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Decision 92-02-029 February 5, 1992

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Rulemaking Proceeding on the Commission's Own Motion to Revise the Regulatory Treatment of Research, Development and Demonstration in the Electric and Gas Industries.	ORIGINAL R.87-10-013 (Filed October 16, 1987)

INTERIM OPINION

I. Summary

This decision adopts the Standard Format of the Annual Report on Research, Development, and Demonstration (Standard Format), attached as Appendix A. Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), Southern California Edison Company (Edison), and Southern California Gas Company (SoCal) are ordered to follow the Standard Format for the next Annual Report on Research, Development, and Demonstration (RD&D) due March 31, 1992.

II. Background

The Commission opened this Rulemaking on October 16, 1987, requesting comments on a rule proposed to revise the Commission's procedures for review and funding of energy utility RD&D programs. In Decision (D.) 89-06-046, dated June 21, 1989 we reflected the comments of parties and requested a second round of comments on a revised proposed rule. In D.90-09-045, dated September 12, 1990, we adopted a procedure and schedule for Commission regulatory treatment of, as well as objectives for, RD&D. We also ordered the Commission Advisory and Compliance Division (CACD), the California Energy Commission (CEC), the

Division of Ratepayer Advocates (DRA), PG&E, SoCal, Edison, and SDG&E to develop a standardized format for the Annual Report on RD&D required by the Commission. In D.90-12-083, we adopted the standardized format, called the RD&D Annual Report Format. D.90-09-045 also ordered CACD to prepare a Biennial Report (BR) on RD&D.

III. Discussion

A. The CACD BR

The purpose of the CACD BR is to:

a. Provide the Commission with periodic information on the status, direction, and performance of RD&D programs by PG&E, SDG&E, Edison and SoCal.

b. Evaluate the performance of each utility's RD&D program, emphasizing not project-by-project review, but overall performance, particularly with regard to:

   1. ratepayers' benefit from RD&D investments; and

   2. achievement of the objectives of Public Utilities (PU) Code § 740.1 and supplemental criteria adopted in D.90-09-045.

c. Minimize the duplication of RD&D effort between the utilities.

d. Recommend appropriate policy changes in utility RD&D programs to achieve the Commission's goals.

The CACD presented its draft first BR to the California Utility Research Council (CURC) at its mid-year meeting on August 7-8, 1991. At the meeting, utilities requested more time to individually and collectively review the report and consider its recommendations.

CACD then adopted a "Two Track" approach to provide CURC and its members adequate time to review the draft Biennial Report, as well as ensure that refinements to the standard format of the utilities' annual report on RD&D are in place for the next report, due on March 31, 1992. Track 1 deals with the RD&D Annual Report Format. Track 2 deals with the BR.

By placing the two efforts on separate tracks, they could proceed in parallel.

CACD also extended the deadline for comments and reply comments on its draft BR to November 1 and 15, 1991, respectively. CACD intends to issue its final BR by March 13, 1992. Policy issues raised in that report will be considered subsequently by the Commission.

B. The RD&D Report Format

In preparing the first BR, CACD found that certain refinements were necessary to meet the reporting requirements we specified in D.90-09-045; CACD proposed refinements based on its experience as well as suggestions and concerns of the four participating utilities, CEC and DRA. Those refinements, issued for comment in the Administrative Law Judge (ALJ) Ruling of September 16, 1991, were intended to clarify the requirements for the utilities' Annual Report on RD&D, to achieve greater uniformity between the utilities, and meet the reporting requirements of D.90-09-045.

In addition, the Demand-Side Management (DSM) Reporting Requirements Manual (December 1990), prepared by CACD staff in conjunction with the utilities and CEC staff, provides a useful guide for regulatory consistency and uniform reporting. DSM reporting requirements are similar to those for RD&D: reporting requirements "founded on a common set of definitions and levels of detail which facilitate the flow and evaluation of information between rate cases and between the two regulatory agencies."

CACD's proposed refinements address Recommendations "R" and "S" in the CACD's Draft Biennial Report on RD&D dated August 7, 1991.

> "R. ISSUE: In attempting to summarize the utilities' RD&D budgets for their current GRC cycle, it became clear that reporting only on the RD&D expense category is not enough to perform the programmatic and prospective review the Commission has stated it intends to make.
>
> "RECOMMENDATION: Any expenditures or activities related to RD&D should be reflected in the utilities' Annual Reports on RD&D, such as:
>
> '1. Diablo Canyon PG&E postulates that future research and testing may be performed at the Diablo Canyon plant if justified by results applicable to PG&E's non-nuclear power plants, and funded by Diablo Canyon. Such work should be reported, even if not funded out of the RD&D expense category.
>
> '2. Natural Gas Vehicle (NGV) Programs The Commission concluded that the RD&D budget should be supplemented to expand the NGV programs, and that future use of the RD&D budget for utility NGV programs will be determined in its next review. Presumably, this will be PG&E's and SDG&E's next GRCs (general rate case) (TY (test year) 1993). In the interim, these programs should be reported fully in the utility's Annual Reports on RD&D.
>
> '3. Capital Expenditures Only Edison provided information on capital expenditures in the recent Annual Report. PG&E anticipates making separate requests for capital funding for demonstration projects would be made in 1991-1994 for Solar Thermal Development and Testing, Wind Development and Analysis, System Storage Development, and Photovoltaic Development and Testing. To provide a

complete view of utility RD&D expenditures, capital expenditures need to be fully reported in the Annual Reports on RD&D (recorded and projected). (Sect. VI.B.)

"S. ISSUE: Additional standards for the objective measurement of investment status and results are needed to facilitate the timely and effective analysis of the utilities' Annual Reports by the CACD.

"RECOMMENDATION: To facilitate the development of more effective standards for the Annual Report, the Commission should propose a standard format developed by the CACD in R.87-10-013 and finalize the format via comments and/or workshop conducted by the CACD by December 31, 1991. Specific standards recommended are:

'1. Performance measures enabling the CACD to gauge achievement of the statutory and CPUC criteria, with respect to ratepayer benefits.

'2. Uniform spreadsheets for RD&D budgets, expenditures (including balancing account activity), co-funding, economic results, and agreed performance measures (pursuant to Section V recommendations), which will be submitted to the CACD in an agreed-upon computer readable form to facilitate review and analysis.

'3. These uniform spreadsheets must incorporate common data elements and correlate to each utility's complete GRC cycle (all years up to the next TY), including escalation, interest and other factors as needed....

'4. A concise description of the utilities' RD&D planning and management processes and procedures, in sufficient depth to allow review the decision-making and review cycle, and conformance with CPUC and CEC policies and guidelines.

'5. The format and level of detail in SoCalGas' "Resource Allocation Overview" and "Sub Program Summary Projects" tables, particularly with respect to the identification of new projects and the status of ongoing ones.

'6. Edison's "Status of Technologies" chart format, which graphically represents the relative status of a group of related technologies.

'7. The same project identification numbers should be used for continuing projects in future reports; and two categories should be added to the Section IV, Technology Summary tables: 28. Alternate Fuel Vehicles and 29. Advanced Fuel Economy.'"

These proposed refinements do not address two areas; they will be addressed at a later date:

1. The need for uniform performance measures dealing with ratepayer benefits, which will be done along with establishing a methodology for measuring ratepayer benefits.

2. The reporting requirements for incentive regulation; these requirements will be developed along with any incentive program for RD&D that may be adopted.

In preliminary comments, SoCal, SDG&E, and Edison expressed concerns about the increased level of detail CACD proposes.

SoCal suggested that the proposed refinements would require reporting detailed information for each project, which would be cumbersome and contrary to the Commission's goal of streamlining the regulatory treatment of RD&D. SoCal suggested alternative revisions.

SDG&E believes it can generally conform to the proposed refinements, but identified certain requested information as

unnecessary, redundant information already furnished in GRCs, overly detailed or unavailable.

Edison expressed concern with the level of detail required. Edison suggests that if detailed program reviews in GRCs continue, the reporting requirements of the utility Annual Report and CACD's BR need to be reduced. Alternatively, if the process set forth in D.90-09-045 is actively implemented, the level of detail in the GRC can be reduced. Edison urges the Commission to clarify its intentions for the implementation of D.90-09-045. Edison also offered the following specific comments:

a. The proposed Executive Summary is too complex and should be reorganized and condensed to meet the needs of the Commission.

b. The information required in the "Sub-Program Summary" is at the project level and is not required by D.90-09-045.

c. Edison characterizes Section IV, "Technology Summary," as newly proposed by CACD, and characterizes it as neither requested nor supported by the discussion in D.90-09-045. However, this section was part of the original Annual Report format adopted in D.90-12-083.

At the workshop conducted by the CACD on October 24, 1991, revisions to the proposed refinements were jointly developed by the CACD, CEC, PG&E, SDG&E, Edison, and SoCal to address the concerns expressed in the Preliminary Comments. On October 31, 1991, the CACD filed its Final Draft of the Proposed Refinements and served it on the parties to this rulemaking.

The following changes resulted from the comments:

Detailed information on RD&D spending authorized in the current GRC cycle was moved from the re-named "Overview of Utility RD&D," to the Technical Appendix A. Section III, "Sub-Program Summary," was extensively reorganized to minimize the demands on the utilities while accommodating the needs of the CPUC and CEC for

meaningful information, and reflects the agreements reached in the workshop. A by-product of this reorganization is the elimination of Section IV; spending by CEC Technology has been incorporated into Section III. The CEC will maintain the list of CEC Technology Numbers to be used, which is attached as Exhibit 1.

The following suggestions of SDG&E were not implemented.

SDG&E argued that a concise description of utility RD&D planning and management processes is not consistent with our intent. We disagree; in D.90-09-045 (at Appendix C, Item 5) we state that a utility's "RD&D program should demonstrate balanced policy formulation and execution,...and project management and coordination."

SDG&E disputed the three-year reporting requirement, which we clearly stated is needed. (D.89-09-045, Appendix A p. 1.)

SDG&E believed the requirement to report RD&D spending by operation, primary objective and project duration was inconsistent with our intent. Reporting in these three areas is consistent with our directive to CACD to evaluate the utility's performance relative to the criteria in PU Code § 740.1 and the Supplemental Criteria in Appendix C of D.90-09-045.

Finally, SDG&E opposed the new Technical Appendix; we conclude that the Technical Appendix is consistent with our standard practice.

Parties were allowed to file Final Comments by November 18, 1991. Comments were received from SDG&E and SoCal.

SDG&E made a new suggestion, that funding related to an RD&D project but not funded through the utility's RD&D unit should be excluded from the Annual Report. For example, its current funding of research into the development of new compressed natural gas vehicles (NGVs) and support equipment is an expense item and is included in the Annual Report. In contrast, SDG&E is also funding an NGV conversion and infrastructure development program being carried out by its Marketing Department (authorized separately from the GRC cycle); SDG&E does not consider these to be research funds,

and therefore they should not be included in the Annual Report on RD&D.

We believe reporting of RD&D activities should be based on the activity, regardless of the utility organizational unit controlling it.

SoCal supports the Final Proposed Refinements, except for the requirement for data to be submitted on 5-1/4" floppy disks in Lotus or Quattro Pro-readable spreadsheet files. SoCal's RD&D Department currently has Macintosh computers using 3-1/2" disks, and uses Excel software for spreadsheets, not Lotus or Quattro. SoCal represents that it would be burdensome for it to have to convert its Annual Report data to meet the proposed requirement. While we don't wish to unduly burden SoCal, we don't see that transferring the data from one format to another is necessarily burdensome. However, if SoCal believes it is, we encourage SoCal to work with CACD to find a software medium and format or other solution acceptable to both parties.

C. Conclusion

We conclude that CACD's final proposed refinements satisfy the goals and objectives we established in D.90-09-045, and reasonably reflect the concerns of the utilities. We believe that this has achieved the desired reasonable balance between regulatory information and oversight, and utility flexibility in administering RD&D activities. While it is not our intent to overly burden utilities with reporting requirements, it nevertheless is necessary for the Commission to have adequate information on which to evaluate RD&D.

The Standard Format in Appendix A, attached, should be adopted, and used by PG&E, SDG&E, Edison, and SoCal in their next Annual Report on RD&D due on March 31, 1992.

Because of the need for the utilities to develop the annual reports on RD&D by the due date, this order should become effective on the date signed.

Findings of Fact

1. CACD, in preparing its first BR, believes that refinements to the RD&D Report Format adopted in D.90-12-083 are appropriate.

2. CACD has developed proposed revisions to the RD&D Report Format in coordination with the parties.

3. The utilities have had reasonable opportunities to comment on the CACD proposed revisions.

4. The utilities' next Annual Reports on RD&D are due March 31, 1992.

5. The Commission will consider reporting requirements for regulatory incentives for utility RD&D in a subsequent decision.

6. The Commission will consider policy issues raised in CACD's first BR, and further revisions to the reporting format if appropriate.

7. There is an immediate need to implement this decision for use by the utilities in preparing their annual reports on RD&D.

Conclusions of Law

1. The Standard Format of the Annual Report on RD&D attached as Appendix A should be adopted.

2. CACD and SoCal should reach a reasonable agreement on a software medium and format or other solution acceptable to both parties.

3. This decision should be effective on the date signed.

INTERIM ORDER

IT IS ORDERED that:

1. The Standard Format of the Annual Report on Research, Development, and Demonstration, attached in Appendix A, is adopted.

2. Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Edison Company, and Southern California Gas Company shall comply with the Standard Format of the

Annual Report on Research, Development, and Demonstration, in submitting the next Annual Report on Research, Development, and Demonstration due March 31, 1992.

This order is effective today.

Dated February 5, 1992, at San Francisco, California.

DANIEL Wm. FESSLER
President
JOHN B. OHANIAN
PATRICIA M. ECKERT
NORMAN D. SHUMWAY
Commissioners

I CERTIFY THAT THIS DECISION WAS APPROVED BY THE ABOVE COMMISSIONERS TODAY

NEAL J. SHULMAN, Executive Director

STANDARD FORMAT OF THE ANNUAL REPORT ON RESEARCH, DEVELOPMENT AND DEMONSTRATION

General Standards

1. All regulated research, development and demonstration (RD&D) activities, as defined in D.82-12-005 (Appendix A at pp. 1-3) must be reflected in the Annual Report. All funding sources (e.g., RD&D Expense, Capital Expenditure, NGV Funding, Co-Funding, etc.) must be discretely identified for each reported activity and summarized at successive levels of reporting (e.g., sub-program, program, and total).

2. All tabular data and the supporting formulas and assumptions, organized to parallel the Annual Report, must be additionally submitted to the Commission Advisory and Compliance Division (CACD) Energy Branch on 5 1/4" floppy disk(s) in Lotus- or Quattro Pro-readable spreadsheet file(s). The medium and format may be modified by the CACD as it deems necessary to facilitate its compilation and analysis of the Annual Report data.

3. To facilitate use of the Annual Report, the beginning of each Section should be labeled with tabs (I., Executive Summary, II., Program Summary, III., Sub-Program Summary, IV., Technology Summary, Technical Appendix).

I. OVERVIEW OF UTILITY RD&D

General Guidelines for Preparation: This section includes general descriptions and explanations regarding the utility's overall RD&D Program. The tabular information reported in this section should represent data which is aggregated from the more detailed tables in subsequent sections. Checking for consistency between the various levels and "views" of information should be an important part of the report's preparation.

The primary function of the Overview should be to highlight the status, direction and performance of RD&D program activities relative to what was previously authorized and reported and signal any significant changes anticipated before the next Annual Report on RD&D is filed. Tables should be designed to convey this information in a numeric form; the text prepared for this section should underscore these issues in general terms and refer to more detailed explanations in subsequent sections.

Report Format and Guidelines for Preparation:

A. Introduction

1. Purpose of report.

2. History of regulations.

3. Compliance with CPUC order(s).

4. Rate Case/Test Year decision(s), and any other decisions or orders affecting the utility's RD&D activities, including those outside the RD&D Expense category (which should be so identified).

5. RD&D planning and management processes. Provide a concise description of the utility's RD&D planning and management processes, in enough depth to indicate a systematic and controlled decision-making and review cycle and incorporation of CPUC and CEC policies and guidelines. This overall description should be consistent with any detailed references in Sections II and III.

B. Direction of RD&D

1. Major directions/business environment. This unit should include the clear identification of any change in direction or activity affecting RD&D made or anticipated since the last Annual Report (or omitted in the last Annual Report). "Potential Policy Conflicts" identified in Section II should also be discretely summarized here, and facilitate reference to detailed discussions in Section II.

2. Justification of direction. This unit should include the express discussion of any change in direction or activity identified in Unit 1.

3. Brief Description of program areas. This unit should include the express identification of any change made or anticipated since the last Annual Report (or omitted in the last Annual Report). It should provide the reader with an understanding of how the utility organizes all of its regulated RD&D activities, and reflect the programmatic organization of Sections II and III.

4. RD&D Programs Matrix

5. New RD&D activities. This unit should provide a concise overview of the discrete RD&D activities newly undertaken or planned since the last Annual Report (or omitted in the last Annual Report), and expressly relate to any change in direction or activity identified in Units 1-3. Per D.90-09-045, Appendix A, this unit "should include program goals and timetables as well as indicators of program performance." Further, the reader should be able to reference these new activities in Sections II and/or III based on this description.

C. RD&D Spending General Note: the assumptions and adjustment procedures used to derive the information summarized in this Subsection must be documented in the "Technical Appendix" of the Annual Report (see final section), as well as in the spreadsheet file(s) additionally submitted to the CACD.

1. Test year/Attrition years - authorization vs. actual. See TABLE 1 for the general format and an example of this table, and Technical Appendix Section TA-I for detailed guidelines of preparation.

TABLE 1

RD&D General Rate Case Cycle Budget
(000's)

NOTE: Example Years ONLY	1990 (Test Yr)	1991 (Attrition	1992 Years)	Cum. Total
A. AUTHORIZED FUNDS	$	$	$	$
B. EXPENDITURES (Recorded/Budgeted)	$	$	$	$
C. YEAR-END BALANCE (Line A - B)	$	$	$	$
D. % OF AUTH. FUNDS SPENT (Line B / A)	%	%	%	%

Footnotes

1. Detail, assumptions and adjustment procedures for this table are provided in the Technical Appendix, Section TA-I and Table TA-1.

2. ... n. if necessary.

(END of TABLE 1)

2. RD&D spending as a percent of Gross Operating Revenue. To provide a meaningful historical perspective, data for at least the last five years must be provided and should reflect total regulated RD&D spending (i.e., as indicated by TABLE 1). The derivation of this aggregate data must be documented in the Technical Appendix and spreadsheet file(s).

3. RD&D funding range. (Recommended/Approved)

4. Allocation of RD&D funds among utility programs. This should be an aggregation of the "Resource Allocation Overview" for each program in Section II (and as such, will include the past, current and three (3) future years). Bear in mind the general standard to report all regulated RD&D activities.

5. Relative balance of spending by Operation (production, transmission, distribution and end-use). Consistent with D.90-09-045, this allocation of total RD&D spending should be done for the past, current and three (3) future years (following the format of the Resource Allocation Overview table in Section II). This data is aggregated from corresponding tables in Sections II and III.

6. Relative balance of spending by Primary Objective (as defined in PU Code § 740.1 (e): Environmental improvement, Safety, Energy conservation, Resource development, System reliability/Cost reduction). Likewise, this allocation of total RD&D spending should be done for the past, current, and three (3) future years (following the format of the Resource Allocation Overview table in Section II); and should be expressed as expenditure/budget ($) and number of projects (#) that have as the primary objective:

   a. Environmental improvement, Total $/# and:

      1. $/# that targets air quality improvement.

      2. $/# that targets water quality improvement.

      3. $/# that targets hazardous waste prevention.

   b. Public and employee safety, Total $/#

   c. Energy conservation, Total $/#

   d. Development of new resources or processes, Total $/# and:

      1. $/# that represents renewable resources.

   e. Improved system reliability and/or reduced operating costs, Total $/#.

   It is recognized that projects often have more than one objective that would fit this list. The intent here is NOT to allocate project spending among multiple objectives nor imply a sole objective, but to indicate the PRIMARY objective. This data is

aggregated from corresponding tables in Sections II and III.

7. Relative balance of spending by Project Duration (Short-, Mid-, and Long-Term). This allocation of total RD&D spending should be also be done for the past, current, and three (3) future years (following the format of the Resource Allocation Overview table in Section II); and should be expressed as expenditure/budget ($) and number of projects (#) which are:

   Short-Term (0-2 years)
   Mid-Term (3-5 Years)
   Long-Term (6+ Years)

   This data is aggregated from the corresponding tables in Sections II and III.

D. RD&D Successes

Examples of major milestones met or completion of significant projects. Descriptions should include: 1. the type of product/deliverable (e.g., report, prototype, test completion); 2. the product/deliverable results (e.g., the information included and conclusions/findings); and 3. how the results have been or are expected to be used. Further, the reader should be able to reference these activities in Sections II and/or III based on this description.

II. PROGRAM SUMMARY

General Guidelines for Preparation: This section summarizes information for each RD&D Program, and must encompass all regulated RD&D spending. All funding sources (e.g., RD&D Expense, Capital Expenditure, NGV Funding, Co-Funding, etc.) must be discretely identified for each reported activity and summarized at successive levels of reporting (e.g., Sub-Program, Program, and Overview/total).

Report Format and Guidelines for Preparation:

A. ... X. PROGRAM NAME

1. Program Description
   a. Overview
   b. Objectives
2. Direction
   a. Utility's View
   b. Consistency with CPUC and CEC decisions and policies
   c. Potential Policy Conflicts
3. Benefits NOTE that benefits are to be reported discretely as:
   a. Ratepayers
   b. Societal

4. Resource Allocation Overview

Table form showing the following information for each sub-program included in this program.

(000s)

NOTE: EXAMPLE Years ONLY	(Recorded) Prior Yr 1991	(Budget) Current Yr 1992	(Estimated) Future Year 1993	1994	1995
Sub-Program					
A					
B					
C					
PROGRAM TOTAL					

5. Funding Overview

Table form showing the following information for each funding source for this program.

(000s)

	(Recorded) Prior Yr 1991	(Budget) Current Yr 1992	(Estimated) Future Year 1993	1994	1995
Funding Source:					
A (e.g., RD&D Expense)					
B (e.g., Capital Expend.)					
C (e.g., NGV Funding)					
... X. Co-Funding					
1) Calif. IOU					
2) Other					
Co-Funding SUBTOTAL					
TOTAL					

6. Criteria Overview For each Program, provide the information requested in Section I, Executive Summary, Subsection C (RD&D Spending), Units 5, 6, and 7.

a. Relative balance of spending by Operation (production, transmission, distribution, and end-use).

b. Relative balance of spending by Primary Objective (as defined in PU Code § 740.1 (e):

Environmental improvement, Safety, Energy conservation, Resource development, System reliability/Cost reduction).

c. Relative balance of spending by Project Duration (short-, mid-, and Long-Term).

III. SUB-PROGRAM SUMMARY

General Guidelines for Preparation: This section summarizes information for each RD&D Sub-Program, and must encompass all regulated RD&D spending. All funding sources (e.g., RD&D Expense, Capital Expenditure, NGV Funding, Co-Funding, etc.) must be discretely identified for each reported activity and summarized at successive levels of reporting (e.g., Sub-program, Program and Overview).

Report Format and Guidelines for Preparation:

A. ... X. PROGRAM NAME

1. ... n. Sub-Program Name

a. Objectives (These should be measurable and provide the basis for indicators of performance.)

b. Funding Overview

(000s)

NOTE: EXAMPLE Years Only	(Recorded) Prior Yr 1991	(Budget) Current Yr 1992	(Estimated) Future Year 1993	1994	1995
Funding Source:					
1) (e.g., RD&D Expense)					
2) (e.g., Capital Expend.)					
3) (e.g., NGV Funding)					
... n) Co-Funding					
a) Calif. IOU					
(1) ... (n) (List Each)					
b) Other					
(1) ... (n) (List Each)					
Co-Funding SUBTOTAL					
TOTAL					

c. Criteria Overview: For each Sub-Program, provide the information requested in Section I, Executive Summary, Subsection C (RD&D Spending), Units 5, 6, and 7.

1) Relative balance of spending by Operation (production, transmission, distribution and end-use).

2) Relative balance of spending by Primary Objective (as defined in PU Code § 740.1 (e): Environmental improvement, Safety, Energy conservation, Resource development, System reliability/Cost reduction).

3) Relative balance of spending by Project Duration (short-, mid-, and long-Term).

d. Prior Year Accomplishments (Highlights of Milestones completed and/or Performance Indicators; also, discussion of any change from last year's Report. Descriptions should include: 1. the type of product/deliverable (e.g., report, prototype, test completion); 2. the product/deliverable results (e.g., the information included and conclusions/findings); and 3. how the results have been or are expected to be used.)

e. Future Direction (Highlights of Milestones and/or Performance Indicators; also, discussion of planned/anticipated/potential change in direction. Descriptions should include: 1. the type of product/deliverable; 2. the product/deliverable results (e.g., the information included and conclusions/findings); and 3. how the results have been or are expected to be used.)

f. Potential Benefits (These should correspond with the Benefits cited in Section II.)

1) Ratepayers

2) Societal

g. Identifier No. Profile Table form showing the following information for each Identifier Number in this Sub-Program. (*NOTE*: The two sub-tables which follow may be combined if all the information elements requested in each sub-table can be provided in a single table.)

TABLE g-1

ID #	Descriptor	Start and Finish Dates	Status

1) ID # = IDENTIFIER NUMBER The SAME identification number should be used for the duration of the activity associated with the ID #.

2) Descriptor = The name consistently associated with this ID #, which should be used for the duration of the activity associated with the ID #.

3) Start and Completion Dates = The actual or estimated dates on which the activity associated with the ID # begins and ends.

4) Status = (List One) New, Continuing/(Specify Phase), Cancelled, Completed

TABLE g-2

(000s)

ID #	CEC #	(Recorded) Prior Yr	(Budget) Current Yr	(Estimated) Future Yrs 1,2,3

1) ID # = IDENTIFIER NUMBER Use in the same sequence used for Table g-1.

2) CEC # = The CEC's best applicable Technology Reference Number(s) for each ID #. See list of CEC Technology Reference Numbers in Exhibit 1.

3) Prior Yr = Display the recorded expenditures for the last year by CEC #.

4) Current Yr = Display the budgeted expenditures for the current year by CEC #.

5) Future Yrs 1,2,3 = Display the estimated expenditures for the next three years by CEC #.

TECHNICAL APPENDIX

General Guidelines for Preparation: The purpose of the Technical Appendix to the Annual Report is twofold: document the sources and procedures used in developing the Report, and facilitate the reader's use and understanding. The organization of the material for the Technical Appendix should generally parallel the information in the main Report, for ready cross-referencing. At a minimum, the following documentation is required:

TA-I. OVERVIEW OF UTILITY RD&D

C. RD&D Spending The assumptions and adjustment procedures used to derive the information summarized in the Overview Subsection must be documented here, as well as in the spreadsheet file(s) additionally submitted to the CACD.

1. Test year/Attrition years - authorization vs. actual.

a. Detailed information (supporting TABLE 1) is provided in TABLE TA-1 (see format and example following). Guidelines for Preparation:

1) TABLES 1 and TA-1 include --

a) The utility's most recently adopted GRC Test Year and all years up to the next scheduled GRC Test Year. I.e., if the utility's next GRC Test Year is delayed (as was Edison's and SDG&E's in the current cycle), the additional attrition year(s) should be included in this table.

b) The year previous to the Report, regardless of whether it is in the most recently adopted GRC cycle or not. If a column must be added, it should be inserted in chronological order and footnoted appropriately.

2) The amounts reported should be expressed in nominal dollars.

3) "Authorized" generally refers to the last GRC; if a proceeding other than the GRC

provided explicit funding levels, this should be so noted. "Authorized" dollars should reflect escalation due to inflation, interest and adjustments resulting from balancing accounts (as applicable) and changes authorized subsequent to the GRC.

4) Further, for the purposes of TABLES 1 and TA-1, "authorized" refers to the amount authorized for RD&D projects/activities in the respective years, should this deviate from the amount authorized in rates in the respective years (e.g., Capital Expenditures). This latter information element is required in TABLE TA-2 (see format and example following).

b. Authorization citations, adjustments (e.g., escalation, interest and other balancing account adjustments) and changes must be fully documented here, as well as in the spreadsheet file(s) additionally submitted to the CACD.

2. RD&D spending as a percent of Gross Operating Revenue. The derivation of the aggregate data presented in the Executive Summary must be documented here and in spreadsheet file(s).

TABLE TA-1

Detail: RD&D General Rate Case Cycle Budget
(000's)

NOTE: Example Years ONLY	1990 (Test Yr)	1991 (Attrition Years)	1992	Cum. Total
A. AUTHORIZED FUNDS				
1. GRC RD&D Expense	$	$	$	$
2. Other GRC RD&D (e.g., Capital Exp.)				
3. Other RD&D (e.g., NGV)				
4. SUBTOTAL Auth. Funds	$	$	$	$
B. EXPENDITURES (Recorded/Budgeted)				
5. GRC RD&D Expense	$	$	$	$
6. Other GRC RD&D				
7. Other RD&D				
8. SUBTOTAL Expenditures		$	$	$ $
C. YEAR-END BALANCE (Lines 1,2,3 - 5,6,7, respectively)				
9. GRC RD&D Expense	$	$	$	$
10. Other GRC RD&D				
11. Other RD&D				
12. TOTAL Yr-End Balance	$	$	$	$
D. % OF AUTH. FUNDS SPENT (Lines 5,6,7,8/1,2,3,4 respectively)				
9. GRC RD&D Expense	%	%	%	%
10. Other GRC RD&D	%	%	%	%
11. Other RD&D	%	%	%	%
12. TOTAL % Spent	%	%	%	%

Footnotes as necessary. These may be used to provide documentation of the assumptions and adjustment procedures used to develop this table (and TABLE 1).

END of TABLE TA-1

TABLE TA-2

Detail: RD&D General Rate Case Cycle Budget
Amounts Authorized in Rates
(000's)

NOTE: Example Years ONLY	1990 (Test Yr)	1991 (Attrition Years)	1992	Cum. Total
AUTHORIZED IN RATES				
1. GRC RD&D Expense	$	$	$	$
2. Other GRC RD&D (e.g., Capital Exp.)				
3. Other RD&D (e.g., NGV)				
4. TOTAL Auth. in Rates	$	$	$	$

Footnotes as necessary.

END of TABLE TA-2

(END OF APPENDIX A)

EXHIBIT 1

CALIFORNIA ENERGY COMMISSION
ENERGY TECHNOLOGY STATUS REPORT (ETSR) - TECHNOLOGY INDEX

December 17, 1991

ETSR GENERATION TECHNOLOGIES

1.0	FUEL CYCLES
1.1	Conventional Fuels
1.1.1	Petroleum Fuel
1.1.1.1	Conventional Oil Extraction
1.1.1.2	Enhanced Oil Extraction
1.1.1.2.1	Thermal Enhanced Oil Recovery (TEOR)
1.1.1.2.2	Chemical Oil Recovery
1.1.1.2.3	Gas Displacement Oil Recovery
1.1.2	Natural Gas
1.1.3	Conventional Coal
1.1.4	Nuclear Fission
1.1.4.1	Nuclear Fission Full Fuel Cycle
1.1.4.2	Nuclear Fission Waste Disposal
1.1.4.3	Nuclear Fission Decommissioning
1.1.5	Liquid Petroleum Gas (LPG)
1.1.6	Liquified Natural Gas (LNG)
1.1.7	Peat
1.1.8	Petroleum Coke ("Coke")
1.2	Alternative Fuels
1.2.1	Oil Shale
1.2.2	Tar Sands
1.2.3	Nuclear Fusion
1.2.4	Coal
1.2.4.1	Coal Gasification
1.2.4.2	Coal-Based Methanol
1.2.4.3	Methanol/Electricity Coproduction
1.2.4.4	Coal-Based Synthetic Oil
1.2.5	Ethanol
1.2.6	Methanol (Non-Coal)
1.2.7	Hydrogen
1.3	Renewable Fuels
1.3.1	Geothermal
1.3.1.1	Hydrothermal
1.3.1.2	Hot Dry Rock
1.3.1.3	Geopressured
1.3.1.4	Magma
1.3.2	Biomass Fuel
1.3.3	Municipal Solid Waste
1.3.4	Solar Resource
1.3.4.1	Solar Insolation
1.3.4.2	Active Solar Systems
1.3.4.3	Passive Solar Systems
1.3.4.4	Photovoltaic Systems
1.3.5	Wind

(ETSR Generation Technologies, continued)

2.0	OIL AND GAS COMBUSTION
2.0.1	Fuel Use Alternatives
2.0.1.1	Alcohol
2.0.1.2	Hydrogen
2.0.2	Repowering of Existing Boilers
2.0.3	Life Optimization for Existing Power Plants
2.0.4	Catalytic Combustors
2.0.5	Ceramic Combustors
2.0.6	Pollution Control Technologies
2.0.7	Dry Cooling Technology
2.1	Rankine Cycles
2.1.1	Conventional Rankine Cycle
2.1.2	Supercritical Rankine Cycle
2.1.3	Kalina Rankine Cycle
2.2	Brayton Cycle
2.3	Combined Cycle
2.4	Aeroderivative Gas Turbine Cycles
2.4.1	Steam Recuperated Gas Turbine (SRGT) Cycle
2.4.2	Intercooled SRGT Cycle
2.4.3	Chemical Recuperated Gas Turbine (CRGT) Cycle
2.4.4	Humid Air Turbine (HAT) Cycle
3.0	COAL
3.0.1	Gas/Oil to Coal Retrofit Options
3.0.2	Pollution Control Technologies
3.1	Conventional Steam Boiler Rankine Cycle
3.2	Fluidized Bed Combustion (FBC) Rankine Cycles
3.2.1	Atmospheric FBC
3.2.2	Circulating FBC
3.2.3	Pressurized FBC
3.3	Integrated Coal Gasification Combined Cycle
3.4	Integrated Gasification Humid Air Tubine (IGHAT) Cycle
3.5	Brayton Cycles
3.5.1	Direct Coal-Fired Brayton Cycle
3.5.2	Indirect Coal-Fired Brayton Cycle
3.6	Magnethohydrodynamics (MHD)
4.0	NUCLEAR FISSION
4.1	Pressurized Water Reactor (PWR)
4.2	Boiling Water Reactor (BWR)
4.3	High Temperature Gas Cooled Reactor (HTGR)
4.4	Liquid Metal Fast Breeder Reactor (LMFBR)
4.5	Life Extension
4.6	Layup
5.0	NUCLEAR FUSION
5.1	High Temperature
5.2	Cold Fusion

(ETSR Generation Technologies, continued)

6.0	GEOTHERMAL
6.0.1	Pollution Control
6.1	Vapor-Dominated Resources
6.2	Liquid-Dominated Resources
6.2.1	Flashed Steam
6.2.2	Binary Cycle
6.2.3	Rotary Separator
7.0	HYDROELECTRIC
7.1	Conventional Hydroelectric
8.0	BIOMASS
8.0.1	Pollution Control
8.1	Direct Combustion
8.2	Gasification
8.3	Anaerobic Fermentation
9.0	MUNICIPAL SOLID WASTE
9.0.1	Pollution Control
9.1	Direct Combustion
9.1.1	Mass Burn
9.1.2	Refuse Derived Fuel (RDF)
9.1.2.1	Spreader Stoker
9.1.2.2	Co-Firing (20% Coal)
9.1.2.3	Fluidized Bed Boilers
9.2	Gasification
9.2.1	Pyrolysis/Thermal Gasification
9.2.2	Landfill Gas Recovery
9.3	Recycling
10.0	Cogeneration
10.1	Gas Turbine Based Systems
10.1.1	Heat Recovery
10.1.2	Combined Cycles
10.2	Combustion Engines
10.2.1	Reciprocating Engines
10.2.2	Stirling Engines
10.3	Topping Steam Turbine Systems
10.3.1	Back-Pressure Turbine Systems
10.3.2	Extraction Steam Turbine Systems
10.4	Bottoming Cycle Systems
10.4.1	Low Pressure Steam Turbines
10.4.2	Organic Rankine Engines
10.5	Packaged Cogeneration Systems
10.6	Advanced Heat Recovery
10.6.1	Ceramic Heat Exchangers
10.6.2	Kalina Cycle
10.7	Phosphoric Acid Fuel Cells

(ETSR Generation Technologies, continued)

11.0	WIND
11.1	Utility-Scale Systems
12.0	SOLAR THERMAL ELECTRIC
12.1	Concentrating Systems
12.1.1	Central Receivers
12.1.2	Parabolic Dishes
12.1.3	Parabolic Troughs
12.2	Salt Ponds
13.0	PHOTOVOLTAICS
13.1	Utility-Scale Systems
14.0	OCEAN ENERGY CONVERSION TECHNOLOGIES
14.1	Tidal Energy Conversion
14.2	Wave Energy
14.3	Ocean Thermal Energy Conversion
15.0	FUEL CELLS
15.1	Phosphoric-Acid Utility-Scale Systems
15.2	Molten Carbonate
15.3	Solid Oxide
15.4	Alkaline
15.5	Proton Exchange Membrane
16.0	STORAGE
16.0.1	Comparison of all storage technologies and their dynamic benefits
16.1	Pumped Hydroelectric
16.1.1	Conventional Pumped Hydroelectric
16.1.2	Modular Pumped Storage
16.2	Compressed Air Energy Storage
16.3	Utility-Scale Battery
16.4	Superconducting Magnetic Energy Storage (SMES)

ETSR END-USE TECHNOLOGIES

17.0	WATER HEATING
17.1	Pulse Combustion Water Heater
17.2	Condensing Water Heater
17.3	Radiant Storage Water Heater
17.4	Heat Pump Water Heater
17.5	Tankless Water Heater
17.6	Solar Water Heating
17.6.1	Passive Solar Water Heater
17.6.2	Active Solar Water Heater
17.7	Thermophotovoltaic Gas Water Heater (formerly Thermophotovoltaic Equipment)
17.8	Waste Heat Recovery Water Heater
17.9	Passive Hot Water Recovery System

(ETSR End-Use Technologies, continued)

18.0 SPACE HEATING
18.1 Condensing Furnaces
18.1.1 Recuperative Furnaces
18.1.2 Pulse Combustion Furnaces
18.2 Heat Pipe Furnaces
18.3 Ceramic Burner (formerly Pyrocore Burner)
18.4 Active Solar Heating

19.0 SPACE COOLING
19.1 Desiccant Cooling
19.2 Gas-Fired Cooling
19.2.1 Gas Absorption Cooling
19.2.2 Gas Engine Cooling
19.3 High Efficiency Electric Compression Air Conditioner
19.4 Evaporative Cooling
19.5 Heat Recovery Absorption
19.6 Active Solar Cooling
19.7 Roof Ponds

20.0 HEATING AND COOLING TECHNOLOGIES
20.1 Gas-Fired Heat Pumps
20.2 Advanced Electric Heat Pumps
20.2.1 High Efficiency Air Source
This section includes variable capacity compressor and multi-zone heat pumps (formerly 21.2.4 and 21.2.5)
20.2.2 Water Source
20.2.3 Ground Coupled
20.2.4 Bivalent
20.3 Heat Pump Setback Thermostats
20.4 Integrated Appliances
20.5 Heat Pipe Assisted AC
Note: This assumes this technology provides heating as well as cooling; if not, relocate to section 20 (cooling)
20.6 Passive Solar Heating and Cooling

21.0 BUILDING ENVELOPE TECHNOLOGIES
21.1 Advanced Glazing
21.1.1 Films and Coatings
21.1.2 High R-Value Windows
21.1.2.1 Gas Filled Glazings
21.1.2.2 Transparent Gel
21.1.2.3 Evacuated Glazings
21.1.2.4 Switchable Windows
21.2 Fenestration Control Systems*
21.2 Advanced Insulation
21.3 Radiant Barriers

(ETSR End-Use Technologies, continued)

22.0	LIGHTING
22.1	High Efficiency Incandescent Lamps
22.1.1	Advanced Filaments and Krypton Filling
22.1.2	Infrared-Reflecting Coatings
22.1.3	Reflector Lamps
22.1.4	Tungsten-Halogen Lamps
22.2	Conventional Fluorescent Lighting
22.2.1	High Efficiency Lamps
22.2.1.1	Reduced Wattage Lamps
22.2.1.2	T-8 Lamps
22.2.1.3	Increased Surface-Area Envelope
22.2.1.4	High Efficacy Phosphor Lamps
22.2.2	Energy Efficient Ballasts
22.2.1	High Efficiency Electromagnetic Ballasts
22.2.2	Electronic Ballasts
22.2.3	High Efficiency Fixtures
22.2.4	High Efficiency Fixtures
22.2.5	Fluorescent Retrofits
22.2.5.1	Lamp Replacement
22.2.5.2	Reflector Retrofit
22.2.5.3	Ballast Retrofit
22.2.5.4	Lens Replacement
22.3	Compact Fluorescent Lighting
22.3.1	Integral Compact Fluorescent Lamps
22.3.2	Modular Compact Fluorescent Lamps
22.4	High Intensity Discharge Lighting
22.4.1	HID Lamps
22.4.1.1	Mercury Vapor Lamps
22.4.1.2	Metal Halide Lamps
22.4.1.3	High Pressure Sodium Lamps
22.4.1.4	Low Pressure Sodium Lamps
22.4.2	HID Electronic Ballasts
22.5	Lighting Control Systems
22.5.1	Lighting Control Hardware
22.5.1.1	Dimming Controls
22.5.1.2	Photocell Controls
22.5.1.3	Scheduling Controls
22.5.1.4	Occupancy Sensors
22.5.2	Lighting Control Strategies
22.5.2.1	Daylighting Systems
22.5.2.2	Lumen Maintenance Systems
22.5.2.3	Occupancy Scheduling
22.5.2.4	Fine Tuning
22.5.2.5	Load Shedding
22.6	Advanced Lighting Distribution Systems
22.6.1	Light Pipes
22.6.2	Fiber Optic Systems

(ETSR End-Use Technologies, continued)

23.0	APPLIANCES
23.1	Refrigerators
23.1.1	Advanced Insulation
23.1.2	High Efficiency Refrigerators
23.2	High Efficiency Cooking Appliances
23.2.1	Residential Cooking Appliances
23.2.1.1	Advanced Electric Cooktops
23.2.1.2	Advanced Ovens
23.2.1.3	Solar Cooker
23.2.2	Commercial Cooking Appliances
23.2.2.1	Advanced Electric Fryers
23.2.2.2	Advanced Gas Fryers
23.2.2.3	Advanced Burners
23.2.2.4	Advanced Gas Griddles
23.2.2.5	Advanced Ovens
23.3	Dishwashers
23.1.1	Low Temperature Dishwashers
23.1.2	Advanced High Temperature Dishwashers
23.4	Advanced Clothes Washers
23.5	Advanced Clothes Dryers
23.6	Advanced Office Equipment
24.0	INDUSTRIAL APPLICATIONS
24.1	Industrial Efficiency Improvements
24.1.1	High Temperature Insulation
24.1.2	Boiler and Steam System Improvement
24.1.3	Waste Heat Recovery
24.1.4	Pinch Technology
24.1.5	Advanced Industrial Controls
24.1.6	Industrial Process Load Adjustment
24.2	Alternate/Advanced Process Technologies
24.2.1	Industrial Process Heat Pumps
24.2.2	Freeze Concentration
24.2.3	Membrane Processes
24.2.4	Laser Processing
24.2.5	Advanced Industrial Refrigeration
24.2.6	Advanced Glass Processing
24.3	Advanced Heating, Drying and Curing Processes
24.3.1	Infrared Heating
24.3.2	Microwave Heating
24.3.3	Advanced Gas-Fired Heaters
24.3.4	Solar Industrial Process Heating
24.4	Advanced Combustion
24.4.1	Radiant Low NOx Tube Burners
24.4.2	Advanced Radiant Heat Transfer
25.0	ADVANCED MOTORS
25.1	Programmable DC Motors
25.2	Variable Speed Drive AC Motors
25.3	Stirling Engines

(ETSR End-Use Technologies, continued)

26.0	LOAD MANAGEMENT
26.1	Time-of-Use Metering
26.2	Direct Load Control
26.3	Dynamic Price Sensing and Response Metering System
26.4	Thermal Energy Storage
26.5	Customer Battery Storage
26.6	Energy Management Systems
27.0	COMMUNITY-SCALE TECHNOLOGIES
27.1	District Heating
27.2	Geothermal Direct Use
27.3	Desalination
27.3.1	Multi-Stage Flash Distillation
27.3.2	Multiple Effect Distillation
27.3.3	Reverse Osmosis Distillation
27.3.4	Mechanical and Thermal Vapor Compression Distillation
28.0	ON-SITE ELECTRICITY PRODUCTION
28.1	Distributed Photovoltaic Systems
28.2	Solar Thermal/PV Hybrid
28.3	Distributed Wind Systems
29.0	TRANSMISSION TECHNOLOGIES
29.1	Flexible AC Transmission System (FACTS)
29.2	Amorphous-Cored Transformers
29.3	Dynamic Monitoring
29.4	Superconductors
29.5	Solid-State Arrester
29.6	System Control and Data Acquisition
29.7	Synthetic Taped Cable
29.8	HVDC Circuit Breakers
29.9	High Phase Order Transmission

ETSR TRANSPORTATION TECHNOLOGIES

30.0	ALTERNATIVE TRANSPORTATION FUELS
30.1	Methanol
30.1.1	Methanol Light Duty
30.1.2	Methanol Medium Duty
30.1.3	Methanol Heavy Duty
30.2	Ethanol
30.2.1	Ethanol Light Duty
30.2.2	Ethanol Medium Duty
30.2.3	Ethanol Heavy Duty
30.3	Natural Gas
30.3.1	Natural Gas Light Duty
30.3.2	Natural Gas Medium Duty
30.3.3	Natural Gas Heavy Duty
30.4	Liquid Petroleum Gas (LPG)
30.4.1	LPG Light Duty
30.4.2	LPG Medium Duty
30.4.3	LPG Heavy Duty
30.5	Electricity
30.5.1	Electricity Light Duty
30.5.2	Electricity Medium Duty
30.5.3	Electricity Heavy Duty
30.5.4	Electricity Rail
30.6	Hydrogen
30.6.1	Hydrogen Light Duty
30.6.2	Hydrogen Medium Duty
30.6.3	Hydrogen Heavy Duty
31.0	VEHICLE EFFICIENCY
31.1	Engine Efficiency
31.2	Drive Train Efficiency
31.3	Rolling Resistance Improvements
31.4	Body Improvements

(END OF EXHIBIT 1)