Public Projects		**3,502**	**56%**
Total Funding of Private Projects		**2,111**	**34%**
Total Funding of Monopoly Projects		**606**	**10%**
Total Project Funding w/o Admin and Planning		**6,218**	**100%**
Total Admin and Planning Funding		**466**	
Total SDG&E RD&D Funding		**6,684**	
Adjustment to Pro-Rate Administrative Funding			
SDG&E Public Benefit RD&D Funding		**3,764**	**56%**
SDG&E Private Benefit RD&D Funding		**2,269**	**34%**
SDG&E Monopoly Function RD&D Funding		**651**	**10%**
Total SDG&E Project Funding		**6,684**	**100%**

Southern California Gas Company

Utilization Systems **Residential**	Public Project	1993 Expenses ($000's)
Equipment/Building Systems		*$3*
Interior Gas Piping	Y	3
2 psi Delivery Study	Y	0
CIEE Energy Efficiency Study	Y	0
Gas Appliances		*441*
Rheem/AGAL Water Heater	N	56
Alzeta Atmospheric Low NOx Water Heater	N	61
CERAC BBQ	N	0
CERAC Fireplace	N	0
Residential Gas Light	N	36
Tecogen Water Heater Development	N	207
Residential Technology Transfer	Y	81
Universal electric Ignition System	N	0
Cooking Equipment Evaluation	N	0
Combo System Improvement	N	0
Advanced Clothes Dryer	N	0
Advanced Fireplace Development	N	0
Indoor Air Quality		*8*
Western IAQ Studies	Y	8
Gas Energy End Use Survey	Y	0
Spillage and Backdrafting Investigation	Y	0
Wall Heater Evaluation	Y	0
Space Conditioning and Gas Heat Pumps		*361*
Chemisorption Cycle Development	Y.	77
CSULA Field Test and DAS	N	0
Gas Pneumatic Heat Pump	N	18
JGEHP Development	N	119
JPL Regenerative Heat Pump	N	50
Phillips Absorption Heat Pump	N	5
EAC Environmental Chamber	N	92
Aerojet Solid Sorption Concept	Y	0
Carrier GAX Absorption	N	0
Fludidized Bed Desiccant	N	0
Subtotal Residential Public Project Funding		169
Subtotal Residential Private Project Funding		644
Residential Total Project Funding		813

Southern California Gas Company

Utilization Systems **Commercial**	Public Project	1993 Expenses ($000's)
Advanced Combustion		*$45*
Atmospheric Burner-CSLB	N	1
Fluidic Nozzle Burner	N	41
Test Center Burner Dev	Y	3
ADL/GRI Burner Dev	N	0
Burners and Controls		*67*
Combustion Material Evaluation	N	67
Alzeta Burner Improvement	N	0
Gas Control Valve-Power Burners	N	0
Commercial Boilers/Water Heating		*443*
Acoustic Controller Dev	N	19
AGAL/Raypak Boiler	N	114
Alzeta-Zum Field Test	N	40
Commercial Technology Transfer	N	270
Commercial water Heater Improvement	N	0
Commercial Heating and Cooling Systems		*546*
GRI GAX Dev	Y	100
Insights west Desiccant study	N	0
Gas High Efficiency Cycle Evaluation	N	70
AUS Hybrid Heat Pump	N	61
GRI Commercial Triple Effect Absorption Dev	N	100
Product Team Dev	N	215
Large Cooling	N	0
Fast Food Resturants		*147*
Vertical Conveyor Oven	N	20
Commercial Cooking Field Test	N	9
Commercial Vent. Study-GRI	N	84
Ventless Oven	N	8
Rotisserie Oven	N	26
Countertop Fryer	N	0
Large Tonnage Refrigeration		*0*
Refrigeration Product Development	N	0
Restaurant/Institutional		*134*
Raypak Water Booster	N	14
Self Clean Oven	N	0
Steam Generator	N	0
Roll-in Combo Oven	N	120
Other Commercial Cooking	N	0
Small Tonnage Refrigeration		*8*
Solid vapor Absorption Refrigeration System	N	0
Gas-Powered Refrigeration Options	N	0
Industrial Refrigeration Technology Assessment	N	8
Subtotal Commercial Public Project Funding		103
Subtotal Commercial Private Project Funding		1,287
Commercial Total Project Funding		1,390

Southern California Gas Company		
Utilization Systems	Public Project	1993 Expenses ($000's)
Industrial		
Air Toxics and waste Processing		*$0*
Auto Shredder Waste Reduction	N	0
Air Toxics Emission Reduction	N	0
Molten Salt Oxidation	N	0
VOC and Air Toxics Control System	N	0
Boiler, Process and Fluid Heaters		*211*
Wave Tech/Gas Turbine Eval	N	9
Burner Diagnostic Lab Devlopment-UCI	N	100
Cannon Nox Digester Demo	N	56
Clayton Burner	N	22
Cyclonic Dev-IGT	N	-108
Firetube Burner	N	52
Fuel Injection Recirculation	N	22
MTCI/Pulse Combustion	N	3
Selective Catalyst	N	36
Cal Poly Clinic Power Jet Water Cooled Burner	N	16
Power Jet Water Cooled Burner Dev	N	3
Industrial Combustion System	N	0
Process Heater Burner Dev	N	0
Metals Melting, Finishing & Heat Treating		*421*
High Temperature Heat Treating	N	0
Industrial Process Technology	N	43
No NOx Combustion System	N	138
Regenerative Radiant Burner	N	2
Industrial Technology Transfer	N	210
Aluminum Melting Process Modernization	N	28
High Performance Burner Demo	N	0
Aluminum Melting Burner Dev	N	0

Southern California Gas Company

Utilization Systems **Industrial**	Public Project	1993 Expenses ($000's)
Non-metals Melting		*$222*
NOx Reduction from High-Performance Burners	N	222
Hi-Rad Burner Dev	N	0
Oxy-Fuel Demo	N	0
Gas Reburn Demo	N	0
Non-Metals Process Heating, Drying, Curing &Forming		*372*
Biofiltration	N	17
Continuous Fiber Ceramic Composites	N	90
Direct Air Heater Burner Dev	N	20
Industrial Burner Dev	N	84
Valuing Gas Industry	N	-9
Plastic Extruder	N	0
Direct Heated Paper Dryer Demo	N	0
MicroGas Dryer	N	170
Infrared Drying	N	0
Sensors and Controls		*75*
Emission Sensors	N	0
Solid States Proportioning Valve	N	75
Subtotal Industrial Public Funding		0
Subtotal Industrial Private Funding		1,301
Total Industrial Funding		1,301
Subtotal UTIL SYS PUBLIC PROJECT FUNDING		**272**
Subtotal UTIL SYS PRIVATE PROJECT FUNDING		**3,232**
UTILIZATION SYSTEMS PROJECT FUNDING		**3,504**

Southern California Gas Company

	Public Project	1993 Expenses ($000's)
Operations		
Compressor Station Opaerations		*$39*
Advanced Operating Technologies	MONOPOLY	8
Continuous Emissions Monitoring System	MONOPOLY	31
Parametric Emissions Monitoring System	MONOPOLY	0
Storage Field Operations		*175*
Real time Erosion Monitoring	MONOPOLY	123
Shoe Leak Investigation Tool	MONOPOLY	0
Microbiologically Influenced Corrosion Study	MONOPOLY	52
Pipeline Mainenance		*1034*
Acoustic Plastic Pipe Locater	MONOPOLY	156
AGA Pipeline Research	MONOPOLY	114
Casing Cutter	MONOPOLY	35
Chipless Hot Tap Cutter	MONOPOLY	35
Plastic Pipe Pressure Control	MONOPOLY	148
System Earthquake Integrity	MONOPOLY	18
UAF Gas	MONOPOLY	32
Universal Electrofusion Controller	MONOPOLY	117
Urban Corrosion Maonitoring	MONOPOLY	100
Operations Technology Transfer	MONOPOLY	183
Brittle Pipe Crack Arrestor	MONOPOLY	15
Tool Efficiency Analyzer	MONOPOLY	55
Advanced Metal Pipe Locater	MONOPOLY	0
NG Pipeline Lining Study Harvey Mudd	MONOPOLY	26
GRI mouse	MONOPOLY	0
Advanced Hot Tap Cutter	MONOPOLY	0
Smartpipe Fiber Optics	MONOPOLY	0
CP Line Drop Tool	MONOPOLY	0
Street Restoration Techniques		*158*
A/C Pavement Repair Study	MONOPOLY	66
Spoil Recycle Study	MONOPOLY	92
One Step Pavement Repair	MONOPOLY	0
Utility Cut Issues Study	MONOPOLY	0
Trenchless Technology		*2*
Excavation Techniques	MONOPOLY	2
Advanced Guided Boring System	MONOPOLY	0
Safety		*87*
Equipment and tool Safety Technology	MONOPOLY**	44
Investigation Leaking Hydraulic Lifts	MONOPOLY**	1
Improved Sonic Leak Pinpointer	MONOPOLY**	31
Novel Tool Concepts	MONOPOLY**	7
Advanced Excess Flow Valve	MONOPOLY**	0
CO/CH4 Detector Demo	MONOPOLY**	4
Lightweight Traffic Plates	MONOPOLY**	0
Multiple Sensor Device	MONOPOLY**	0
Sewer Locator	MONOPOLY**	0

** Utilities have indicated that they do not want to fund these projects in the future. Therefore, they counted as public projects.

Southern California Gas Company

Operations	Public Project	1993 Expenses ($000's)
Waste Remediation		*$37*
Multiple Soil Treatment Technology Evaluation	MONOPOLY**	0
In-situ Bioremediation of PAH Soils	MONOPOLY**	19
PCB Remediation	MONOPOLY**	0
Soil Washing Demo	MONOPOLY**	18
Soil Vapor Extraction Study	MONOPOLY**	0
Communication/Automation		*19*
Computer Technology Research	MONOPOLY	0
Automatic Meter Reading	MONOPOLY	0
Smart Siesmic Technology	MONOPOLY	14
Technology Assesssment/Operations	MONOPOLY	5
Advanced Data communications	MONOPOLY	0
Universal Meter Interface	MONOPOLY	0
Customer Services		*205*
Portable Gas Chromatograph	MONOPOLY	41
Field Multipurpose Device	MONOPOLY	164
Metering Concepts		*143*
Optical Volumetric Flow Meter	MONOPOLY	0
Compact Gas Meter	MONOPOLY	15
Field Test Support Activities and AMR video	MONOPOLY	0
Expert Systems	MONOPOLY	5
Sonic Nozzle Prover Interface	MONOPOLY	25
Next Generation Meter	MONOPOLY	50
MSA Cabinets	MONOPOLY	48
Smart Meter	MONOPOLY	0
Metering Technology Assessment	MONOPOLY	0
Subtotal Operations Public Project Funding		**124**
Subtotal Operations Private Project Funding		**0**
Subtotal Operations Monopoly Funding		**1775**
Operations Total Project Funding		**1899**

** Utilities have indicated that they do not want to fund these projects in the future. Therefore they are counted as public projects.

Southern California Gas Company

	Public Project	1993 Expenses ($000's)
Power Generation		
Fuel Cells		*$1,451*
IFC Development of a 200KW PAFC	Y	470
Econ Feas anal of DEPG	Y	0
Fuel Cell Site Design	Y	0
Polymer Fuel Cell Design	Y	13
Solid OXide Fuel Cell Development	Y	250
Technology Assessment	Y	410
West Coast 250 DW MCFC	Y	263
Hydrogen Storage Study	Y	15
Derect Methane Fuel Cell	Y	0
Ballard Reformate Technology	Y	0
National Fuel Cell Center	Y	0
Fuel Cell Research Planning	Y	30
Other Technologies		*122*
Solar Hybrid Receiver Design	Y	50
Thermophotovoltaic Evaluation	Y	40
Small Reformer Design	Y	0
Fuel Processing'OSU water Pumper	Y	0
Urban Energy and Environmental Center	Y	0
Hydrodynamic Generator	N	32
Hydrogen/Carbon Conversion	Y	0
Cogeneration		*190*
Electro-Catalytic NOx Reduction	Y	39
Emission control System	Y	0
Emission Control Evaluation	Y	0
Three-Way Catalytic Field Test	Y	151
Congeneration Study	Y	0
Combustor Development		*216*
Advanced Catalytic Combustor	N	0
Allision Low NOx Combustor Development	Y	200
Cal Poly EIC Turbine Project	Y	16
Hydrogen Enrichment	Y	0
Hydrogen Burner	N	0
System Development		*459*
DOE Funding Initiative	Y	109
GRI/NREC Small Turbine Developement	Y	350
Advanced Gas Turbine-Large	Y	0
Advanced Gas Turbine-Small	Y	0
Duct Burner development	Y	0
Dispersed Power Generation study	Y	0
Subtotal Power Generation Public Project Funding		**2406**
Subtotal Power Generation Private Project Funding		**32**
Power Generation Total Project Funding		**2438**

Southern California Gas Compay

	Public Project	1993 Expenses ($000's)
Transportation (not included in totals)		
NGV Infrastructure Development		
NGV Support Systems	*Y*	*$146*
Refueling Systems	*Y*	*19*
Natural Gas Vehicles		
Fuel Systems Development	*Y*	*513*
Heavy Duty Natural Gas Engines & Vehicles	*Y*	*1,060*
Medium and Light Duty Natural Gas Vehicles Development	*Y*	*1,366*
Subtotal Transportation Public Project Funding		*3,104*
Subtotal Transportation Private Project Funding		*0*
Transportation Total Project Funding		*3,104*

Southern California Gas Compay

	Public Project	1993 Expenses ($000's)	%
Research Contributions			
CIEE	100%	$600	
Sustaining Membership Program	50%	100	
Subtotal Research Contributions Public Funding		**650**	
Subtotal Research Contributions Private Funding		**50**	
Research Contributions Total Funding		**700**	
Total SCG Public Project Funding		**2,802**	**36%**
Total SCG Private Project Funding		**3,264**	**42%**
Total SCG Monopoly Project Funding		**1,775**	**23%**
SCG Project Funding w/o Admin and Planning		**7,841**	**100%**
Special Program		**687**	
Administration		**2,757**	
Total SCG R&D Spending		**11,285**	
Adjustment to Pro-Rate Administrative Funding			
SCG Public Benefit RD&D Funding		**4,033**	**36%**
SCG Private Benefit RD&D Funding		**4,698**	**42%**
SCG Monopoly Function RD&D Funding		**2,555**	**23%**
Total SCG Project Funding		**11,285**	**100%**

D. PROJECT-BY-PROJECT METHOD #2 (NARROW SCOPE)

This funding level is based on the Project-by-Project Method #1 data. Each project listed in the investor-owned utilities' annual RD&D reports to the CPUC is categorized as a public interest project (yes or no) or as a monopoly service project. All transmission and distribution projects qualify as monopoly service. Other projects fall into the public interest category if they relate to energy efficiency, renewables, or environmental impacts not directly associated with generation projects. Generation projects (fossil, geothermal, hydroelectric, cogeneration and distributed generation projects, including fuel cells) and storage projects (batteries, SMES) are excluded from the public interest category. Product development activities are excluded from the public interest category, as are technology scanning activities. Research contributions, such as EPRI and CIEE, are allocated to the public interest category based on CEC staff assumptions.

Once all projects have been classified into one of the three categories, the base year project expenses for each category is summed. Administrative costs are then pro-rated based on each category's proportional share of the total expenses.

This analysis yields a total of $32 million for public interest RD&D for investor-owned utilities, in 1996 dollars. If the research contributions are included, which are currently viewed as regulated RD&D activities, public interest RD&D at current funding levels would be $50 million.

Two municipal utilities, Los Angeles Department of Water and Power (LADWP) and the Sacramento Municipal Utility District (SMUD), have conducted RD&D programs. No other municipal utility in California has been identified as having an RD&D program. LADWP spent over $10 million on RD&D in 1993, including $1 million spent on transportation and transmission planning studies, which are not public interest RD&D categories; and $5 million for EPRI. Net public interest RD&D spending was about $4 million. SMUD spent over $11 million on RD&D in 1993, of which about $6 million was for renewables. Municipal utility public interest RD&D totaled approximately $10 million.

Total base year public interest RD&D spending, in 1996 dollars, was about $42 million, consisting of $32 million from IOUs, $4 million from LADWP, and $6 million from SMUD.

"Public interest" research contributions, currently viewed as regulated RD&D activities, represent an additional $24 million, $19 million from IOUs and $5 million from LADWP - for a total of approximately $66 million.

An additional $25 million could be added for renewable demonstrations. This would yield a total of $91 million.

- Results
- Project-by-Project #2 Totals (1996$)
- Project-by-Project #2 Totals (nominal $)
- Categorization of Projects as Public, Private, or Monopoly: SCE, PG&E, SDG&E, and SCG

Project-by-Project #2 (Narrow Scope)
Method Results

1996$

Parties Included	W/O Research Contributions	W/ Research Contributions
Elec. IOUs (PG&E, SCE, SDG&E)	$29,812,000	$47,794,000
So. Cal. Gas	$1,858,000	$2,554,000
LADWP	$4,280,000	$9,630,000
SMUD	$6,420,000	$6,420,000
Subtotal	**$42,370,000**	$66,398,000
High Cost Market Transformation	$25,000,000	$25,000,000
Total	$67,370,000	$91,398,000
Recommended Funding Level:	**$42,370,000**	

Project-by-Project #2
1996$

	SCE	PG&E	SDG&E	Subtotals	%	SCG	Totals	%
End Use Technology R&D								
Public Benefit RD&D	$1,595	$5,888	$135	$7,619	82%	$1,179	$8,799	67%
Private Benefit RD&D	$614	$910	$112	$1,637	18%	$2,610	$4,247	33%
Subtotal	$2,210	$6,799	$247	$9,255		$3,789	$13,044	
Generation/Storage RD&D								
Public Benefit RD&D	$5,744	$2,060	$0	$7,804	30%	$96	$7,900	27%
Private Benefit RD&D	$9,509	$7,920	$1,118	$18,547	70%	$2,512	$21,060	73%
Subtotal	$15,253	$9,980	$1,118	$26,351		$2,609	$28,960	
Environmental RD&D								
Public Benefit RD&D	$6,384	$2,391	$209	$8,983	62%	$0	$8,984	62%
Private Benefit RD&D	$3,048	$2,319	$133	$5,501	38%	$0	$5,501	38%
Subtotal	$9,432	$4,710	$341	$14,484		$0	$14,484	
Transportation RD&D								
Public Benefit RD&D	$0	$0	$0	$0	0%	$0	$0	0%
Private Benefit RD&D	$2,308	$2,468	$245	$5,021	100%	$3,321	$8,343	100%
Subtotal	$2,308	$2,468	$245	$5,021		$3,321	$8,342	
Research Contributions								
Public Benefit RD&D	$5,816	$9,829	$2,337	$17,982	55%	$696	$18,678	55%
Private Benefit RD&D	$4,746	$8,254	$1,961	$14,960	45%	$54	$15,014	45%
Subtotal	$10,562	$18,082	$4,298	$32,942		$749	$33,691	
Monopoly Function RD&D								
Subtotal	$9,602	$6,157	$648	$16,408		$1,992	$18,400	
Totals w/o Administrative								
Public Benefit RD&D	$19,539	$20,168	$2,681	$42,387	41%	$1,971	$44,359	38%
Private Benefit RD&D	$20,226	$21,871	$3,569	$45,666	44%	$8,497	$54,163	46%
Monopoly Function RD&D	$9,602	$6,157	$648	$16,408	16%	$1,992	$18,400	16%
Subtotal	$49,366	$48,196	$6,898	$104,461		$12,460	$116,921	
Administrative Planning								
Subtotal	$6,644	$6,198	$499	$13,340		$3,685	$17,025	
Totals w/ Administrative								
Public Benefit RD&D	$22,158	$22,762	$2,875	$47,794	41%	$2,554	$50,348	38%
Private Benefit RD&D	$23,162	$24,684	$3,827	$51,673	44%	$11,010	$62,683	47%
Monopoly RD&D	$10,889	$6,949	$695	$18,534	16%	$2,582	$21,115	16%
Totals	$56,209	$54,394	$7,397	$118,000		$16,145	$134,146	
Totals as % of Operating Revenues								
Operating Revenues ($ Millions)	$7,707	$11,101	$1,992	$20,800		$3,008	$23,807	
Public Benefit RD&D %	0.29%	0.21%	0.14%	0.23%		0.08%	0.21%	
Private Benefit RD&D %	0.30%	0.22%	0.19%	0.25%		0.37%	0.26%	
Monopoly RD&D %	0.14%	0.06%	0.03%	0.09%		0.09%	0.09%	
Total RD&D %	0.73%	0.49%	0.37%	0.57%		0.54%	0.56%	

Project-by-Project #2
Nominal Totals

Project-by-Project #2 Totals Nominal Dollars	SCE	PG&E	SDG&E	Subtotals	%	SCG	Totals	%
End Use Technology R&D								
Public Benefit RD&D	$1,491	$5,608	$126	$7,225	82%	$1,102	$8,328	68%
Private Benefit RD&D	$574	$867	$105	$1,546	18%	$2,439	$3,985	32%
Subtotal	$2,065	$6,475	$231	$8,771		$3,541	$12,312	
Generation/Storage RD&D								
Public Benefit RD&D	$5,368	$1,962	$0	$7,330	29%	$90	$7,420	27%
Private Benefit RD&D	$9,073	$7,543	$1,045	$17,661	71%	$2,348	$20,010	73%
Subtotal	$14,441	$9,505	$1,045	$24,991		$2,438	$27,429	
Environmental RD&D								
Public Benefit RD&D	$5,966	$2,277	$195	$8,438	62%	$0	$8,439	62%
Private Benefit RD&D	$2,849	$2,209	$124	$5,182	38%	$0	$5,182	38%
Subtotal	$8,815	$4,486	$319	$13,620		$0	$13,620	
Transportation RD&D								
Public Benefit RD&D	$0	$0	$0	$0	0%	$0	$0	0%
Private Benefit RD&D	$2,157	$2,350	$229	$4,736	100%	$3,104	$7,841	100%
Subtotal	$2,157	$2,350	$229	$4,736		$3,104	$7,840	
Research Contributions								
Public Benefit RD&D	$5,436	$9,361	$2,185	$16,981	55%	$650	$17,631	55%
Private Benefit RD&D	$4,436	$7,861	$1,833	$14,129	45%	$50	$14,179	45%
Subtotal	$9,871	$17,221	$4,017	$31,109		$700	$31,809	
Monopoly Function RD&D								
Subtotal	$8,974	$5,864	$606	$15,444		$1,862	$17,306	
Totals w/o Administrative								
Public Benefit RD&D	$18,261	$19,208	$2,506	$39,974	41%	$1,842	$41,816	38%
Private Benefit RD&D	$19,089	$20,830	$3,336	$43,254	44%	$7,941	$51,195	46%
Monopoly Function RD&D	$8,974	$5,864	$606	$15,444	16%	$1,862	$17,306	16%
Subtotal	$46,323	$45,901	$6,447	$98,671		$11,645	$110,316	
Administrative Planning								
Subtotal	$6,209	$5,903	$466	$12,578		$3,444	$16,022	
Totals w/ Administrative								
Public Benefit RD&D	$20,708	$21,678	$2,687	$45,072	41%	$2,387	$47,460	38%
Private Benefit RD&D	$21,647	$23,508	$3,577	$48,732	44%	$10,290	$59,022	47%
Monopoly RD&D	$10,177	$6,618	$650	$17,445	16%	$2,413	$19,858	16%
Totals	$52,532	$51,804	$6,913	$111,249		$15,089	$126,338	
Totals as % of Operating Revenues								
Operating Revenues ($ Millions)	$7,203	$10,572	$1,861	$19,636		$2,811	$22,447	
Public Benefit RD&D %	0.29%	0.21%	0.14%	0.23%		0.08%	0.21%	
Private Benefit RD&D %	0.30%	0.22%	0.19%	0.25%		0.37%	0.26%	
Monopoly RD&D %	0.14%	0.06%	0.03%	0.09%		0.09%	0.09%	
Total RD&D %	0.73%	0.49%	0.37%	0.57%		0.54%	0.56%	

SCE	Public Project?	1993 Expenses ($000's)
Customer Energy Technologies		
Industrial/Environmental Technologies	N	574
Advanced Commercial Energy Systems	Y	785
Advanced Residential Systems	Y	492
Conservation/Non-Electric Technologies	Y	214
Subtotal Funding for Public Projects		1,491
Subtotal Funding for Private Projects		574
Category Subtotal		2,065
Customer Air Quality		
NOx Rule Compliance	N	785
ROC and Air Toxic Rule Compliance	N	732
New AQMP Regulations	N	562
Conservation-Based Environmental Compliance	N	31
Subtotal Funding for Public Projects		0
Subtotal Funding for Private Projects		2,110
Category Subtotal		2,110
Electrical and Communication Systems		
NetComm High Speed Communications	MONOPOLY	2,045
T&D Systems Technology	MONOPOLY	4,079
Electronic Controls and Diagnostics	MONOPOLY	301
Integrated Digital Communications	MONOPOLY	2,549
Modular Generation Technologies	N	6,228
Advanced and Renewable Electrical Concepts	Y	340
Subtotal Funding for Public Projects		340
Subtotal Funding for Private Projects		6,228
Subtotal Funding for Monopoly Projects		8,974
Category Subtotal		15,542

SCE

	Public Project?	1993 Expenses ($000's)
System Energy Management		
Generation Improvement	N	1,859
Emission Control	N	902
Energy Storage	N	84
Alternative Renewable Energy	Y	5,028
Subtotal Funding for Public Projects		5,028
Subtotal Funding for Private Projects		2,845
Category Subtotal		7,873
Environmental Quality Improvement		
Occupational Health and Injury Prevention	N	739
Air, Land and Water Quality	Y	2,061
Natural Habitat Conservation	Y	1,671
Community Environmental Quality	Y	2,234
Subtotal Funding for Public Projects		5,966
Subtotal Funding for Private Projects		739
Category Subtotal		6,705
Electric Transportation		
Electric Vehicles	N	2,055
Mass Transit	N	102
Subtotal Funding for Public Projects		0
Subtotal Funding for Private Projects		2,157
Category Subtotal		2,157

SCE	Public Project?	1993 Expenses ($000's)	%
Research Support			
Research Regulation, Contracts and Valuation	ADMIN.	1,612	
Research Support	ADMIN.	4,597	
Subtotal Funding for Public Projects		0	
Subtotal Funding for Private Projects		0	
Subtotal Funding for Administrative Programs		6,209	
Category Subtotal		6,209	
Research Contributions			
EPRI	50%	8,820	
CIEE	100%	1,000	
WEST Associates	50%	51	
Subtotal Funding For Public Projects		5,436	
Subtotal Funding For Private Projects		4,436	
Category Subtotal		9,871	
Total Funding for Public Projects		**18,261**	**39%**
Total Funding for Private Projects		**19,089**	**41%**
Total Funding for Monopoly Projects		**8,974**	**19%**
Total Funding for non-Admin SCE RD&D Projects		**46,323**	**100%**
Administrative and Planning RD&D Funding		**6,209**	
Total SCE RD&D Funding		**52,532**	
Adjustment to Pro-Rate Administrative Funding			
SCE Public Benefit RD&D Funding		**20,708**	**39%**
SCE Private Benefit RD&D Funding		**21,647**	**41%**
SCE Monopoly Function RD&D Funding		**10,177**	**19%**
Total SCE Project Funding		**52,532**	**100%**

PG&E	Public Project?	1994 Expenses ($000's)
Customer Systems		
Commercial Energy Efficiency		*$1,234*
Dynamic Buildings	Y	614
Office Technology	Y	140
Office Productivity	Y	110
Lighting & Controls	Y	110
Scanning & Planning	N	60
EE Design Tools	Y	110
Measurement Tools & Process Optimization	Y	50
HVAC	Y	40
Advanced Building Controls & Communications	Y	0
Marriott Moscone Demonstration Project	Y	0
EE, Environmentally Preferred Building Systems Technologies	Y	0
Building Performance Monitoring & Analysis	Y	0
Strategic Planning & Advanced Technology Assessment	N	0
Industrial and Agricultural Energy Efficiency		*950*
Scanning	N	40
Component Development & Field Testing	N	180
Power Electronics/Motors & Systems	Y	275
Power Quality	N	320
Power Electronics	N	135
Residential		*463*
Residential Energy Management	N	40
Building Systems	Y	403
Advanced Appliances	Y	20
Customer Energy Management	N	0
Building Performance Monitoring & Analysis	Y	0
EE Building System Technology	Y	0
Residential Space Conditioning	Y	0
EE Environmentally Preferred Lighting & Appliance Technology	Y	0
Strategic Planning & Advanced Technology Assessment	N	0

PG&E	Public Project?	1994 Expenses ($000's)
Customer Systems		
Transportation		*$2,350*
Clean Air Vehicle Technology Center	N	300
OEM NGV/EV Development	N	50
NGV/EV Performance Monitoring	N	650
Advanced Refueling Evaluation NGV/ & EV	N	1,250
Wayside Energy Storage	N	35
Advanced Technological Assessment	N	65
System Impacts Evaluation	N	0
Customer Systems Planning		*92*
Strategic Planning	N	92
Food Service Technology Center		*475*
UTP Development	Y	120
Ancillary Issues	Y	330
EE Warewasher	Y	25
UTP Development	Y	0
Advanced Customer Technology, ACT2		*3,261*
Project Management	Y	3,261
ACTT	Y	0
Subtotal Customer Systems Public Project Funding		5,608
Subtotal Customer Systems Private Project Funding		3,217
Category Subtotal		8,825

PG&E

	Public Project?	1994 Expenses ($000's)
Energy Delivery and Control		
Electric Distribution		*$2,538*
DA Communications	MONOPOLY	1,343
DA Information & Computing	MONOPOLY	294
DA Sensors	MONOPOLY	152
DA Systems Issues	MONOPOLY	403
Existing Systems, Methods & Equipment	MONOPOLY	346
Integrated Utility Communications	MONOPOLY	0
Dist. Planning & Simulation tools	MONOPOLY	0
Dist Operational Tools	MONOPOLY	0
Dist Maintenance Tools & Diagnostics	MONOPOLY	0
Public & Employee Safety	MONOPOLY	0
Energy System Integration		*1,004*
Smart Substation	MONOPOLY	344
GENIUS	MONOPOLY	15
Communication Development	MONOPOLY	20
Sensor Development	MONOPOLY	215
System Modeling	MONOPOLY	410
Planning and Development		*434*
Technical Planning & Development	MONOPOLY	200
DSCA Membership	MONOPOLY	50
Enabling Technical Assessment	MONOPOLY	154
EPRI/GRI Handbook	MONOPOLY	30
Gas Systems		*1,021*
Pipe Renovation Lining	MONOPOLY	450
Smart Seismic Device	MONOPOLY	100
Energy Meter/Gas Analysis	MONOPOLY	100
Advance Control Systems	MONOPOLY	105
Transmission Construction, Maint & Ops Techs	MONOPOLY	41
Distribution Construction, Maint & Ops-Adv Techs	MONOPOLY	225
Infrastructure Life Extension	MONOPOLY	0
System Operating & Maintenance Efficiency	MONOPOLY	0
Advanced Gas Instrumentation & Measurement	MONOPOLY	0
Electric Transmission Systems		*867*
Dynamic M&O Costs	MONOPOLY	310
Minimize Capital Costs	MONOPOLY	0
System Asset Utilization	MONOPOLY	400
Maintain Service Reliability	MONOPOLY	157
Transmission Grid Operations	MONOPOLY	0
Subtotal Energy Delivery/Control Public Funding		0
Subtotal Energy Delivery/Control Private Funding		0
Subtotal Energy Delivery/Control Monopoly Funding		5,864
Category Subtotal		5,864

PG&E	Public Project?	1994 Expenses ($000's)
Environment, Health and Safety		
Fossil Emissions Reduction		*$2,414*
Fossil Emissions	N	1,508
Air & Water Quality	Y	662
Fossil Waste Management	N	244
Air Emissions Control Technologies	N	0
Air Quality Impact Assessment & Modeling	Y	0
Geothermal Abatement		*191*
H2S Abatement	N	99
Waste Minimization	N	92
H2S Emissions Control Technologies	N	0
Waste Management Technologies	N	0
Pollution Management Cost Reduction		*0*
Pollution Management Cost Reduction	Y	0
Natural Resources Management		*1,313*
Water Quantity and Quality	Y	1,056
Vegetation Management	N	190
Environmental Impact/Mitigation	Y	67
Aquatic Habitat Assessment & Compliance Methods	Y	0
Watershed Effects	Y	0
Improved Tech for Managing Company Rights-of-Way and Facilities	N	0
Wildlife Mitigation Methods	Y	0
Health and Safety Research		*492*
EMF	Y	270
Indoor Air Quality	Y	222
EMF Exposure Assessment	Y	0
Indoor Air Quality	Y	0
Seismic Safety	N	0
Occupational Health & Safety	Y	0
Exploratory Research		*76*
Exploratory Research	N	76
Subtotal Env, Health, Safety Public Funding		2,277
Subtotal Env, Health, Safety Private Funding		2,209
Category Subtotal		4,486

PG&E

Generation and Storage	Public Project?	1994 Expenses ($000's)
Fossil Power Plants		*$2,007*
Improve Power Plant Efficiency Monitoring	N	25
Improve Performance Through Component Replacement or Modification	N	614
Improve Plant Controls	N	0
Improve Plant Equipment Condition Assessment	N	747
Automated Equipment Diagnostic Technologies	N	240
Advanced Fossil Plant Maintenance Practices	N	83
Improve Repair Technologies	N	103
Improve Equipment Life Assessment	N	147
Identify Cost-Effective Replacement Equipment	N	48
Advanced Hydro		*735*
Mechanical/Electrical Equipment Condition Assessment Technologies	N	16
Hydro Plant Maintenance Technologies	N	273
Dam Safety	N	215
Water Conveyance System Safety	N	71
Water Conveyance System Life Extension	N	63
Hydro Resource Planning Optimization	N	97
Geysers Power Plant		*313*
Mitigate Geysers' Steam Decline & Improve Steam Rate	N	75
Maximize Geysers' Equipment Life	N	238
Power System Optimization		*500*
Advanced Generation Control and Scheduling	N	0
Resource Planning & Assessment Technologies	N	111
Real-Time Monitoring & Energy Management System Operations	N	46
System Security & Network Optimization Technologies	N	163
Electric Grid Operation Technologies	N	0
Power Merchant Information Technologies	N	0
Short-Term Power Resource Scheduling Technologies	N	180
Distributed Peaking		*3,270*
Substation Applications	N	1,308
Premium Power Supply	N	0
Customer-Sited Distributed Peaking & Demand-Side Management	N	0
PVUSA	Y	1,589
PV as a Demand-Side Management Option	Y	120
PV Off-Grid Service Option	Y	253
Technology Scanning & Assessment		*2,680*
Technology Scanning & Assessment	N	2,680
Subtotal Generation & Storage Public Funding		1,962
Subtotal Generation & Storage Private Funding		7,543
Category Subtotal		9,505

(Note: Only PV projects qualify as public interest RD&D)

PG&E	Public Project?	1994 Expenses ($000's)	%
Planning and Business Services			
Planning, Regulatory Issues, and Business Services			
Policy, Planning, Management and Administration	ADMIN.	$5,491	
Research Contributions			
EPRI	50%	14,681	
GRI	50%	866	
CIEE	100%	1,500	
Others	50%	174	
EPRI Tailored Collaboration		0	
Analytic Studies			
Distributed Utility Planning	ADMIN.	412	
Subtotal Planning & Business Services Public Funding		9,361	
Subtotal Planning & Business Services Private Funding		7,861	
Subtotal Planning & Business Services Admin. Funding		5,903	
Category Subtotal		23,124	
Total PG&E Public Project Funding		**19,208**	**42%**
Total PG&E Private Project Funding		**20,830**	**45%**
Total PG&E Monopoly Project Funding		**5,864**	**13%**
PG&E Project Funding w/o Admin. and Planning		**45,901**	
Total PG&E Admin. and Planning Funding		**5,903**	
Total PG&E Project Funding		**51,804**	
Adjustment to Pro-Rate Administrative Funding			
PG&E Public Benefit RD&D Funding		**21,678**	
PG&E Private Benefit RD&D Funding		**23,508**	
PG&E Monopoly Function RD&D Funding		**6,618**	
Total PG&E Project Funding		**51,804**	

SDG&E

Generation Efficiency	Public Project?	1993 Expenses ($000's)
Fuel Cell Development	N	$718
Advanced Gas Turbine	N	124
Energy Storage	N	4
Alternative Energy Systems	N	15
Plant Expert Systems	N	63
Shift Worker Productivity	N	39
Asset Management	N	82
Fuel Science	N	0
Super Heat Life Extension	N	0
Distributed Generation/Resources	N	0
Subtotal funding of Public Projects		0
Subtotal funding of Private Projects		1,045
Total funding of Generation Efficiency Projects		1,045

Delivery and End-Use	Public Project?	1993 Expenses ($000's)
DSM Technology Development	Y	$126
Non-Conductive Structure	MONOPOLY	575
Customer Battery	N	85
Advanced T&D Systems	MONOPOLY	13
Fuel Planning Models	N	12
Advanced Metering	MONOPOLY	18
Thermal Energy Storage	N	8
Packaged Cogeneration	N	0
Power Quality	MONOPOLY	0
Energy Technology Center	Y	0
SMES	N	0
Building Optimal Energy Intelligent	N	0
Subtotal funding of Public Projects		126
Subtotal funding of Private Projects		105
Subtotal funding of Monopoly Projects		606
Total funding of Delivery and End-Use Projects		837

SDG&E

	Public Project?	1993 Expenses ($000's)
Environment		
Environmental Research/Support	Y	$44
EMF Research	Y	63
Indoor Air Quality Study	Y	82
Biodegradation	Y	6
75 Ton Chiller	N	14
25 Ton Chiller	N	12
Reverse Osmosis	Y	0
Emissions Monitor	N	10
Low-NOx Burners	N	38
CFC-11	N	50
Waste Water Utilization	N	0
Subtotal funding of Public Projects		195
Subtotal funding of Private Projects		124
Total funding of Environment Projects		319
Planning, Admin & Tech Transfer		
EPRI Membership	50%	3,546
Technology Transfer	ADMIN.	0
EPRI Participation	50%	79
GRI Participation	50%	25
RD&D Coordination	ADMIN.	466
WEST Associates	50%	15
CIEE	100%	352
Subtotal funding of Public Projects		2,185
Subtotal funding of Private Projects		1,833
Subtotal funding of Administrative Projects		466
Category Subtotal		4,483

SDG&E	Public Project?	1993 Expenses ($000's)	%
Clean Air Vehicles			
Electric Vehicle Demonstration	N	$133	
Long-Term NGV Development	N	3	
Bi-Polar Battery	N	18	
Hybrid Bus	N	50	
Hybrid Vehicle Development	N	25	
Subtotal funding of Public Projects		0	
Subtotal funding of Private Projects		229	
Category Subtotal		229	
Total Funding of Public Projects		2,506	39%
Total Funding of Private Projects		3,336	52%
Total Funding of Monopoly Projects		606	9%
Total Project Funding w/o Admin and Planning		6,447	100%
Total Admin and Planning Funding		466	
Total SDG&E RD&D Funding		6,913	
Adjustment to Pro-Rate Administrative Funding			
SDG&E Public Benefit RD&D Funding		2,687	39%
SDG&E Private Benefit RD&D Funding		3,577	52%
SDG&E Monopoly Function RD&D Funding		650	9%
Total SDG&E Project Funding		6,913	100%

Southern California Gas Company

	Public Project?	1993 Expenses ($000's)
Utilization Systems		
Residential		
Equipment/Building Systems		*$3*
Interior Gas Piping	Y	3
2 psi Delivery Study	Y	0
CIEE Energy Efficiency Study	Y	0
Gas Appliances		*441*
Rheem/AGAL Water Heater	Y	56
Alzeta Atmospheric Low NOx Water Heater	Y	61
CERAC BBQ	N	0
CERAC Fireplace	N	0
Residential Gas Light	Y	36
Tecogen Water Heater Development	Y	207
Residential Technology Transfer	N	81
Universal electric Ignition System	Y	0
Cooking Equipment Evaluation	Y	0
Combo System Improvement	Y	0
Advanced Clothes Dryer	Y	0
Advanced Fireplace Development	N	0
Indoor Air Quality		*8*
Western IAQ Studies	Y	8
Gas Energy End Use Survey	Y	0
Spillage and Backdrafting Investigation	Y	0
Wall Heater Evaluation	Y	0
Space Conditiong and Gas Heat Pumps		*361*
Chemisorption Cycle Development	Y	77
CSULA Field Test and DAS	Y	0
Gas Pneumatic Heat Pump	Y	18
JGEHP Development	Y	119
JPL Regenerative Heat Pump	Y	50
Phillips Absorption Heat Pump	Y	5
EAC Environmental Chamber	Y	92
Aerojet Solid Sorption Concept	Y	0
Carrier GAX Absorption	Y	0
Fluididized Bed Desiccant	Y	0
Subtotal Residential Public Project Funding		732
Subtotal Residential Private Project Funding		81
Residential Total Project Funding		813

Southern California Gas Company

	Public Project?	1993 Expenses ($000's)
Utilization Systems		
Commercial		
Advanced Combustion		*$45*
Atmospheric Burner-CSLB	N	1
Fluidic Nozzle Burner	N	41
Test Center Burner Dev	Y	3
ADL/GRI Burner Dev	N	0
Burners and Controls		*67*
Combustion Material Evaluation	Y	67
Alzeta Burner Improvement	N	0
Gas Control Valve-Power Burners	N	0
Commercial Boilers/Water Heating		*443*
Acoustic Controller Dev	N	19
AGAL/Raypak Boiler	N	114
Alzeta-Zum Field Test	N	40
Commercial Technology Transfer	N	270
Commercial water Heater Improvement	Y	0
Commercial Heating and Cooling Systems		*546*
GRI GAX Dev	N	100
Insights west Desiccant study	N	0
Gas High Efficiency Cycle Evaluation	Y	70
AUS Hybrid Heat Pump	N	61
GRI Commercial Triple Effect Absorption Dev	N	100
Product Team Dev	N	215
Large Cooling	Y	0
Fast Food Resturants		147
Vertical Conveyor Oven	N	20
Commercial Cooking Field Test	Y	9
Commercial Vent. Study-GRI	Y	84
Ventless Oven	N	8
Rotisserie Oven	N	26
Countertop Fryer	N	0
Large Tonnage Refrigeration		*0*
Refrigeration Product Development	N	0
Restaurant/Institutional		*134*
Raypak Water Booster	N	14
Self Clean Oven	N	0
Steam Generator	N	0
Roll-in Combo Oven	N	120
Other Commercial Cooking	N	0
Small Tonnage Refrigeration		*8*
Solid vapor Absorption Refrigeration System	N	0
Gas-Powered Refrigeration Options	Y	0
Industrial Refrigeration Technology Assessment	N	8
Subtotal Commercial Public Project Funding		233
Subtotal Commercial Private Project Funding		1,157
Commercial Total Project Funding		1,390

Southern California Gas Company

	Public Project?	1993 Expenses ($000's)
Utilization Systems		
Industrial		
Air Toxics and waste Processing		*$0*
Auto Shredder Waste Reduction	N	0
Air Toxics Emission Reduction	Y	0
Molten Salt Oxidation	N	0
VOC and Air Toxics Control System	N	0
Boiler, Process and Fluid Heaters		*211*
Wave Tech/Gas Turbine Eval	N	9
Burner Diagnostic Lab Devlopment-UCI	Y	100
Cannon Nox Digester Demo	N	56
Clayton Burner	N	22
Cyclonic Dev-IGT	N	-108
Firetube Burner	N	52
Fuel Injection Recirculation	N	22
MTCI/Pulse Combustion	N	3
Selective Catalyst	N	36
Cal Poly Clinic Power Jet Water Cooled Burner	N	16
Power Jet Water Cooled Burner Dev	N	3
Industrial Combustion System	N	0
Process Heater Burner Dev	N	0
Metals Melting, Finishing & Heat Treating		*421*
High Temerature Heat Treating	N	0
Industrial Process Technology	N	43
No NOx Combustion System	N	138
Regenerative Radiant Burner	N	2
Industrial Technology Transfer	N	210
Aluminum Melting Process Modernization	N	28
High Performance Burner Demo	N	0
Aluminum Melting Burner Dev	N	0

Southern California Gas Company	Public Project?	1993 Expenses ($000's)
Utilization Systems		
Industrial		
Non-metals Melting		*$222*
NOx Reduction from High-Performance Burners	N	222
Hi-Rad Burner Dev	N	0
Oxy-Fuel Demo	N	0
Gas Reburn Demo	N	0
Non-Metals Process Heating, Drying, Curing &Forming		*372*
Biofiltration	N	17
Continuous Fiber Ceramic Composites	N	90
Direct Air Heater Burner Dev	N	20
Industrial Burner Dev	N	84
Valuing Gas Industry	N	-9
Plastic Extruder	N	0
Direct Heated Paper Dryer Demo	N	0
MicroGas Dryer	N	170
Infrared Drying	N	0
Sensors and Controls		*75*
Emission Sensors	N	0
Solid States Proportioning Valve	N	75
Subtotal Industrial Public Funding		100
Subtotal Industrial Private Funding		1,201
Total Industrial Funding		1,301
Subtotal UTIL SYS PUBLIC PROJECT FUNDING		1,065
Subtotal UTIL SYS PRIVATE PROJECT FUNDING		2,439
UTILIZATION SYSTEMS PROJECT FUNDING		3,504

Southern California Gas Company

Operations	Public Project?	1993 Expenses ($000's)
Compressor Station Operations		*$39*
Advanced Operating Technologies	MONOPOLY	8
Continuous Emissions Monitoring System	MONOPOLY	31
Parametric Emissions Monitoring System	MONOPOLY	0
Storage Field Operations		*175*
Real time Erosion Monitoring	MONOPOLY	123
Shoe Leak Investigation Tool	MONOPOLY	0
Microbiologically Influenced Corrosion Study	MONOPOLY	52
Pipeline Mainenance		*1,034*
Acousticv Plastic Pipe Locater	MONOPOLY	156
AGA Pipeline Research	MONOPOLY	114
Casing Cutter	MONOPOLY	35
Chipless Hot Tap Cutter	MONOPOLY	35
Plastic Pipe Pressure Control	MONOPOLY	148
System Earthquake Integrity	MONOPOLY	18
UAF Gas	MONOPOLY	32
Universal Electrofusion Controller	MONOPOLY	117
Urban Corrosion Maonitoring	MONOPOLY	100
Operations Technology Transfer	MONOPOLY	183
Brittle Pipe Crack Arrestor	MONOPOLY	15
Tool Efficiency Analyzer	MONOPOLY	55
Advanced Metal Pipe Locater	MONOPOLY	0
NG Pipeline Lining Study Harvey Mudd	MONOPOLY	26
GRI mouse	MONOPOLY	0
Advanced Hot Tap Cutter	MONOPOLY	0
Smartpipe Fiber Optics	MONOPOLY	0
CP Line Drop Tool	MONOPOLY	0
Street Restoration Techniques		*158*
A/C Pavement Repair Study	MONOPOLY	66
Spoil Recycle Study	MONOPOLY	92
One Step Pavement Repair	MONOPOLY	0
Utility Cut Issues Study	MONOPOLY	0
Trenchless Technology		*2*
Excavation Techniques	MONOPOLY	2
Advanced Guided Boring System	MONOPOLY	0
Safety		*87*
Equipment and tool Safety Technology	MONOPOLY	44
Investigation Leaking Hydraulic Lifts	MONOPOLY	1
Improved Sonic Leak Pinpointer	MONOPOLY	31
Novel Tool Concepts	MONOPOLY	7
Advanced Excess Flow Valve	MONOPOLY	0
CO/CH4 Detector Demo	MONOPOLY	4
Lightweight Traffic Plates	MONOPOLY	0
Multiple Sensor Device	MONOPOLY	0
Sewer Locator	MONOPOLY	0

Southern California Gas Company

Operations	Public Project?	1993 Expenses ($000's)
Waste Remediation		*$37*
Multiple Soil Treatment Technology Evaluation	Y	0
In-situ Bioremediation of PAH Soils	Y	19
PCB Remediation	Y	0
Soil Washing Demo	Y	18
Soil Vapor Extraction Study	Y	0
Communication/Automation		*19*
Computer Technology Research	MONOPOLY	0
Automatic Meter Reading	MONOPOLY	0
Smart Siesmic Technology	MONOPOLY	14
Technology Assesssment/Operations	MONOPOLY	5
Advanced Data communications	MONOPOLY	0
Universal Meter Interface	MONOPOLY	0
Customer Services		*205*
Portable Gas Chromatograph	MONOPOLY	41
Field Multipurpose Device	MONOPOLY	164
Metering Concepts		*143*
Optical Volumetric Flow Meter	MONOPOLY	0
Compact Gas Meter	MONOPOLY	15
Field Test Support Activities and AMR video	MONOPOLY	0
Expert Systems	MONOPOLY	5
Sonic Nozzle Prover Interface	MONOPOLY	25
Next Generation Meter	MONOPOLY	50
MSA Cabinets	MONOPOLY	48
Smart Meter	MONOPOLY	0
Metering Technology Assessment	MONOPOLY	0
Subtotal Operations Public Project Funding		37
Subtotal Operations Private Project Funding		0
Subtotal Operations Monopoly Funding		1,862
Operations Total Project Funding		1,899

Southern California Gas Compay

	Public Project?	1993 Expenses ($000's)
Power Generation		
Fuel Cells		*$1,451*
IFC Development of a 200KW PAFC	N	470
Econ Feas anal of DEPG	N	0
Fuel Cell Site Design	N	0
Polymer Fuel Cell Design	N	13
Solid OXide Fuel Cell Development	N	250
Technology Assessment	N	410
West Coast 250 DW MCFC	N	263
Hydrogen Storage Study	N	15
Derect Methane Fuel Cell	N	0
Ballard Reformate Technology	N	0
National Fuel Cell Center	N	0
Fuel Cell Research Planning	N	30
Other Technologies		*122*
Solar Hybrid Receiver Design	Y	50
Thermophotovoltaic Evaluation	Y	40
Small Reformer Design	N	0
Fuel Processing'OSU water Pumper	N	0
Urban Energy and Environmental Center	Y	0
Hydrodynamic Generator	N	32
Hydrogen/Carbon Conversion	N	0
Cogeneration		*190*
Electro-Catalytic NOx Reduction	N	39
Emission control System	N	0
Emission Control Evaluation	N	0
Three-Way Catalytic Field Test	N	151
Cogeneration Study	N	0
Combustor Development		*216*
Advanced Catalytic Combustor	N	0
Allison Low NOx Combustor Development	N	200
Cal Poly EIC Turbine Project	N	16
Hydrogen Enrichment	N	0
Hydrogen Burner	N	0
System Development		*459*
DOE Funding Initiative	N	109
GRI/NREC Small Turbine Developement	N	350
Advanced Gas Turbine-Large	N	0
Advanced Gas Turbine-Small	N	0
Duct Burner development	N	0
Dispersed Power Generation study	N	0
Subtotal Power Generation Public Project Funding		90
Subtotal Power Generation Private Project Funding		2,348
Power Generation Total Project Funding		2,438

Southern California Gas Compay	Public Project?	1993 Expenses ($000's)	%
Transportation			
NGV Infrastructure Development			
NGV Support Systems	N	$146	
Refueling Systems	N	19	
Natural Gas Vehicles			
Fuel Systems Development	N	513	
Heavy Duty Natural Gas Engines & Vehicles	N	1,060	
Medium and Light Duty Natural Gas Vehicles Development	N	1,366	
Subtotal Transportation Public Project Funding		0	
Subtotal Transportation Private Project Funding		3,104	
Transportation Total Project Funding		3,104	
Southern California Gas Compay			
Research Contributions			
Project Name			
CIEE	100%	600	
Sustaining Membership Program	50%	100	
Subtotal Research Contributions Public Funding		650	
Subtotal Research Contributions Private Funding		50	
Research Contributions Total Funding		700	
Total SCG Public Project Funding		1,842	16%
Total SCG Private Project Funding		7,941	68%
Total SCG Monopoly Project Funding		1,862	16%
SCG Project Funding w/o Admin and Planning		11,645	100%
Administration and Special Programs		3,444	
Total SCG R&D Spending		15,089	
Adjustment to Pro-Rate Administrative Funding			
SCG Public Benefit RD&D Funding		2,387	16%
SCG Private Benefit RD&D Funding		10,290	68%
SCG Monopoly Function RD&D Funding		2,413	16%
Total SCG Project Funding		15,089	100%

E. HYBRID APPROACH (LIMITED FUNDING SCOPE)

In an attempt to determine pre-restructuring RD&D expenditures, a base year was chosen that adequately reflects a pre-PBR RD&D budget for each of the regulated utilities. The base years chosen for each utility are: PG&E-1993, Edison-1994, SDG&E-1995, and SCG-1994. The analysis also includes LADWP and SMUD, with a base year of 1994.

After a base year was selected, a case-by-case analysis was done by each utility to determine what projects were dropped in the subsequent years and, in the case of PG&E, which projects were forecasted to be dropped or reduced in the near future. Although a specific set of public interest criteria was not used by each utility in conducting their analysis, Working Group decisions concerning the characteristics of public interest projects were followed. The Hybrid Approach assumes that some types of public interest RD&D will continue to be funded within the utilities. No funding for generation, fuel cells, EMF, or utility contributions to GRI was included in the calculations. Furthermore, only customer-sited photovoltaics research was included. As with all of the approaches, transportation was excluded from the analysis. SMUD had no decrease in RD&D funding between the base year and their current 1996 budget, as is not shown in the appendix. The assumption was also made that the smaller municipal utilities have been doing little to no RD&D and thus restructuring will cause no significant change to their research budgets.

- Results
- Calculations for PG&E, SCE, SDG&E, SCG, and LADWP

Hybrid (Limited Funding Scope)
Method Results

1996$

Parties Included

Elec. IOUs (PG&E, SCE, SDG&E)	$16,625,000
So. Cal. Gas	$555,000
LADWP	$2,950,000
Administration	$1,718,000
Subtotal	**$21,848,000**
High Cost Market Transformation	$0
Total	$21,848,000
Recommended Funding Level:	**$21,848,000**

PG&E RD&D Expenditures
1996$ ($000's)

Research Area	1993	1996	Difference
Transmission	9,778	12,527	-2,749
Generation	3,909	3,304	605
Env., Health & Safety	4,684	6,069	-1,385
Customer Systems	8,091	6,900	1,191
Contributions	13,193	4,207	8,986
Management Support	5,133	5,392	-259
TOTAL	44,788	38,399	6,389

Research Area		Method for Funding
Air Quality	400	
Water Quality	400	
Customer Energy Technologies	1,500	
Customer PV	50	
PVUSA	250	
EPRI	4,458	50% of drop in EPRI funding
CIEE	1,000	
TOTAL	**8,058**	

SCE RD&D Expenditures
1996$ ($000's)

Research Area	1994	1995	Difference	% Difference
Transmission	20,894	5,332	15,562	74%
Generation	6,363	737	5,626	88%
Other	7,321	368	6,952	95%
Customer Systems	5,018	1,701	3,317	66%
Contributions	19,620	13,705	5,916	30%
Management Support	7,116	3,458	3,658	51%
TOTAL	66,332	25,301	41,031	62%

Research Area	1994	1995	Public Interest Funding	Percent of 1994 Level	Method for Funding
Photvoltaics	887	135	753	85%	Difference between years.
Wind	1	0	1	100%	Difference between years.
Customer Air Quality	2,014	339	1,675	83%	Difference between years.
Customer Energy Technologies	3,004	1,363	1,641	55%	Difference between years.
EPRI	18,520	12,685	2,918	16%	50% of difference between years.
CIEE	1,000	1,000	1,000	100%	Continued level of funding.
TOTAL	25,426	15,521	7,988	31%	

SDG&E RD&D Expenditures
1996$ ($000's)

Research Area	1994	1996	Difference	% Difference
Transmission	3,059	2,163	896	29%
Generation	3,078	1,928	1,150	37%
Other	3,705	2,724	981	26%
Customer Systems	9,842	6,815	3,027	31%
Contributions	3,876	3,124	752	19%
Management Support	584	655	-71	-12%
TOTAL	24,144	17,409	6,735	28%

Research Area		Method for Funding
EPRI	227	50% of drop in EPRI funding.
CIEE	352	Continued funding.
TOTAL	**579**	

SCG RD&D Expenditures
1996$ ($000's)

Research Area	1994	1996	Difference	% Difference
Operations	3,212	2,163	1,049	33%
Power Generation	3,232	1,928	1,304	40%
Utilization	3,890	2,724	1,166	30%
TOTAL	10,334	6,815	3,519	34%

Public Interest Decreases

Research Area	
Boilers	166
Space Cooling	105
Renewables	127
Environmental	158
TOTAL	**555**

LADWP RD&D Expenditures
1996$ ($000's)

Public Interest Decreases

Research Area		Method for Funding
EPRI	2,250	50% of decrease in contributions.
DSM	400	Decrease in funding level.
Other RD&D	300	Decrease in funding level.
Total	**2,950**	

F. OTHER APPROACHES CONSIDERED

1. Gap Method

As shown in the Basic Data (Appendix III-A.), there was a sharp decline in total RD&D expenditures after 1994, the year in which the future restructuring of the electric industry was announced. The probable relationship between this sudden decline and the announcement of restructuring is the axiom from which the Gap Method works. In other words, the Gap Method assumes that all of the RD&D which has been dropped by utilities during 1995 and 1996 has been public interest RD&D (1996 figures are utility estimates). The present gap in utility RD&D is figured by subtracting the average spending between 1995-1996 from the average spending between 1991-1994. GRI and EPRI projections of their RD&D expenditures in the year 2000 were used to find a percentage decline in RD&D funding between 1995 and the year 2000. The percentage decline is then applied to the average present spending of the utilities to find a projected decline between the present and the year 2000. The gap-to-present and the projected gap are then summed to yield the total annual funding gap.

2. Weighting Method

The spreadsheets in this group show how weights (percentages of public benefit) are applied to the total spending within the 740.1 categories to estimate the total spending on public interest projects. This figure is then converted into a percentage of public interest spending. It is assumed that this percentage is the amount by which all RD&D funding will decline. The percentage is, therefore, applied to the average present spending for each party to find the funds to be raised through the public interest surcharge. The only exception to this application is with SMUD, whose percentage of public benefit spending is likely to be higher than for the IOUs. For this reason, weights were applied individually to SMUD program categories from their Advanced and Renewable Technologies summaries.

F. OTHER APPROACHES CONSIDERED

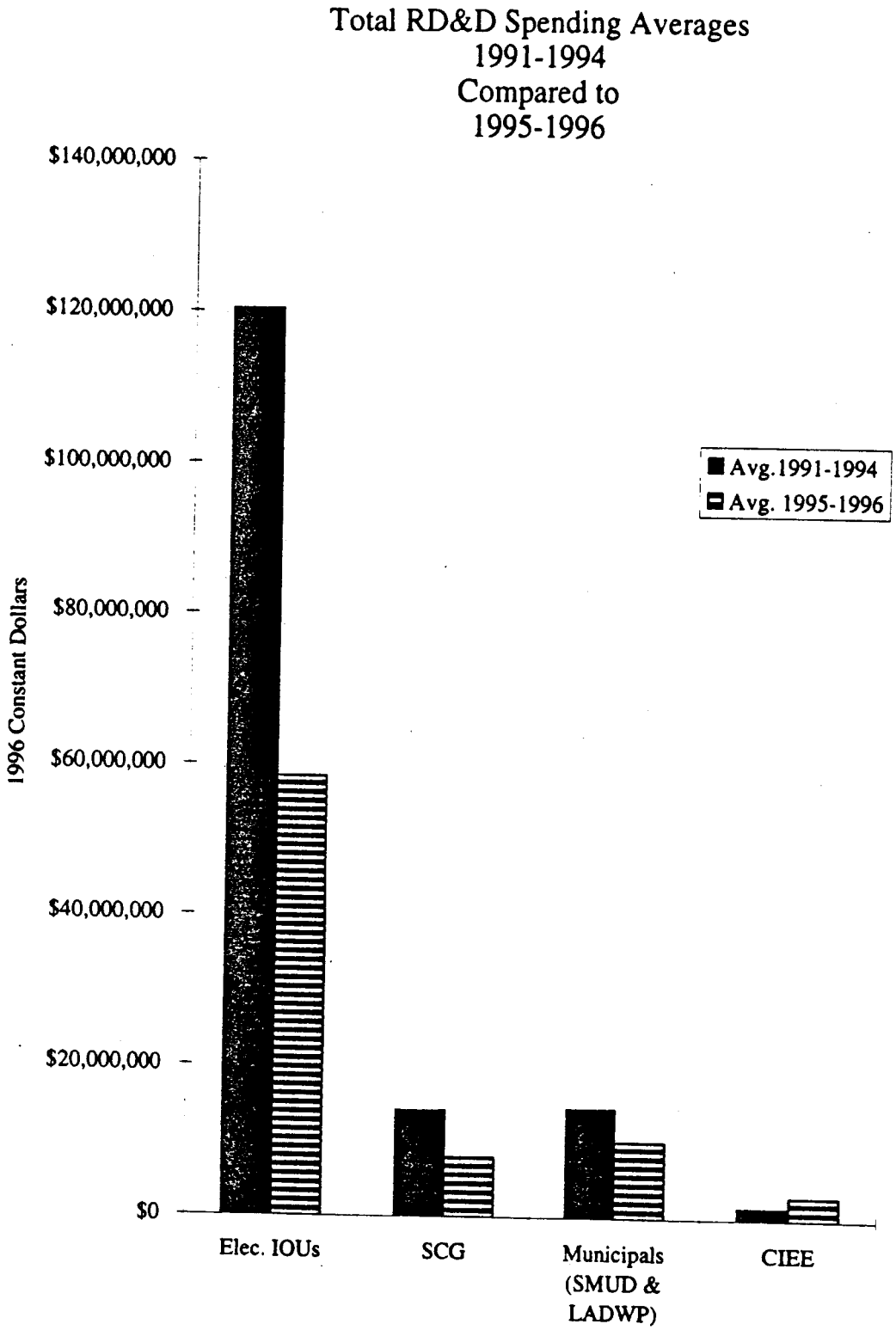
1. Gap Method

- Results
- Chart: Total RD&D Spending Averages (1991-1994 compared to 1995-1996)
- Average RD&D Expenditures (1991-1994 and 1995-1996) and Projected RD&D Spending in the year 2000
- RD&D Spending Projection to the Year 2000 Using GRI and EPRI Estimates

Gap Method
Results

1996$

Parties Included	Decline to Date	Projected Decline Present-2000	Decline to Date Plus Projected Decline
Elec. IOUs (PG&E, SCE, SDG&E)	$61,922,876	$18,063,388	$79,986,265
So. Cal. Gas	$6,222,757	$2,329,206	$8,551,963
Municipals (SMUD, LADWP)	$4,335,426	$3,130,173	$7,465,598
Subtotal	$72,481,059	$23,522,767	$96,003,826
CIEE	($1,465,189)	$930,835	($534,353)
Subtotal	$71,015,871	$24,453,603	$95,469,473
GRI (CA prorata share)	$2,880,125	$5,805,954	$8,686,078
EPRI (CA prorata share)	$6,394,968	$11,264,494	$17,659,462
Subtotal	$80,290,963	$41,524,051	$121,815,014
DOE in CA	($30,844,500)	$216,997,266	$186,152,766
Subtotal	$49,446,463	$258,521,316	$307,967,779
High Cost Market Transformation	$50,000,000	$50,000,000	$50,000,000
Total	$19,155,500	$266,997,266	$236,152,766



Transportation RD&D excluded.
1996 figures are planned spending.

DOE R&D Spending in CA:
$670,852,000 1991-1994
$701,696,500 1995-1996

Other Approaches Considered
Gap Method

1996$	Average RD&D Expenditures*		Projected RD&D Spending in 2000**
	Avg.1991-1994	Avg. 1995-1996	Gap Method
Elec. IOUs	$120,333,826	$58,410,950	$40,347,562
SCG	$14,091,697	$7,868,940	$5,539,734
Municipals (SMUD & LADWP)	$14,457,356	$10,121,930	$6,991,757
CIEE	$1,544,822	$3,010,010	$2,079,175
Subtotal	$150,427,701	$79,411,830	$54,958,227
GRI (CA prorata)	$22,494,833	$19,614,709	$13,808,755
EPRI (CA prorata)	$41,324,367	$34,929,399	$23,664,904
Subtotal	$214,246,900	$133,955,937	$92,431,887
DOE in CA	$670,852,000	$701,696,500	$484,699,234
Total	$885,098,900	$835,652,437	$577,131,121

*See sources under Appendix III-A, Basic Historical Data.
**Based on GRI and EPRI RD&D spending projections.

GRI's Projection of the Future of Gas RD&D
Source: July 27, 1995 fax "Estimated Total U.S. Gas-related R&D" from GRI staff, Ron Edelstein.

Numbers approximated from chart.

		Budget in Constant 1990$		
Year		1990	1995	2000
Producer and Service Co.		$370,000,000	$255,000,000	$190,000,000
LDCs and Pipelines		$40,000,000	$45,000,000	$3,000,000
GRI		$190,000,000	$190,000,000	$170,000,000
DOE		$120,000,000	$165,000,000	$70,000,000
	Subtotal	$720,000,000	$655,000,000	$433,000,000
Not included in total:				
Manufacturers		$100,000,000	$95,000,000	$95,000,000
	Total	$820,000,000	$750,000,000	$528,000,000

Inflation Adjustment 1.17

		Budget in 1996$		
Year		1990	1995	2000
Producer and Service Co.		$432,900,000	$298,350,000	$222,300,000
LDCs and Pipelines		$46,800,000	$52,650,000	$3,510,000
GRI		$222,300,000	$222,300,000	$198,900,000
DOE		$140,400,000	$193,050,000	$81,900,000
	Subtotal	$842,400,000	$766,350,000	$506,610,000
Not included in total:				
Manufacturers		$117,000,000	$111,150,000	$111,150,000
	Total	$959,400,000	$877,500,000	$617,760,000

We now use these projections to get a percent decline in spending.

		% Decline in Gas Related R&D	
		1990-1995	1995-2000
Producer and Service Co.		31.08%	25.49%
LDCs and Pipelines		-12.50%	93.33%
GRI		0.00%	10.53%
DOE		-37.50%	57.58%
	Subtotal	9.03%	33.89%
Not included in total:			
Manufacturers		5.00%	0.00%
	Total	8.54%	29.60%

GRI Estimated Percent Decline between 1995-2000: **29.60%**

The GRI estimated percent decline is applied to the average spending in 1995-1996 for GRI and SCG.

EPRI's Projection of the Future of Electricity R&D Spending
Source: EPRI staff, Bob Sherman.

Year	1995	1996	2000
Total R&D Spending	$501,840,000	$448,000,000	$340,000,000

EPRI Estimated Percent Decline between 1995-2000: **32.25%**

The EPRI estimated percent decline is applied to the 95-96 average for EPRI and SCE.

Average of EPRI and GRI Estimated Percent Declines: **30.92%**

The average of the GRI and EPRI estimated percent declines is applied to the 95-96 average for the mixed gas/electric parties.

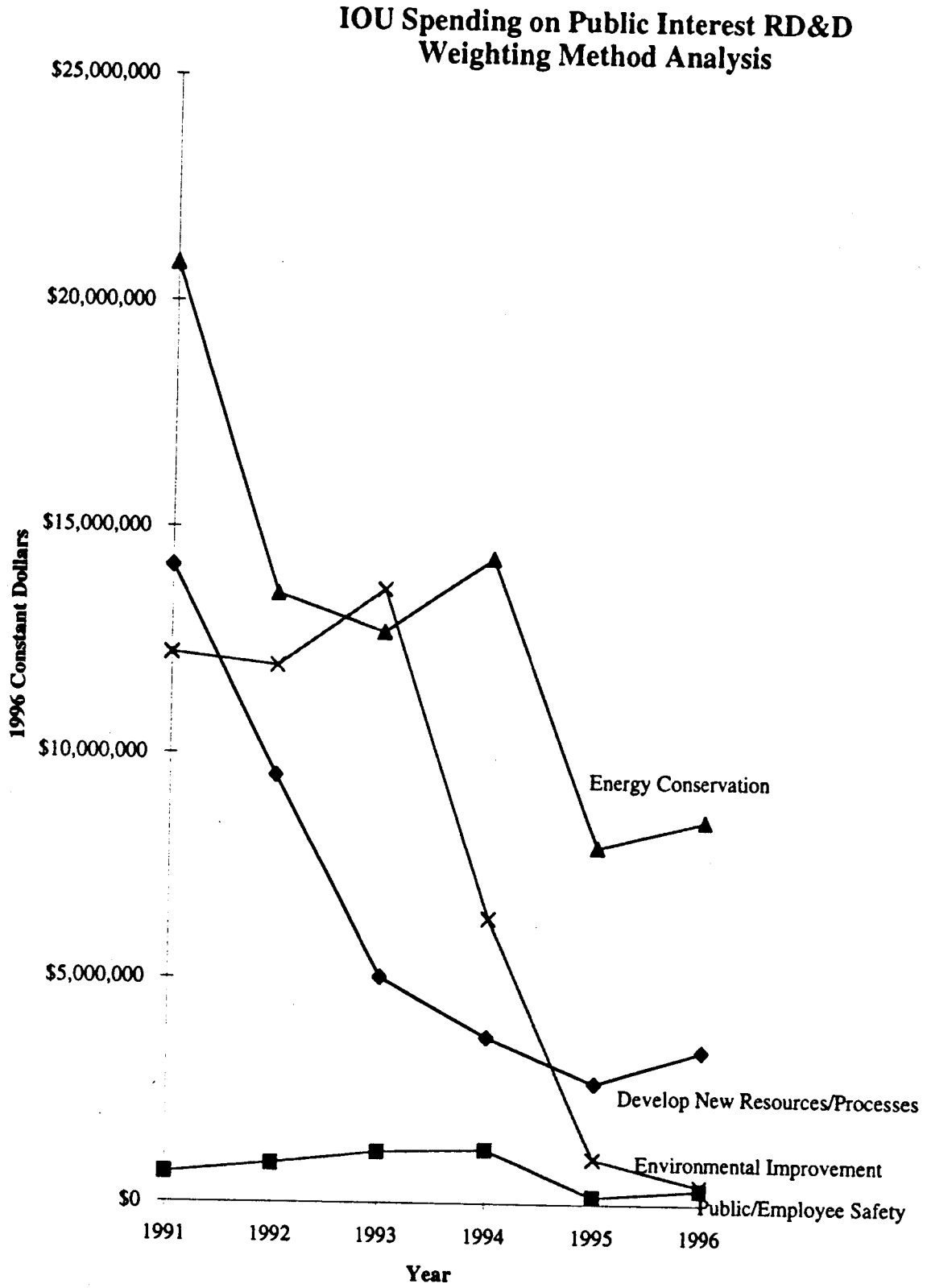
F. OTHER APPROACHES CONSIDERED

2. Weighting Method

- Results
- Chart: IOU Spending on Public Interest RD&D (Weighting Method Analysis)
- Weights Applied to the Utility Spending within each 740.1 Category
- Explanation of the Weights
- Total Public Interest Spending within each 740.1 Category
- Application of Weights to 740.1 Category Spending: PG&E, SCE, SDG&E, SCG
- Application of Weights to SMUD RD&D Spending Categories
- Public Interest RD&D Spending: Overview for IOUs, LADWP, SMUD, GRI, EPRI, DOE, and CIEE

Weighting Method
Results

1996$	
Parties Included	
Elec. IOUs (PG&E, SCE, SDG&E)	$48,334,998
So. Cal. Gas	$3,705,104
Municipals (SMUD, LADWP)	$6,687,422
Subtotal	$58,727,524
CIEE	$646,292
Subtotal	$59,373,816
GRI (CA prorata share)	$9,060,446
EPRI (CA prorata share)	$16,692,240
Subtotal	$85,126,502
DOE in CA	$270,185,000
Subtotal	$355,311,502
High Cost Market Transformation	$50,000,000
Total	$405,311,502


IOU Spending on Public Interest RD&D
Weighting Method Analysis
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
1996 Constant Dollars
1991
1992
1993
1994
1995
1996
Year
Energy Conservation
Develop New Resources/Processes
Environmental Improvement
Public/Employee Safety

Weights Applied to the Utility Spending Within Each 740.1 Category

Environmental Improvement		50%
	Air Quality Improvement	50%
	Water Quality Improvement	50%
	Hazardous Waste Prevention	50%
Public and Employee Safety		25%
Energy Conservation		75%
Development of New Resources or Processes		50%
	Renewable Resources	100%
	Non-Renewable Resources	0%
Improved System Reliablity and/or Reduced Operating Costs		0%
Contributions		
	GRI	50%
	EPRI	50%
	CIEE	100%
	Others	50%
Administration		Weighted

Explanation of the Weights Applied to the 740.1 Categories

Environmental Improvement

It is estimated that 50% of the project expenditures are to achieve longer term environmental improvements (public goods), and 50% of the expenditures are to meet existing regulatory requirements and to serve customer retention objectives.

Public and Employee Safety

It is estimated that 25% of the project expenditures are to achieve improvements in safety beyond those required by regulation (public goods), and 75% of the expenditures are to meet existing regulatory requirements or to reduce the risk of litigation.

Energy Conservation

It is estimated that 75% of the project expenditures are to meet regulatory policies by addressing the technology and market barriers which inhibit ratepayer acceptance in a competitive market, and that 25% of the expenditures are for customer retention.

Development of New Resources or Processes

It is estimated that 100% of the renewable energy project expenditures are to serve the longer-term public interest unserved by the competitive market, and that the non-renewable projects relate to competitive markets which do (or will soon) exist.

Improved System Reliability and/or Reduced Operating Costs

It is estimated that the project expenditures are to retain customers and reduce operating costs.

Contributions

It is estimated that 100% of the CIEE project expenditures are to address the technical and market barriers to energy conservation which the competitive market is not addressing, and therefore are public interest projects. It is also estimated that EPRI and GRI projects funded by California IOUs carry about the same proportion of public goods as do the utilities themselves, on the order of 50% of project expenditures based on the above estimates.

Weighting Method
Total Public Interest Spending within each 740.1 Category

Nominal $

	1991	1992	1993	1994	1995	1996
Environmental Improvement	$12,507,500	$8,727,000	$4,704,000	$3,520,500	$2,641,000	$3,406,500
Public and Employee Safety	$578,250	$796,750	$1,054,500	$1,138,750	$161,250	$327,750
Energy Conservation	$18,433,500	$12,402,000	$11,860,500	$13,650,000	$7,800,750	$8,543,250
Development of New Resources or Processes	$10,797,000	$10,951,500	$12,728,000	$6,046,000	$980,000	$408,000
Improved System Reliablity and/or Reduced Operating Costs	$0	$0	$0	$0	$0	$0
Total	$42,316,250	$32,877,250	$30,347,000	$24,355,250	$11,583,000	$12,685,500
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1

1996$

	1991	1992	1993	1994	1995	1996
Environmental Improvement	$14,133,475	$9,512,430	$5,033,280	$3,696,525	$2,693,820	$3,406,500
Public and Employee Safety	$653,423	$868,458	$1,128,315	$1,195,688	$164,475	$327,750
Energy Conservation	$20,829,855	$13,518,180	$12,690,735	$14,332,500	$7,956,765	$8,543,250
Development of New Resources or Processes	$12,200,610	$11,937,135	$13,618,960	$6,348,300	$999,600	$408,000
Improved System Reliablity and/or Reduced Operating Costs	$0	$0	$0	$0	$0	$0
Total	$47,817,363	$35,836,203	$32,471,290	$25,573,013	$11,814,660	$12,685,500

Other Approaches Considered
Weighting Method
Applications of Weights to 740.1 Category Spending

PG&E Public Interest RD&D Spending
No transportation. All gas included.
Nominal dollars, except where indicated.

	% Pb	1991	1992	1993	1994	1995	1996
Environmental Improvement							
Air Quality Improvement	0.5	$1,312,000	$1,093,500	$1,134,500	$1,708,500	$874,000	$1,419,000
Water Quality Improvement	0.5	$0	$28,500	$0	$0	$602,000	$915,500
Hazardous Waste Prevention	0.5	$82,000	$75,000	$168,000	$105,500	$4,000	$0
Environmental Improvement Subtotal		$1,394,000	$1,197,000	$1,302,500	$1,814,000	$1,480,000	$2,334,500
Public and Employee Safety	0.25	$133,750	$263,750	$243,500	$143,750	$19,000	$50,000
Energy Conservation	0.75	$4,767,000	$5,016,000	$4,856,250	$4,320,750	$3,852,750	$4,395,750
Development of New Resources or Processes	0.5	$400,000	$310,000	$1,340,000	$0	$0	$0
Renewable Resources	1	$4,320,000	$4,336,000	$3,270,000	$590,000	$576,000	$260,000
Non-Renewable Resources	0	$0	$0	$0	$0	$0	$0
Development of New Resources or Processes Subtotal		$4,720,000	$4,646,000	$4,610,000	$590,000	$576,000	$260,000
Improved System Reliablity and/or Reduce Operating	0	$0	$0	$0	$0	$0	$0
Contributions							
GRI (Participation)	0.5	$674,500	$883,000	$433,000	$500,000	$500,000	$0
EPRI (Membership & Participation)	0.5	$6,863,500	$7,198,000	$7,340,500	$7,500,000	$0	$1,606,156
CIEE	1	$1,500,000	$1,500,000	$1,500,000	$1,000,000	$0	$1,000,000
Others (ex: IGT, West Associates)	0.5	$27,350	$233,500	$87,000	$182,000	$77,000	$800,000
Contributions Subtotal		$9,065,350	$9,814,500	$9,360,500	$9,182,000	$577,000	$3,406,156
Public Goods Subtotal (no Administration)		$20,107,450	$21,170,750	$20,459,750	$16,232,500	$6,581,750	$11,246,406
Total Administration		$5,271,000	$4,932,000	$5,903,000	$5,536,000	$2,877,000	$3,450,000
Weighted Administration		$2,082,206	$2,053,698	$2,331,363	$1,913,528	$786,987	$1,173,520
Total Public Interest Spending (nominal$)		$22,189,656	$23,224,448	$22,791,113	$18,146,028	$7,368,737	$12,419,926
Total Public Interest Spending $1996		**$25,074,311**	**$25,314,649**	**$24,409,282**	**$19,053,330**	**$7,516,112**	**$12,419,926**
Total Private Interest Spending 1996$		**$30,743,169**	**$27,531,821**	**$28,947,338**	**$29,174,220**	**$15,695,008**	**$19,233,074**
Total RD&D Spending $1996		$55,817,480	$52,846,470	$53,356,620	$48,227,550	$23,211,120	$31,653,000
% Public Interest		**45%**	**48%**	**46%**	**40%**	**32%**	**39%**

Other Approaches Considered
Weighting Method
Applications of Weights to 740.1 Category Spending

SCE Public Interest RD&D Spending
No transportation. All gas included.
Nominal dollars, except where indicated.

	% Pb	1991	1992	1993	1994	1995	1996
Environmental Improvement	0.5		$687,500	$507,500			
Air Quality Improvement	0.5	$8,128,500	$2,434,000	$1,742,000	$534,500	$272,500	$200,000
Water Quality Improvement	0.5	$0	$401,500	$213,000	$136,000	$215,000	$175,000
Hazardous Waste Prevention	0.5	$557,500	$329,000	$243,500	$80,000	$0	$0
Environmental Improvement Subtotal		$8,686,000	$3,852,000	$2,706,000	$750,500	$487,500	$375,000
Public and Employee Safety	0.25	$355,000	$404,500	$610,000	$920,500	$62,000	$142,500
Energy Conservation	0.75	$12,306,000	$5,509,500	$4,821,000	$4,731,750	$1,278,000	$900,000
Development of New Resources or Processes	0.5	$0	$1,869,500	$975,000	$0	$142,000	($77,000)
Renewable Resources	1	$5,068,000	$4,191,000	$7,128,000	$5,440,000	$196,000	$200,000
Non-Renewable Resources	0	$0	$0	$0	$0	$0	$0
Development of New Resources or Processes Subtotal		$5,068,000	$6,060,500	$8,103,000	$5,440,000	$338,000	$123,000
Improved System Reliablity and/or Reduce Operating	0	$0	$0	$0	$0	$0	$0
Contributions							
GRI (Participation)	0.5	$0	$0	$0	$0	$0	$0
EPRI (Membership & Participation)	0.5	$0	$0	$4,410,000	$8,819,000	$6,000,000	$6,000,000
CIEE	1	$0	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Others (ex: IGT, West Associates)	0.5	$0	$18,500	$25,500	$24,000	$0	$0
Cotnributions Subtotal		$0	$1,018,500	$5,435,500	$9,843,000	$7,000,000	$7,000,000
Public Goods Subtotal (no Administration)		$26,415,000	$16,845,000	$21,675,500	$21,685,750	$9,165,500	$8,540,500
Total Administration		$0	$2,414,000	$6,209,000	$6,811,000	$3,390,000	$2,281,000
Weighted (Public) Administration		$0	$618,762	$2,708,783	$3,650,650	$625,827	$687,472
Total Public Interest Spending (nominal$)		$26,415,000	$17,463,762	$24,384,283	$25,336,400	$9,791,327	$9,227,972
Total Public Interest Spending $1996		**$29,848,950**	**$19,035,501**	**$26,115,567**	**$26,603,220**	**$9,987,153**	**$9,227,972**
Total Private Interest Spending 1996$		**$51,929,030**	**$23,975,858**	**$29,512,687**	**$39,212,350**	**$14,868,193**	**$13,644,028**
Total RD&D Spending $1996		$78,344,030	$41,439,620	$53,896,970	$64,548,750	$24,659,520	$22,872,000
% Public Interest		**38%**	**46%**	**48%**	**41%**	**41%**	**40%**

Other Approaches Considered
Weighting Method
Applications of Weights to 740.1 Category Spending

SDG&E Public Interest RD&D Spending
No transportation. All gas included.
Nominal dollars, except where indicated.

	% Pb	1991	1992	1993	1994	1995	1996
Environmental Improvement	0.5						
Air Quality Improvement	0.5	$108,000	$16,000	$71,000	$120,000	$135,500	$70,000
Water Quality Improvement	0.5	$42,000	$6,000	$0	$20,000	$0	$10,000
Hazardous Waste Prevention	0.5	$18,000	$2,500	$3,000	$0	$0	$12,500
Environmental Improvement Subtotal		$168,000	$24,500	$74,000	$140,000	$135,500	$92,500
Public and Employee Safety	0.25	$500	$0	$9,750	$2,750	$10,000	$37,500
Indoor Air Quality Study	1	$43,000	$78,000	$82,000	$42,000	$0	$0
EMF Research	1	$46,000	$43,000	$63,000	$9,000	$51,000	$75,000
Public and Employee Safety Subtotal		$89,500	$121,000	$154,750	$53,750	$61,000	$112,500
Energy Conservation	0.75	$610,500	$537,000	$158,250	$143,250	$249,000	$259,500
Development of New Resources or Processes	0.5		$233,000				
Renewable Resources	1	$1,009,000	$12,000	$15,000	$16,000	$66,000	$25,000
Non-Renewable Resources	0	$0	$0	$0	$0	$0	$0
Development of New Resources or Processes Subtotal		$1,009,000	$245,000	$15,000	$16,000	$66,000	$25,000
Improved System Reliablity and/or Reduce Operating	0	$0	$0	$0	$0	$0	$0
Contributions							
GRI (Participation)	0.5	$14,500	$11,000	$12,500	$7,500	$21,000	$35,000
EPRI (Membership & Participation)	0.5	$0	$1,793,000	$1,812,500	$1,803,000	$1,797,500	$1,895,000
CIEE	1	$357,000	$357,000	$352,000	$0	$0	$0
Others (ex: IGT, West Associates)	0.5	$5,500	$9,000	$7,500	$500	$52,500	$52,500
Contributions Subtotal		$377,000	$2,170,000	$2,184,500	$1,811,000	$1,871,000	$1,982,500
Public Goods Subtotal (no Administration)		$2,254,000	$3,097,500	$2,586,500	$2,164,000	$2,382,500	$2,472,000
Total Administration		$361,000	$399,000	$466,000	$546,000	$655,000	$665,000
Weighted Administration		$158,646	$177,521	$174,354	$164,263	$210,855	$222,116
Total Public Interest Spending (nominal$)		$2,412,646	$3,275,021	$2,760,854	$2,328,263	$2,593,355	$2,694,116
Total Public Interest Spending $1996		**$2,726,290**	**$3,569,773**	**$2,956,875**	**$2,444,676**	**$2,645,222**	**$2,694,116**
Total Private Interest Spending 1996$		**$3,810,264**	**$8,154,501**	**$4,391,026**	**$9,583,987**	**$4,707,805**	**$3,663,884**
Total RD&D Spending $1996		$6,222,910	$11,429,522	$7,151,880	$11,912,250	$7,301,160	$6,358,000
% Public Interest		**44%**	**31%**	**41%**	**21%**	**36%**	**42%**

Other Approaches Considered
Weighting Method
Applications of Weights to 740.1 Category Spending

State Electric IOU Totals (no SoCalGas)
Public Interest RD&D Spending
No transportation. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement						
Air Quality Improvement	$0	$687,500	$507,500	$0	$0	$0
Water Quality Improvement	$9,548,500	$3,543,500	$2,947,500	$2,363,000	$1,282,000	$1,689,000
Hazardous Waste Prevention	$42,000	$436,000	$213,000	$156,000	$817,000	$1,100,500
Environmental Improvement Subtotal	$657,500	$406,500	$414,500	$185,500	$4,000	$12,500
	$10,248,000	$5,073,500	$4,082,500	$2,704,500	$2,103,000	$2,802,000
Public and Employee Safety	$578,250	$789,250	$1,008,250	$1,118,000	$142,000	$305,000
Energy Conservation	$17,683,500	$11,062,500	$9,835,500	$9,195,750	$5,379,750	$5,555,250
Development of New Resources or Processes						
Renewable Resources	$400,000	$2,412,500	$2,315,000	$0	$142,000	($77,000)
Non-Renewable Resources	$10,397,000	$8,539,000	$10,413,000	$6,046,000	$838,000	$485,000
Development of New Resources or Processes Subtotal	$0	$0	$0	$0	$0	$0
	$10,797,000	$10,951,500	$12,728,000	$6,046,000	$980,000	$408,000
Improved System Reliablity and/or Reduce Operating Costs	$0	$0	$0	$0	$0	$0
Contributions						
GRI (Participation)	$689,000	$894,000	$445,500	$507,500	$521,000	$35,000
EPRI (Membership & Participation)	$6,863,500	$8,991,000	$13,563,000	$18,122,000	$7,797,500	$9,501,156
CIEE	$1,857,000	$2,857,000	$2,852,000	$2,000,000	$1,000,000	$2,000,000
Others (ex: IGT, West Associates)	$32,850	$261,000	$120,000	$206,500	$129,500	$852,500
Cotnributions Subtotal	$9,442,350	$13,003,000	$16,980,500	$20,836,000	$9,448,000	$12,388,656
Public Goods Subtotal (no Administration)	$48,749,100	$40,879,750	$44,634,750	$39,900,250	$18,052,750	$21,458,906
Total Administration	$5,632,000	$7,745,000	$12,578,000	$12,893,000	$6,922,000	$6,396,000
Weighted Administration	$2,240,852	$2,849,982	$5,214,500	$5,728,441	$1,623,669	$2,083,108
Total Public Interest Spending (nominal$)	$50,989,952	$43,729,732	$49,849,250	$45,628,691	$19,676,419	$23,542,014
Total Public Interest Spending $1996	**$57,618,645**	**$47,665,408**	**$53,388,546**	**$47,910,126**	**$20,069,947**	**$23,542,014**
Total Private Interest Spending 1996$	**$82,765,775**	**$58,050,204**	**$61,016,924**	**$76,778,424**	**$35,101,853**	**$37,340,986**
Total RD&D Spending $1996	$140,384,420	$105,715,612	$114,405,470	$124,688,550	$55,171,800	$60,883,000
% Public Interest	**41%**	**45%**	**47%**	**38%**	**36%**	**39%**

Other Approaches Considered
Weighting Method
Applications of Weights to 740.1 Category Spending

SCG Public Interest RD&D Spending
No transportation. All gas included.
Nominal dollars, except where indicated.

	% Pb	1991	1992	1993	1994	1995	1996
Environmental Improvement	0.5						
Air Quality Improvement	0.5	$2,139,000	$3,284,000	$556,500	$739,500	$507,000	$517,000
Water Quality Improvement	0.5	$17,500	$32,500	$0	$0	$0	$0
Hazardous Waste Prevention	0.5	$103,000	$337,000	$65,000	$76,500	$31,000	$87,500
Environmental Improvement Subtotal		$2,259,500	$3,653,500	$621,500	$816,000	$538,000	$604,500
Public and Employee Safety	0.25	$0	$7,500	$46,250	$20,750	$19,250	$22,750
Energy Conservation	0.75	$750,000	$1,339,500	$2,025,000	$4,454,250	$2,421,000	$2,988,000
Development of New Resources or Processes	0.5	$0	$0	$0	$0	$0	$0
Renewable Resources	1	$0	$0	$0	$0	$0	$0
Non-Renewable Resources	0	$0	$0	$0	$0	$0	$0
Development of New Resources or Processes Subtotal		$0	$0	$0	$0	$0	$0
Improved System Reliablity and/or Reduce Operating	0	$0	$0	$0	$0	$0	$0
Contributions*							
CIEE	1	$589,000	$600,000	$600,000	$600,000	$0	$0
Contributions Subtotal		$589,000	$600,000	$600,000	$600,000	$0	$0
Public Goods Subtotal (no Administration)		$3,598,500	$5,600,500	$3,292,750	$5,891,000	$2,978,250	$3,615,250
Total Administration (must take some contributions out)		$1,948,000	$2,673,000	$2,157,000	$2,464,000	$1,376,000	$1,432,000
Weighted Administration		$457,743	$754,695	$488,713	$878,817	$234,135	$279,221
Total Public Interest Spending (nominal$)		$4,056,243	$6,355,195	$3,781,463	$6,769,817	$3,212,385	$3,894,471
Total Public Interest Spending $1996		**$4,583,555**	**$6,927,163**	**$4,049,947**	**$7,108,308**	**$3,276,633**	**$3,894,471**
Total Private Interest Spending 1996$		**$15,440,777**	**$18,128,385**	**$15,321,675**	**$16,265,384**	**$12,632,295**	**$12,451,529**
Total RD&D Spending $1996		$19,497,020	$24,483,580	$19,103,138	$23,035,201	$15,844,680	$16,346,000
% Public Interest		**24%**	**28%**	**21%**	**31%**	**21%**	**24%**

Other Approaches Considered
Weighting Method
Applications of Weights to 740.1 Category Spending

State IOU Totals (Including SoCalGas)
Public Interest RD&D Spending
No transportation. All gas included.
Nominal dollars, except where indicated.

	1991	1992	1993	1994	1995	1996
Environmental Improvement						
Air Quality Improvement	$0	$687,500	$507,500	$0	$0	$0
Water Quality Improvement	$11,687,500	$6,827,500	$3,504,000	$3,102,500	$1,789,000	$2,206,000
Hazardous Waste Prevention	$59,500	$468,500	$213,000	$156,000	$817,000	$1,100,500
Environmental Improvement Subtotal	$760,500	$743,500	$479,500	$262,000	$35,000	$100,000
	$12,507,500	$8,727,000	$4,704,000	$3,520,500	$2,641,000	$3,406,500
Public and Employee Safety	$578,250	$796,750	$1,054,500	$1,138,750	$161,250	$327,750
Energy Conservation	$18,433,500	$12,402,000	$11,860,500	$13,650,000	$7,800,750	$8,543,250
Development of New Resources or Processes						
Renewable Resources	$400,000	$2,412,500	$2,315,000	$0	$142,000	($77,000)
Non-Renewable Resources	$10,397,000	$8,539,000	$10,413,000	$6,046,000	$838,000	$485,000
Development of New Resources or Processes Subtotal	$0	$0	$0	$0	$0	$0
	$10,797,000	$10,951,500	$12,728,000	$6,046,000	$980,000	$408,000
Improved System Reliablity and/or Reduce Operating Costs	$0	$0	$0	$0	$0	$0
Contributions						
EPRI (Membership & Participation)	$0	$0	$0	$0	$0	$0
CIEE	$6,863,500	$8,991,000	$13,563,000	$18,122,000	$7,797,500	$9,501,156
Others (ex. IGT, West Associates)	$2,446,000	$3,457,000	$3,452,000	$2,600,000	$1,000,000	$2,000,000
GRI (Participation)	$32,850	$261,000	$120,000	$206,500	$129,500	$852,500
Contributions Subtotal	$689,000	$894,000	$445,500	$507,500	$521,000	$35,000
	$10,031,350	$13,603,000	$17,580,500	$21,436,000	$9,448,000	$12,388,656
Public Goods Subtotal (no Administration)	$52,347,600	$46,480,250	$47,927,500	$45,791,250	$21,031,000	$25,074,156
Total Administration	$7,580,000	$10,418,000	$14,735,000	$15,357,000	$8,298,000	$7,828,000
Weighted Administration	$2,698,595	$3,604,677	$5,703,212	$6,607,259	$1,857,804	$2,362,329
Total Public Interest Spending (nominal$)	$55,046,195	$50,084,927	$53,630,712	$52,398,509	$22,888,804	$27,436,485
Total Public Interest Spending $1996	**$62,202,200**	**$54,592,571**	**$57,438,493**	**$55,018,434**	**$23,346,580**	**$27,436,485**
Total Private Interest Spending 1996$	**$98,206,551**	**$76,178,589**	**$76,338,599**	**$93,043,808**	**$47,734,148**	**$49,792,515**
Total RD&D Spending $1996	$159,881,440	$130,199,192	$133,508,608	$147,723,751	$71,016,480	$77,229,000
% Public Interest	**39%**	**42%**	**43%**	**37%**	**33%**	**36%**

Other Approaches Considered
Weighting Method
Application of Weights to SMUD RD+D Spending Categories

SMUD

Total Spending						
Category	1991	1992	1993	1994	1995	1996
Solar Programs				$6,303,000	$5,613,000	$4,611,500
Fuel Cell				$2,933,000	$1,581,000	$1,635,000
Biomass				$220,000	$333,000	$213,000
Advanced Turbines				$646,000	$429,0[illegible]	$90,000
Customer Tech minus Transportation				$1,599,000	$1,758,0[illegible]	$802,000
Total R&D Spending (nominal $)		$1,737,000	$10,622,000	$11,701,000	$9,714,000	$7,351,500
Inflation Adjustment	1.13	1.09	1.07	1.05	1.02	1
Total R&D Spending (1996 $)		$1,893,330	$11,365,540	$12,286,050	$9,908,280	$7,351,500

Public Benefit Spending	Weight Applied	1992*	1993*	1994	1995	1996
Category						
Solar Programs	0.5	$467,837	$2,860,887	$3,151,500	$2,806,500	$2,305,750
Fuel Cell	0.5	$217,700	$1,331,268	$1,466,500	$790,500	$817,500
Biomass	0.5	$16,329	$99,856	$110,000	$166,500	$106,500
Advanced Turbines	0.5	$47,949	$293,215	$323,000	$214,500	$45,000
Customer Tech minus Transportation	0.75	$178,027	$1,088,662	$1,199,250	$1,318,500	$601,500
Public Benefit R&D Spending (nominal $)		$927,842	$5,673,887	$6,250,250	$5,296,500	$3,876,250
Inflation Adjustment		1.09	1.07	1.05	1.02	1
Public Benefit R&D Spending (1996$)		**$1,011,348**	**$6,071,059**	**$6,562,763**	**$5,402,430**	**$3,876,250**

Source: SMUD data based on ART summaries and informations from SMUD staff, Bud Beebe. R&D program started in mid-1992.

Public Interest RD&D Spending (According to the Weighting Method)
Overview for IOUs, SMUD, LADWP, GRI, EPRI, DOE, and CIEE

	1991	1992	1993	1994	1995	1996
% Declines as Found by Weighting Method						
Electric IOUs Only	41%	45%	47%	38%	36%	39%
Gas Company Only	24%	28%	21%	31%	21%	24%
Electric IOUs+Gas Company	39%	42%	43%	37%	33%	36%
IOUs						
Electric IOU total	$134,118,570	$115,832,120	$111,025,215	$120,359,400	$55,380,900	$61,441,000
Public Benefits for Electric IOUs	$52,179,103	$48,568,452	$47,765,617	$44,826,818	$18,206,403	$21,827,617
Electric IOUs Avg Public Benefits 91-94	$48,334,998					
SCG total spending	$12,825,500	$17,491,230	$12,240,459	$13,809,600	$7,490,880	$8,247,000
Public Benefits for SCG	$3,015,147	$4,948,811	$2,595,029	$4,261,430	$1,549,092	$1,964,866
SCG Avg Public Benefits 91-94	$3,705,104					
Municipal Utilities						
SMUD total spending	$0	$1,893,330	$11,365,540	$12,286,050	$9,908,280	$7,351,500
Public Benefits for SMUD	$0	$1,011,348	$6,071,059	$6,562,763	$5,402,430	$3,876,250
LADWP total spending	$8,296,460	$8,437,690	$9,470,853	$6,079,500	$1,279,080	$1,705,000
Public Benefits for LADWP	$3,227,755	$3,537,927	$4,074,580	$2,264,257	$420,496	$605,721
Total Spending for Municipals	$8,296,460	$10,331,020	$20,836,393	$18,365,550	$11,187,360	$9,056,500
Public Benefits for Municipals	$3,227,755	$4,549,275	$10,145,640	$8,827,020	$5,822,926	$4,481,971
Munis Avg Public Benefits 91-94	$6,687,422					
GRI						
GRI total spending (CA prorata share)*	$23,160,655	$24,111,138	$21,031,192	$21,676,347	$21,606,917	$17,622,500
Public Benefits for GRI (CA prorata share)	$9,010,700	$10,109,809	$9,048,106	$8,073,168	$7,103,247	$6,260,595
GRI Avg Public Benefits 91-94	$9,060,446					
EPRI						
EPRI total spending (CA prorata share)	$37,794,716	$42,568,826	$44,699,510	$40,234,413	$36,909,310	$32,949,488
Public Benefits for EPRI (CA prorata share)	$14,704,112	$17,849,125	$19,230,764	$14,984,959	$12,133,890	$11,705,682
EPRI Avg Public Benefits 91-94	$16,692,240					
CIEE						
CIEE total spending	$1,661,326	$2,256,300	$2,603,310	($341,650)	$2,245,020	$3,775,000
Public Benefits for CIEE (Weighting)	$646,342	$946,067	$1,120,004	($127,245)	$738,048	$1,341,112
CIEE Avg Public Benefits 91-94	$646,292					
DOE						
DOE total spending in CA	$649,297,000	$691,237,000	$660,276,000	$682,598,000	$744,560,000	$658,833,000
Public Benefits for DOE	$252,610,322	$289,835,938	$284,066,016	$254,227,723	$244,773,181	$234,057,952
DOE Avg Public Benefits 91-94	$270,185,000					

Sources: Utility Annual RD&D Reports (1996 figures are utility planned expenditures); LADWP figures from staff, John Schumann; SMUD figures based on ART summaries; GRI Plans (GRI figures are approved and planned expenditures); EPRI Plans (1993 and1996 figures are planned expenditures); CIEE figures from CIEE staff, Cindy Polensky; DOE figures from *Congressional Budget Obligations-Estimates* and include spending in CA on Energy Supply, General Science, Fossil Energy, Energy Conservation, and El