PROTOCOLS AND PROCEDURES FOR THE VERIFICATION OF COSTS, BENEFITS, AND SHAREHOLDER EARNINGS FROM DEMAND-SIDE MANAGEMENT PROGRAMS

The Protocols contained in this document were developed by:

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INTRODUCTION

This document identifies the protocols and procedures to be used by the four major California investor-owned utilities to document and verify the costs and benefits of major Demand-Side Management (DSM) program activities. The document also describes and identifies the regulatory process for which the measurement protocols will be used to assess reported program costs and benefits.

The protocols identified in this document will be used for identified program activities authorized for implementation in 1994 and each subsequent year. These protocols will be applied in proceedings that begin in 1993 and continue well beyond 1994.

To the extent the protocols identified in this document differ from existing agreements or practices established in prior proceedings for activities in 1993, the protocols identified in this document supersede the prior practices and agreements.

The main text of the document consists of:

- protocols and procedures for the use in the verification of program costs and benefits for purposes of shareholder earnings (Part I); and
- measurement agreements for resource planning purposes (Part II);

Appendix A contains a glossary of the primary terms used in this document. Additional appendices provide detailed reference material and protocols which supplement those identified in the main portion of the text.

PART I: PROTOCOLS AND PROCEDURES FOR VERIFICATION OF PROGRAM COSTS AND BENEFITS FOR SHAREHOLDER EARNINGS

The protocols and procedures identified in Part I of the document are predicated on the key features of adopted shareholder earnings mechanisms. The discontinuation of all earnings mechanisms would render moot many, but not necessarily all, of the protocols and procedures identified in this document. Similarly, significant modifications to the terms and conditions of a particular earnings mechanism for any or all of the utilities may limit or change the applicability of certain protocols.

The protocols and procedures in Part I address two forms of shareholder incentives currently authorized for different types of programs: Shared Savings and Performance Adder (also known as "cost-plus"). Different reporting requirements protocols and impact measurement protocols are necessary for these two types of incentive mechanisms. Changes in the form of ratemaking treatment afforded to a program may limit or change the applicability of certain protocols.

Part I consists of three major sections and associated protocols:

- **SECTION I.A:** Scheduling protocols which address the annual process for utility filings, review, and Commission action on earnings claims from prior year programs;
- **SECTION I.B:** Reporting requirement protocols associated with utility filings which forecast the costs, benefits, and earnings of next year's programs;
- **SECTION I.C:** Reporting requirement protocols and measurement protocols associated with the verification of costs , benefits, and earnings claims of implemented programs, including the recovery of authorized earnings from verified performance.

SECTION I.A: ANNUAL PROCEEDING FOR VERIFICATION OF COSTS, BENEFITS, AND EARNINGS FROM PRIOR YEAR PROGRAMS

A consolidated, annual proceeding – the DSM Annual Earnings Assessment Proceeding (AEAP) – will be held for the four major utilities for the purpose of the regulatory review of (1) earnings claims from prior year programs; and (2) modifications, if necessary, to adopted protocols.[1]

For the 1994-95 time frame, the AEAP will differ each year in terms of schedule and issues addressed. The differences in subject matter addressed in each year are summarized as follows:

- 1994: the AEAP will address earnings claims from 1993 programs, based on existing *ex ante* agreements for 1993 programs.
- 1995 and Beyond: the AEAP will address earnings claims from prior year programs (1994 programs and beyond), based on adopted *ex post* agreements identified in this document.

Recommendations to modify adopted protocols on a prospective basis will be accomplished by obtaining Commission approval and inclusion in Appendix Z of the Protocols. Modifications to adopted protocols on a retroactive basis must be included in earnings claims filings and reports, according to the terms and conditions for noncompliance (Section I.C.(7)). Minor retroactive modifications must obtain unanimous approval from the voting members of the California DSM Measurement Advisory Committee (CADMAC) as set forth in Appendix B. The CADMAC should submit a report in each AEAP describing all retroactive waivers approved by the CADMAC, and the rationale for supporting such waivers. All such waivers will be adopted without further review by the Commission. The appropriateness of continuing CADMAC activities will be examined in the 1997 AEAP. The 1997 AEAP will serve as the forum for a comprehensive reassessment of adopted *ex post* protocols.

[1] Per D.94-10-059, utilities are required to file their projected program costs, benefits, and performance targets on October 1 of each year. This filing will be used to calculate the MPS for shared savings programs. These filings should also include the information necessary to calculate the unit cost incentive and relative program cost ratio required by the adopted performance adder mechanism.

TABLE 1
DEMAND-SIDE MANAGEMENT
ANNUAL EARNINGS ASSESSMENT PROCEEDING SCHEDULE

	1998 AEAP	**1999 AEAP**
EARNINGS CLAIM YEAR (costs, benefits, and earnings from prior year programs)	**PY97 First Earnings Claim PY96 Second Earnings Claim**	**PY98 First Earnings Claim PY97 Second Earnings Claim PY94 Third Earnings Claim**
EARNINGS CLAIM SCHEDULE [2]		
Load Impact studies used to substantiate earnings claims[3]	March 2	March 1
Draft Section VIII (earnings) of DSM Annual Summary	April 15	April 15
DSM Annual Summary (including Final Section VIII) and Technical Appendix	May 1	May 3
Utility Earnings Claim Application	May 1	May 3
ORA Testimony	August 24	August 23
CADMAC Testimony [4]	September 8	September 7
Other Intervenors' Testimony	September 8	September 7
Utility Reply Testimony[5]	September 21	September 20
Energy Division's Independent Reviewers Report[6]	October 13	October 12
Utility Reply Testimony to Independent Review Report	October 20	October 19
Case Management Statement	October 26	October 25
Hearings (if necessary)	November 2-13	November 1-12
Opening Briefs	November 30	November 29
Reply Briefs	December 7	December 6
Proposed Decision	February	February
Final Decision	March	March
FORECAST YEAR (costs, benefits, and earnings for next year's programs)	**1998 Programs**	**1999 Programs**
FORECAST SCHEDULE		
Utility Forecast Filing[7] (including target earnings)	October 1	October 1

2 All dates in the Earnings Claim Schedule after May 1 are subject to modification by the ALJ at the prehearing conference.

3 ORA and the utilities expect a continuation of the current practice of allowing some studies to be filed later than the March date on a case by case basis.

4 Includes prospective Protocol modifications and Appendix Z filings for current or forecast year programs.

5 May include testimony on ORA testimony, CADMAC testimony, or Other Intervenors' Testimony.

6 Two reports may be issued: one on CADMAC's consensus and nonconsensus recommendations, and one on any disputed M&E issues.

7 This may be an advice letter filling or application. It is included for the sake of completeness and is not part of the AEAP. Will not continue for 1999 programs unless authorized by the CPUC.

Each AEAP decision will adopt:

1. Earnings levels from programs implemented in prior years, under the terms and conditions authorized in a General Rate Case for shareholder earnings.
2. Revisions to any protocols which address the scheduling, reporting requirements or measurement protocols identified in this document.

In some cases, the protocols in this document may require Commission adoption, in an AEAP, of certain specific values to be used in the calculation of utility earnings claims. These include:

- avoided costs to be used in earnings claim calculations;[8] and,
- effective useful life(s) of DSM measures.

Table 2 identifies the general relationship between a program year, the AEAP earnings claim filing requirements, and earnings recovery.

TABLE 2
RELATIONSHIPS BETWEEN PROGRAM YEARS, AEAP ACTIVITIES, AND EARNINGS RECOVERY

PROGRAM YEAR	FIRST YEAR OF FIRST EARNINGS CLAIM[9] IN AN AEAP	FIRST YEAR OF EARNINGS RECOVERY FROM AN EARNINGS CLAIM FILED, VERIFIED AND AUTHORIZED IN THE AEAP
1994	1995	1996
1995	1996	1997
1996	1997	1998
1997	1998	1999

8 The specifics of avoided costs and implementation details were addressed by the parties in their 1995 AEAP testimony. D.95-12-054 adopted the parties' consensus recommendations for modifying DSM Policy Rules 7 and 8. The modified language allows the utilities to value avoided costs based on a consistent set of assumptions, but also allows flexibility in determining which set of resource assumptions to use for future DSM program years. Parties were directed to confer with ORA and other interested stakeholders to determine the avoided costs to be used in the forecast advice letter filings. (See pages 23-24 of D.95-12-054.)

9 "First earnings claim" represents the first installment of lifecycle earnings (earnings that may be eventually recovered following the completion and verification of all required impact studies in subsequent years).

SECTION I.B: UTILITY FILINGS OF FORECASTS OF COSTS, BENEFITS, AND EARNINGS FOR NEXT YEAR PROGRAMS

Utility filings of forecasts of costs, benefits, and earnings will continue to be made under the current advice letter process and will address the appropriate parameters used to estimate and subsequently compute and verify earnings from programs authorized for any and all types of shareholder earnings treatment.[10] During implementation, the utilities may modify their programs to respond to market conditions.

For programs authorized for shared savings treatment, the utility forecast filings will contain the information on costs, benefits, and earnings for each program and/or program element planned for the next year. The categories and general substance of the information to be filed are identified in Table 3. Additional reporting requirement protocols for forecast filings are contained in Appendix D.

[10] Per D.94-10-059, utilities are required to file their projected program costs, benefits and performance targets on October 1 of each year. This filing will be used to calculate the MPS for shared savings programs. These filings should also include the information necessary to calculate the unit cost incentive and relative program cost ratio required by the adopted performance adder mechanism.

TABLE 3
REPORTING REQUIREMENT PROTOCOLS FOR UTILITY FILINGS OF FORECASTS OF COSTS, BENEFITS, AND EARNINGS FOR PROGRAMS AUTHORIZED FOR EARNINGS RECOVERY[11]

PERFORMANCE PARAMETER	PROTOCOLS FOR PROGRAMS WITH SHARED SAVINGS TREATMENT
EARNINGS	1. Estimated earnings level for the program year, calculated according to terms and conditions of an authorized shared savings mechanism and an AEAP-adopted earnings recovery schedule and distribution (Table 10).
UTILITY COSTS	1. Administration costs, separately for allocated and nonallocated costs. 2. Allocated administration costs based on utility-specific allocation conventions. 3. Estimated costs for customer financial assistance for measure installation or operation, representing the product of participation levels and the levels and types of participant assistance planned for the next program year.
MEASURE COSTS	1. Estimated measure costs, based on adopted protocols for measure costs.
RESOURCE BENEFITS	1. Forecasted gross and net annual and lifecycle benefits, calculated as the product of estimated load impacts (gross and net) and avoided costs. 2. Avoided costs (marginal costs) consistent with CPUC adopted sources for use in calculating resource benefits for earnings claims purposes from DSM programs. 3. Net first year and lifecycle load impacts, based (whenever appropriate and possible) on (a) end use element load impact per designated unit from measurement studies of prior year programs; (b) expected participation levels (expressed in terms of designated units); and (c) AEAP-adopted effective useful life estimates.
COST-EFFECTIVENESS	1. Total Resource Cost (TRC) and Utility Cost (UC) test Benefit-Cost ratio (for each program end use element), consistent with adopted DSM Rules on cost-effectiveness and the CPUC / CEC Standard Practice Manual (SPM): Economic Analysis of Demand-Side Management Programs.
PERFORMANCE PARAMETER	**PROTOCOLS FOR PROGRAMS WITH PERFORMANCE ADDER TREATMENT**
EARNINGS	1. Earnings level calculated as the product of estimated expenditures during the program year and the adopted incentive rate, assuming minimum program goals have been met.
COSTS	1. Administration costs will represent, and will be reported separately for, allocated and nonallocated costs. 2. Allocated administration costs will be based on utility-specific allocation conventions. 3. Estimated costs for financial assistance for measure installation or operation will represent the sum of all such costs planned for the program year.
BENEFITS	1. Estimated program accomplishments, per adopted unit of performance for each program or program element.

[11] Additional reporting requirement protocols for forecast filings are contained in Appendix D.

SECTION I.C: UTILITY AEAP FILINGS FOR EARNINGS CLAIMS FROM PRIOR YEAR PROGRAMS

(1) Scheduling and Reporting Requirements Protocols

Beginning in 1994, utility claims for prior year program performance will be addressed in the AEAP. The 1994 AEAP filing of utilities will include earnings claims for 1993 program activities. The substance and protocols governing the verification of earnings from 1993 programs in the 1994 AEAP will be based on the *ex ante* agreements authorized for each utility for programs implemented in 1993.

Beginning in 1995, utility AEAP filings to claim and recover earnings from prior year programs will be governed by the protocols identified in this document (this section and Appendix C).

The utility filings for earnings claims in AEAPs beginning in 1995 will include, and will be summarized in terms of, the protocols identified in Table 4. Additional reporting requirement protocols for AEAP earnings claim filings are contained in Appendix E.

(2) Linkage Between DSM Annual Summary and an AEAP Earnings Claim Filing

Beginning in 1995, the utility earnings claim from prior year programs will be formally linked with Chapter 8 of the DSM Annual Summary.[12] The proposed protocols governing the linkage are as follows:

- A preliminary Chapter 8 will be filed with ORA, as a separate document, on April 15, and will represent a preliminary estimate of an earnings claim from the prior year programs;
- A final Chapter 8 will be filed with the standard service lists along with the full DSM Annual Summary (including the Technical Appendix) on the same date as the AEAP earnings claim filing;
- Chapter 8 will identify and document, in summary fashion, an estimate of the level of earnings claimed from the affected programs and program years.

[12] Reporting requirements for these reports are contained in the DSM Reporting Requirements Manual.

TABLE 4
REPORTING REQUIREMENT PROTOCOLS FOR UTILITY AEAP FILINGS FOR EARNINGS CLAIMS[13]

PERFORMANCE PARAMETER	PROTOCOLS FOR PROGRAMS WITH SHARED SAVINGS TREATMENT
EARNINGS	1. Earnings level for the program year (calculated according to the terms and conditions of an authorized shared savings mechanism, and the schedule for the distribution of lifecycle earnings identified in Table 10.)
UTILITY COSTS	1. Administration costs will represent, and will be reported separately for, allocated and nonallocated costs. 2. Allocated administration costs will be based on utility-specific allocation conventions. 3. Recorded costs for financial assistance for measure installation or operation will represent the sum of all such costs incurred during the program year.
MEASURE COSTS	1. Recorded measure costs, based on Appendix C protocols for measure costs, and reported per Appendix E and Section II.A.
RESOURCE BENEFITS	1. Lifecycle benefits calculated as the product of forecasted avoided costs and the estimated lifecycle load impacts from the program year. 2. Avoided costs (or marginal costs) consistent with CPUC adopted sources for application to earnings claims from DSM programs. 3. Annual net load impacts, based on results of load impact measurement studies conducted in conformance with the measurement protocols (identified in Appendix C), reported per Table 6 (end use results) and aggregated to the program level summary per Appendix E, and documented per Table 7. 4. The estimation of annual load impacts for each remaining impact year of the effective useful life, based on 3., annual net load impacts, above.
COST-EFFECTIVENESS	1. Total Resource Cost (TRC) and Utility Cost (UC) test Benefit-Cost ratio (for each program end use element, consistent with adopted DSM Rules on cost-effectiveness and the CPUC / CEC Standard Practice Manual(SPM): Economic Analysis of Demand-Side Management Programs.
PERFORMANCE PARAMETER	**PROTOCOLS FOR PROGRAMS WITH PERFORMANCE ADDER TREATMENT**
EARNINGS	1. Earnings level calculated as the product of recorded expenditures during the program year and the adopted incentive rate, if and when minimum program goals have been met, and required impact studies (Appendix C) have been completed. 2. Earnings recovered per distribution schedule, Table 10.
COSTS	1. Administration costs will represent, and will be reported separately for, allocated and recorded nonallocated costs. 2. Allocated administration costs will be based on utility-specific allocation conventions. 3. Recorded costs for financial assistance for measure installation or operation will represent the sum of all such costs incurred during the program year.
BENEFITS	1. Recorded program accomplishments, per adopted unit of performance for each program and / or program element.

[13] Additional reporting requirement protocols for AEAP earnings claim filings are contained in Appendix E.

(3) Protocols for Implementing and Reporting the Results of Parallel Load Impact Studies

It may be prudent to pursue more than one study or method to estimate the load impacts of a program. A utility that intends to conduct parallel studies or use multiple methods in parallel to estimate load impacts should follow the process and provide the documentation set forth below in order to describe how the utility used the results of parallel studies or multiple methods as the basis for its earnings claim:

1. To reduce the potential for disagreement during the regulatory review process, the utility should document in advance of the study submission its reasons for conducting parallel studies and the criteria that will be used for selecting which study method, or combination will be used as the basis for its earnings claim. The utility should provide the documentation to CADMAC as early as possible in the process, and should always provide it before the results of the studies are available to the utility. CADMAC should attempt to resolve any disagreements about the selection criteria at this time.
2. If the utility plans to use a method that does not comply with the program-specific protocols in Appendix C, the utility should seek a retroactive waiver from CADMAC. In the waiver, the utility should document its reasons for conducting parallel studies and the criteria that will be used for selecting which study, method, or combination will be used as the basis for its earnings claim.
3. In its load impact measurement study submission, the utility should (a) identify the estimate that will be used its earnings claim, (b) the method or combination of methods used to develop the estimate, and (c) the basis for its decisions. The utility should include a copy of the pre-submission documentation that was provided to CADMAC and copies of any related approved retroactive waivers.
4. The utility should enclose the study descriptions and results of any and all parallel studies and methods that were used to develop alternate load impact estimates. The documentation of the parallel studies and methods should be sufficient for the Office of Ratepayer Advocates (ORA) to conduct its review of all of the studies, including conducting verification studies. This documentation includes the completion of Tables 6 and 7 under Protocols for Reporting the Results of Impact Measurement Studies Used to Support an Earnings Claim.

5. If the utility should need to make changes regarding which study, method, or combination will be used as the basis for its earnings claim after the utility has filed the load impact studies, the utility should:
   a. notify ORA of the change as soon as possible **prior** to the filing of its earnings application, and
   b. in its earnings application include documentation for any changes regarding which studies or methods were used as the basis for its earnings claim, the justification for these changes and a copy of the notification to ORA of these changes.

(4) Framework for Methods Used to Measure Load Impacts and Measure Costs

Table 5 identifies the general approach that should be applied to program-specific impact studies, which are identified on a program-by-program basis in Appendix C. The protocols apply to most, but not all program evaluations. Generic deviations (i.e., those applicable to all utilities) from the protocols in Table 5 are contained in the program-specific protocols in Appendix C. Utility-specific modifications / alternatives for program specific protocols (Appendix C) are contained in Appendix Z. To the extent that further modifications to the protocols in Table 5, Appendix C, and Appendix Z are developed and assessed, the general framework and approach identified in Table 5 should be used as an explicit reference point in identifying and justifying such alternatives, and must be approved in an AEAP.[14]

[14] The basis for retroactive modifications to the impact measurement protocols is described below, "Terms and Conditions for Reduced Earnings Due to Noncompliance," Section I.C.(7).

TABLE 5
PROTOCOLS FOR THE GENERAL APPROACH TO LOAD IMPACT MEASUREMENT

A. OBJECTIVES

1. General: to measure the level and type of change in load that can be attributed to a utility program.

2. Energy Efficiency programs in particular: (a) to measure the level and type of change in load at a comparable level of service; and (b) to identify the changes in load in such a way that the results can be used for the purposes of determining shareholder earnings and (if different) for resource planning.

B. MEASUREMENT METHOD / METHODOLOGY (evaluation design criteria for use with one or more End Use Consumption and Load Impact Model)

The methods chosen will be developed and applied in such a way that maximizes the use of measured data (without unreasonable costs or adverse customer impacts) to identify gross and net load impacts (changes in use that can be attributed to the program).

1. Estimation of Gross Energy Impacts

The statistical estimation of gross energy impacts requires billing data and explains changes in energy use as a function of other variables in order to estimate the gross load impacts attributable to a DSM program. A variety of model types - including conditional demand analysis (CDA), statistically adjusted engineering (SAE), fixed effects, and other linear and nonlinear regression models - may qualify as acceptable load impact regression models (LIRMs), depending upon the circumstances.

The LIRMs used to estimate gross energy savings should have the following characteristics:

a. The model is an econometric or statistical model, embodying accepted or thoroughly defensible empirical techniques for measuring impacts of policies, programs and measures.

b. The models employ billing and weather data, pooled by customer, for multiple time periods, as well as customer-specific attributes, and / or other measured or observed data to estimate energy impacts.

c. The model produces diagnostics and test statistics that allow others to assess the robustness of its estimates and / or simulations.

d. The model specification is developed in consideration of the issues identified in the Protocols in Section D.5 of Table 7. That is, the model specification should follow from an accurate conceptualization of the energy consumption process, and should use compatible econometric and statistical techniques.

The estimates of energy impacts should flow from a statistical model rather than a deterministic engineering model, while perhaps relying to some extent on engineering information. For example, an SAE model exhibits an acceptable blend of statistical and engineering models.

Confounding effects on energy consumption should be controlled for. The use of a comparison group and the inclusion of social, political and economic changes, are acceptable methods.

TABLE 5 (continued)
PROTOCOLS FOR THE GENERAL APPROACH
TO LOAD IMPACT MEASUREMENT

2. Estimation of Net Energy Impacts:

The estimation of net energy impacts can also involve the use of a statistical model that does not use energy consumption as the dependent variable but rather uses the observed decisions of customers to participate in DSM programs and to install efficient equipment as the dependent variables. The purpose of these models is to control for free ridership or to derive a net-to-gross savings adjustment. The models may also be used to estimate an adjustment factor to control for self-selection bias.

The LIRMs used to estimate net energy savings should have the following characteristics:

a. The model is an econometric or statistical model, embodying accepted or thoroughly defensible empirical techniques for measuring impacts of policies, programs and measures.

b. The model utilizes comparisons between participants and nonparticipant behavior in a discrete choice, difference-of-differences, or other statistical modeling context to isolate net from gross load impacts.

The model produces diagnostics and test statistics that allow others to assess the robustness of its estimates and / or simulations.

3. If the methodology involves comparing participants and nonparticipants with respect to energy consumption, then the following framwork can be used:

Net Load Impacts = Participant Group Load Impacts
minus
Comparison Group Load Impacts
plus or minus
Effects of Uncontrolled Differences between Participant and Comparison Groups

OR[15]

- Net load impacts = Participant Group Load Impacts minus Comparison Group Load Impacts (referred to as the difference of differences method);
- Participant Group Load Impacts = Participant Group Base Usage minus Participant Group Usage in the Impact Year
- Comparison Group Load Impacts = Comparison Group Base Usage minus Comparison Group Usage in the Impact Year
- Participant Group Base Usage = Participant Group Pre-Installation Usage
- Comparison Group Base Usage = Comparison Group Pre-Installation Usage
- Pre-Installation Usage (Participant and Comparison Group) = measured consumption or proxies for consumption of the energy using equipment or building prior to installation of the measure(s) intended to change energy use, adjusted (when applicable) to reflect the minimum efficiency level of the equipment or building that would have been installed without the utility assistance.

[15] When using certain models, the simplified relationships depicted in this section of the table cannot be interpreted literally; for example, the load impacts for Participant Group and Comparison Group are unlikely to be the exact difference between pre- and post-usage.

TABLE 5 (continued)
PROTOCOLS FOR THE GENERAL APPROACH TO LOAD IMPACT MEASUREMENT

C. SAMPLE DESIGN FOR FIRST LOAD IMPACT YEAR

Evaluation design decisions related to sample design will be determined by the following protocols:

- participants will be defined as (1) those who received utility financial assistance to install a measure or group of measures during the program year, or (2) those who received services under the appropriate authorized utility DSM program (e.g., an energy audit with recommendations, or an energy audit with recommendations combined with the offer of a rebate).
- samples are defined as analysis datasets including, where applicable, program participation records, billing histories, and site-specific survey information;
- if the number of program participants is greater than 350 for nonresidential programs or 200 for residential programs, a sample must be randomly drawn and be sufficiently large to achieve a minimum precision of plus/minus 10% at the 90% confidence level, based on total annual energy use. A minimum of 350 for nonresidential programs or 200 for residential programs must be included in the analysis dataset for each applicable end-use;
- if the number of program participants is greater than 350 for nonresidential programs or 200 for residential programs and the primary method of site-specific data collection for model specification is on-site, the number of participants in the analysis dataset may be less than 350 program participants for nonresidential programs or 200 program participants for residential programs, providing the 10/90 criterion is met; in any case, the number of participants in the analysis dataset may not be below 150;
- if the number of participants is less than 350 for nonresidential programs or 200 for residential programs, a census will be attempted--a minimum of 150 participants is required, and site specific information may involve a combination of telephone/mail surveys and site visits; (the precision at the 90% confidence level reported as if the census were a sample);
- the comparison group sample analysis dataset will be drawn using the same criteria for participants

D. BILLING DATA PROTOCOLS

For load impact measurement methods which require the use of billing data, the following additional evaluation design protocols apply:

- participant group pre-installation usage: 12 months prior to the date of installation
- participant group usage in first impact year: a minimum of 9 consecutive months;
- comparison group usage (A) includes customers who installed applicable measures: pre-installation usage = 12 months prior to the date of installation and a minimum of 9 months of post-installation;
- comparison group usage (B) includes customers who did not install applicable measures during the first 9 months of the program year: minimum of 24 months of billing data, including the 12 months of the program year.

(5) Protocols for Reporting the Results of Impact Measurement Studies Used to Support an Earnings Claim

Tables 6 and 7 identify the common procedures and reporting requirements that should be used when reporting the results of load impact studies identified in Appendix C required for the second earnings claim and the retention studies required for the third and fourth earnings claims. Table 6 protocols apply to all program activities for which an impact study or retention study is required as a condition for earnings. Table 7 identifies supplementary, program-specific protocols for reporting results from completed impact or retention studies.

Upon completion of load impact, retention, or persistence studies required in these Protocols, utilities should submit copies to the Office of Ratepayer Advocates and their designated consultants, the California Energy Commission, and the CPUC Energy Division. A letter to the CPUC Docket Office will be the means of notifying other CADMAC members and parties on the current AEAP service list about the completion of the study and its availability.

TABLE 6
PROTOCOLS FOR REPORTING OF RESULTS OF IMPACT MEASUREMENT STUDIES USED TO SUPPORT AN EARNINGS CLAIM

A. First Year Load Impact Studies

Each impact measurement study and any parallel studies or methods completed and filed in support of an earnings claim in an AEAP will include a summary table which contains the following (minimum) information. All results shown are to be reported at the end use element level, and shown separately for energy and electric capacity.[16]

1. Average Participant Group and Average Comparison Group usage as follows:
- A. Pre-installation usage, Base usage, and Base usage per designated unit of measurement.*
- B. Impact Year usage, Impact year usage per designated unit.*

2. Average net and gross end use load impacts for the impact year as follows:
- A. Load impacts.
- B. Load impacts per designated unit (per Appendix C).
- C. The percent change in usage (relative to base usage) of the participant group and comparison group.*
- D. Realization rates[17] for 2.A. and 2.B.

3. Net-to-Gross ratios based on:
- A. Average load impacts.
- B. Average load impacts per designated unit of measurement.
- C. Average load impacts, expressed as the percent change in usage in the Impact year relative to Base usage in the Impact Year.*

(Note: negative values for any of the above should be reported as a zero NGR.)

4. Designated Unit Intermediate data (e.g., square footage, hours of operation, horsepower):
- A. Pre-installation average (mean) values for Participant Group, Comparison Group.
- B. Post-installation average (mean) values for Participant Group, Comparison Group.

5. The precision of the load impact estimates should be reported at the 90% and 80% confidence level for all results in items 1 through 4 above.[18]

6. Measure count data (by end use element, and by measure within the end use element):
- A. Number of measures installed by participants in the Participant Group.
- B. Number of measures installed by all program participants in the 12 months of the program year.
- C. Number of measures installed by Comparison Group.

7. Market segment data:
- A. Residential (for weather-sensitive end uses) – Distribution by climate zone (CEC forecasting climate zones).
- B. Commercial and Industrial – Distribution (percentages) of participants by Commercial Building type and Industry (3 digit SIC).

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16 The items marked with an asterisk (*) are optional if the model(s) employed in the Study are unable, for valid analytical reasons, to provide the appropriate UECs. For EMS and DA Programs, the designated unit for Table 6 reporting is per participant.

17 The realization rate is defined at the end use level as the load impacts estimated by the Study, divided by the load impacts filed in a utility's first year earnings claim.

18 It is understood that the error surrounding the load impact estimates may be greater than the 10% error associated with the estimate of the population parameter, i.e., the annual kWh usage.

TABLE 6 (continued)
PROTOCOLS FOR REPORTING OF RESULTS OF REQUIRED STUDIES USED TO SUPPORT AN EARNINGS CLAIM

B. Retention Studies

Each retention study or method completed and filed in support of an earnings claim in an AEAP will include a summary table which contains the following (minimum) information. All results shown are to be reported at the measure level
1. Identify the studied measure and the end use it belongs to.
2. Identify the *ex ante* expected useful life and the source of the *ex ante* expected useful life (e.g., Appendix F of the M&E Protocols).
3. Identify the *ex post* expected useful life estimated in the study.
4. Identify the *ex post* expected useful life to be used by the utility in the third and fourth earnings claims.
5. Identify the standard error associated with the *ex post* expected useful life.
6. Provide the 80% confidence interval associated with the *ex post* expected useful life (i.e., provide the upper and lower bounds of the estimated *ex post* estimated useful life.)
7. Provide the p-value associated with the *ex post* expected useful life. The p-value is defined as the smallest probability at which the null hypothesis will be rejected if it is true.
8. Provide the realization rate for the adopted *ex post* expected useful life. This is defined as the ratio of the adopted *ex post* expected useful life to the *ex ante* expected useful life.
9. Identify all the “like” measures associated with the studied measure.

TABLE 7
DOCUMENTATION PROTOCOLS FOR DATA QUALITY AND PROCESSING

A. First Year Load Impact Studies

The following information must accompany a load impact study and any parallel studies or methods used to substantiate an earnings claim. The information should be prepared for each program. When differences in data quality and processing exist among end use elements, or between participant group and comparison group study components, the information should note such differences. For additional details regarding these documentation protocols, the reader is referred to the *Quality Assurance Guidelines for Statistical, Engineering, and Self-Report Methods for Estimating DSM Program Impacts* in Appendix J. Responses to the items raised in Table 7 should be brief but complete.

1. OVERVIEW INFORMATION

a. Study Title and Study ID No.: The study title and identification number should be identical to the information contained in the Statewide Bibliography. Changes in this information should be noted.

b. Program, program year (or years) and program description: The program and program year(s) should be identical to the information contained in the Statewide Bibliography.

c. End uses and/or measures covered: Use the end use designations agreed to in the Protocols.

d. Methods and models used: Describe the final model specification used for the study. Where applicable, indicate the report location of the competing class or types of models that were estimated but were not selected.

e. Participant and comparison group definition: Specifically present the study's definition of what constitutes a participant and, if applicable, a comparison group member. Refer to Table 5 of the Protocols, where appropriate.

f. Analysis sample size: Provide the number of customers, number of installations, number of measures (if different) and the number of observations (monthly units of analysis) in the analysis. If different for different units of analysis, a summary table should be provided.

2. DATABASE MANAGEMENT

a. Describe and provide a flow chart illustrating the relationships between data elements.

b. Identify the specific data sources for each data element.

c. Diagram and describe the data attrition process commencing with the program database for participants, and the utility database for the comparison group. Specific numbers and decision points for inclusion and exclusion should be provided. Where different data sources are used (e.g., surveys and program records), appropriate attrition categories should be used (e.g., response rates for surveys, unidentified account numbers for participants' billing records).

d. Describe the internal/organizational data quality checks and data quality procedures used to match customers and billing records, surveys, participation records, weather data, and any other data used in the analysis.

e. Provide a summary of the data collected specifically for the analysis but not used, the reasons for them not being used, and a documentation of where those data reside.

3. SAMPLING

a. Sampling procedures and protocols: Describe the sampling procedures and protocols used. Information provided should include the sampling frame (e.g., eligible population), sampling strategy (e.g., random, stratified, etc.), sampling basis (e.g., customers, installation, rebate issued), and stratification criteria (e.g., geographic, etc.). Descriptions should be provided separately for participant and comparison group data. Specific data and formulas should be used to present sampling goals and achieved results. Procedures to calculate sample sizes in order to achieve specific levels of precision at given levels of confidence should be explicitly described.

b. Survey information: Survey instruments should be provided. Response rates should be presented. Reasons for refusals should be presented in tabular form. Efforts to account for or test for non-response bias should be presented, as well as corrections to account for the bias.

c. Statistical descriptions: For the key variables that were used in the final models, provide

descriptive statistics for the participant group, and, when present, for the comparison group.

TABLE 7 (continued)
DOCUMENTATION PROTOCOLS FOR DATA QUALITY AND PROCESSING

4. DATA SCREENING AND ANALYSIS

a. Describe procedures used for the treatment of outliers, missing data points and weather adjustment.

b. Describe what was done to control for the effects of background variables, such as economic and political activity that may account for any increase or decrease in consumption in addition to the DSM program itself.

c. Describe procedures, including those identified in Table C-12, used to screen data for inclusion into the final analysis dataset. Show how many customers, installations, or observations were eliminated with each screen. The reviewer should be able to clearly follow the development of the final analysis dataset.

d. Regression statistics: For all final models, provide standard regression statistics in a tabular form.

e. Specification: Refer to the section(s) of the Study that present the initial and final model specifications that were used, the rationale for each, and the documentation for the major alternative models used. In addition, the presentation of the specification should address, at a minimum, the following issues:
   1) describe how the model specification and estimation procedures recognize and address heterogeneity of customers (i.e., cross-sectional variation);
   2) describe how the model specification and estimation procedures recognize and address changes in factors that affect consumption over time (i.e., time series variation), apart from program effects;
   3) describe how the model specification and estimation procedures recognize and address the fact that participants self-select into that status, and discuss the effects of self-selection on model estimates whether or not self-selection is treated explicitly;
   4) discuss the factors, and their associated measures, that are omitted from the analysis, and any tests, reasoning, or special circumstances that justify their omission; and
   5) describe how the model specification can be interpreted to yield the net impacts measure(s) recognized in Section E below.

f. Error in measuring variables: Describe whether and how this issue was addressed, and what was done to minimize the problem.

g. Autocorrelation: Describe any autocorrelation problems and the solutions specifically taken to address the problem. Specific identification and mitigation diagnostics should be presented, including differing treatment for sub-groups, if any.

h. Heteroskedasticity: Describe the diagnostics carried out, the solutions attempted and their effects. If left untreated, explain why.

i. Collinearity: Describe procedures used to address the problem of collinearity, and the reasons for either not treating it or treating it to the level that was done.

j. Influential data points: Describe the influential data diagnostics that were used, and how the identified outliers were treated.

k. Missing data: Describe the methods used for handling missing data during the analysis phase of the study.

l. Precision: Present the methods for the calculation of standard errors for key parameters such as gross impacts, net impacts, and net-to-gross ratios.

m. If engineering analyses were conducted, please refer to Section 3 of Appendix J (*Quality Assurance Guidelines for Statistical, Engineering, and Self-Report Methods for Estimating DSM Program Impacts*) for a discussion of the methodological issues that should be acknowledged and documented.

n. If a comparison group was not used in estimating the net-to-gross ratios or net impacts, please refer to Section 4 of Appendix J (*Quality Assurance Guidelines for Statistical, Engineering, and Self-Report Methods for Estimating DSM Program Impacts*) for a discussion of the methodological issues

that should be acknowledged and documented.

TABLE 7 (continued)
DOCUMENTATION PROTOCOLS FOR DATA QUALITY AND PROCESSING

5. DATA INTERPRETATION AND APPLICATION

a. For all program participants and at the end use level, net impacts should be calculated as either:
   1) Average participant group load impacts, minus average comparison group load impacts, plus or minus the effects of uncontrolled differences between the participant and comparison groups times number of participants;
   2) Average participant group load impacts per designated unit, times the number of designated units, times the NGR (based on designated units);
   3) (If comparison group load impacts not available) Average participant group load impacts, times number of participants, times the NGR (derived independently), or
   4) Other application methods agreed upon by the CADMAC.

b. Describe the process, choices made, and rationale for choices made in Section E.1., above.

B. Retention Studies

The following information must accompany a retention study or methods used to substantiate an earnings claim. The information should be prepared for each program. When differences in data quality and processing exist among measures, the information should note such differences. Responses to the items raised in Table 7 should be brief but complete.

1. OVERVIEW INFORMATION

a. Study Title and Study ID No.: The study title and identification number should be identical to the information contained in the Statewide Bibliography. Changes in this information should be noted.
b. Program, program year (or years) and program description: The program and program year(s) should be identical to the information contained in the Statewide Bibliography.
c. End Uses and Measures covered: Use the end use designations agreed to in the Protocols.
d. Methods and models used: Describe the final model specification used for the study. Where applicable, indicate the study location of the competing class or types of models that were estimated but were not selected. State why the final specification was chosen.
e. Analysis sample size: Provide the number of customers, number of installations, number of measures (if different) and the number of observations in the analysis and time periods of data collection. If different for different units of analysis, a summary table should be provided.

2. DATABASE MANAGEMENT

a. Identify the specific data sources for each data element.
b. Diagram and describe the data attrition process commencing with the program database for participants. Specific numbers and decision points for inclusion and exclusion should be provided. Where different data sources are used (e.g., surveys and program records), appropriate attrition categories should be used (e.g., response rates for surveys).
c. Describe the internal/organizational data quality checks and data quality procedures used to match customers and surveys, participation records, and any other data used in the analysis.
d. Provide a summary of the data collected specifically for the analysis but not used, the reasons for them not being used, and a documentation of where those data reside.

TABLE 7 (continued)
DOCUMENTATION PROTOCOLS FOR DATA QUALITY AND PROCESSING

3. SAMPLING

a. Sampling procedures and protocols: Describe the sampling procedures and protocols used. Information provided should include the sampling frame (e.g., eligible population), sampling strategy (e.g., random, stratified, etc.), sampling basis (e.g., customers, installation, rebate issued), and stratification criteria (e.g., geographic, etc.). Specific data and formulas should be used to present sampling goals and achieved results.

b. Survey information: Survey instruments should be provided. Response rates should be presented. Reasons for refusals should be presented in tabular form. Efforts to account for or test for non-response bias should be presented, as well as corrections to account for the bias.

c. Statistical descriptions: For the key variables that were used in the final models, provide descriptive statistics for the participant group, and, when present, for the comparison group.

4. DATA SCREENING AND ANALYSIS

a. Describe procedures used for the treatment of outliers, and missing data points.

b. Describe what was done to control for the effects of background variables, such as economic, political activity, etc.

c. Describe procedures used to screen data for inclusion into the final analysis dataset. Show how many customers, installations, or observations were eliminated with each screen. The reviewer should be able to clearly follow the development of the final analysis dataset.

d. Model statistics: For all final models, provide standard model statistics in a tabular form.

e. Specification: Refer to the section(s) of the Study that present the initial and final model specifications that were used, the rationale for each, and the documentation for the major alternative models used. In addition, the presentation of the specification should address, at a minimum, the following issues:

   1) describe how the model specification and estimation procedures recognize and address heterogeneity of customers (i.e., cross-sectional variation);

   2) discuss the factors, and their associated measures, that are omitted from the analysis, and any tests, reasoning, or special circumstances that justify their omission; and

f. Error in measuring variables: Describe whether and how this issue was addressed, and what was done to minimize the problem (e.g., response bias, measurement errors, etc.).

g. Influential data points: Describe the influential data diagnostics that were used, and how the identified outliers were treated.

h. Missing data: Describe the methods used for handling missing data during the analysis phase of the study.

i. Precision: Present the methods for the calculation of standard errors.

(6) Required Impact Studies

Tables 8A and 8B identify the requirements for conducting impact and persistence studies, in terms of how often (which program years) the program specific, first load impact year measurement study must be completed (per Appendix C protocols), the measurement period (the number of years between the first load impact study and last persistence study), and the measurement schedule (the frequency and type of study or studies required during the measurement period).

Tables 9A and 9B identify more specific protocols for measurement studies conducted beyond the first load impact year.

Tables 8A and 9A are applicable for PG&E, SDG&E, and SCE. Tables 8B and 9B are applicable for SoCalGas.

TABLE 8A
IMPACT AND PERSISTENCE STUDIES REQUIRED FOR AN EARNINGS CLAIM FOR PG&E, SDG&E, AND SCE

	REQUIRED IMPACT STUDIES		
PROGRAM (Appendix C reference)	**FIRST LOAD IMPACT YEAR** (per Appendix C)	**PERSISTENCE STUDIES**	
	(PROGRAM YEARS)	**MEASURE-MENT PERIOD**	**MEASUREMENT SCHEDULE (1)**
RES. WRI & AEI (space conditioning) (Tables C-1 & C-2)	1994, 1996	10 years	1. 4th & 9th year retention 2. 4th year performance
RES. AEI (Table C-3A-lighting) (Table C-3B-refrigeration)	1994, 1996 1994,1996	7 years 10 years	1. 3rd & 6th year retention 1. 4th & 9th year retention 2. 4th year performance
COMM. EEI (Table C-4)	1994,1995,1996,1997	10 years	1. 4th & 9th year retention study 2. 4th year performance
IND. & AG EEI (Tables C-5 & C-6)	1994,1995,1996,1997	7 years	1. 3rd and 6th year retention 2. 3rd year performance
NEW CONSTRUCTION (Tables C-7 & C-8)	1994,1996	10 years	1. 4th and 9th year retention 2. 4th year performance
MISCELLANEOUS (Table C-9)	Not required	Not applicable	1. Not required
RES. DIR. ASST. (Table C-10-mand.)	1995	Not required	1. Not required
RES. EMS (Table C-11)	1995,1997	Not required	1. Not required
C & I EMS (Table C-11)	1994, 1996	Not required	1. Not required
AGRIC. EMS (Table C-11)	1994,1996	Not required	1. Not required
FUEL SUBSTITUTION (Table C-12)	1997	10 years	1. 4th and 9th year retention study 2. 4th year performance

(1) Notes for Measurement Schedule:

A. Impact Study: An analysis of the net program impacts in the designated load impact year.

B. Retention study: The purpose of this study is to collect data on the fraction of measures or practice remaining in a given year that will be used to produce a revised estimate of its effective useful life.

C. Performance Studies: A time series analysis of the relative change in the performance / efficiency of high efficiency equipment or high performance shell measures over time.

D. Additional protocols governing these studies are specified in Table 9.

TABLE 9A
MEASUREMENT SCHEDULE AND PROTOCOLS FOR PERSISTENCE STUDIES FOR PG&E, SDG&E, AND SCE

PROGRAM	MEASURES INCLUDED IN RETENTION AND PERFORMANCE STUDIES
RESIDENTIAL WRI	Top 10 measures*
RESIDENTIAL AEI (Space Conditioning)	Central AC, Heat pump, Room AC, Evap cooler (for combined utilities, also gas space and gas water heating)
RESIDENTIAL AEI (Lighting & Refrigeration)	High Efficiency Lighting High Efficiency Refrigeration
COMMERCIAL / INDUSTRIAL / AGRICULTURAL EEI	Top 10 measures*
FUEL SUBSTITUTION	Top 10 measures*
RESIDENTIAL NEW CONSTRUCTION	Top 10 measures*
NONRESIDENTIAL NEW CONSTRUCTION	Top 10 measures*
RESIDENTIAL & AGRICULTURAL EMS	Not applicable
COMMERCIAL & INDUSTRIAL EMS.	Not applicable
RESIDENTIAL DIRECT ASSISTANCE	Not applicable

GENERAL:

* Top ten measures – The utility should select the top ten measures, excluding measures that have been identified as miscellaneous (per Table C-9), ranked by net resource value or the number of measures that constitutes the first 50% of the estimated resource value, whichever number of measures is less. After the final decision on the first year's earnings claim, each utility should notify the CADMAC in writing which measures have been selected to ensure coordination with the statewide studies. Utilities will perform individual retention studies for any of the top 10 measures or the number of measures that constitutes the first 50% of the estimated resource value, whichever number of measures is less, not covered by the statewide studies. The procedures for linking the results from the persistence studies to earnings are identified in Table 10.

1. Frequency of Studies and Due Dates for Retention and Performance Studies:
Retention and performance studies required by Table 8A will be carried out in parallel whenever possible. Retention studies will be submitted on March 1 of the appropriate AEAP year following the study year, beginning in 1999. Retention studies for Program Years 1994 and 1995 will be combined and the studies will be conducted on the schedule for Program Year 1994. Similarly, retention studies for Program Years 1996 and 1997 will be combined and the studies will be conducted on the schedule for Program Year 1996. This blend of survival data from participants in the two program years at two points in time should increase the accuracy of the survival function and decrease the total cost of completing the retention studies. For example, results from the first performance and retention study for Program Year 1994 and Program Year 1995 will be presented simultaneously in March 1999 within one study. There is no performance study requirement for any measure within the industrial process end use element. All measures within the industrial lighting end use element will use the results from the Commercial Lighting Performance Study.

TABLE 9A (continued)
MEASUREMENT SCHEDULE AND PROTOCOLS FOR PERSISTENCE STUDIES FOR PG&E, SDG&E, AND SCE

2. Retention Studies: Data for the retention study: Data should be collected using either telephone, on site or mail surveys from program participants. The retention studies shall include data from participant groups from two or more sequential program years to increase the robustness of the sample and to allow for the estimation of a survival function for a number of different measures. This study should include an assessment of the fraction of measures installed in the program year that are in place and operable in the designated analysis year. This information should then be used to re-estimate the effective useful life of measures based on the data collected on remaining measure fractions, other information on measure retention fractions from previous year studies and other data on the shape of the survival function that may be available from the statewide persistence studies or other sources.
3. Performance Studies: The performance studies should be performed by statewide studies or by selecting a sample of program participants with high performance equipment/shell measures in the first year and optionally, a comparison sample of standard efficiency equipment. The performance/efficiency of the equipment should be measured on site and then again four or five years later using similar measuring or monitoring techniques. For statewide studies, degradation factors may be estimated using multiple data sources, including site measurements, laboratory studies, and manufacturers tests. Because the existing statewide studies have covered the vast majority of the measures, there is no performance study requirement for any measures not included in the statewide performance studies.

TABLE 8B
IMPACT AND PERSISTENCE STUDIES REQUIRED FOR AN EARNINGS CLAIM FOR SoCalGas

PROGRAM (Appendix C reference)	REQUIRED IMPACT STUDIES		
	FIRST LOAD IMPACT YEAR (per Appendix C)	PERSISTENCE STUDIES	
	(PROGRAM YEARS)	MEASURE-MENT PERIOD	MEASUREMENT SCHEDULE (1)
RES. WRI & AEI (space conditioning) (Tables C-1 & C-2)	1994, 1997	10 years	1. 4th year measure retention 2. 9th year measure retention
RES. AEI (Tables C-3A-& C-3B)	not applicable		
COMM. EEI (Table C-4)	1996	10 years	1. 4th and 9th year measure retention
IND. EEI (Table C-5)	1995	7 years	1. 4th and 6th year measure retention.
AG EEI (Table C-6)	1995	7 years	1. 4th and 6th year measure retention.
NEW CONSTRUCTION (Tables C-7 & C-8)	1994, 1997 (Res) 1995 (Nonres)	10 years	1. 4th and 9th year measure retention.
MISCELLANEOUS (Table C-9)	Not required	Not applicable	1. Not required
RES. DIR. ASST. (Table C-10-mand.)	1996	Not required	1. Not required
ENERGY MGMT SERVICES (Table C-11)	1994, 1997 (Res) 1995 (Ind.) 1996 (Comm / Ag)	Not required	1. Not required
FUEL SUBSTITUTION (Table C-12)	1997	10 years	1. 4th and 9th year retention study 2. 4th year performance

(1) NOTES for Measurement Schedule requirements:

A. Annual load impact: An analysis of the annual load impacts for each remaining year of Measurement Period.

B. Measure retention study: An assessment of: (a) the length of time the measure(s) installed during the program year are maintained in operating condition; and (b) the extent to which there has been a significant reduction in the effectiveness of the measure(s).

C. Additional protocols governing these studies are specified in Table 9.

TABLE 9B
MEASUREMENT SCHEDULE AND PROTOCOLS FOR PERSISTENCE STUDIES FOR SoCalGas

PROGRAM(S)	MEASURES INCLUDED IN RETENTION AND PERFORMANCE STUDIES
RESIDENTIAL WRI	Top 10 measures* (ranked by net resource value*)
RESIDENTIAL AEI	Central AC, Heat pump, Room AC, Evap cooler, gas space and water heating.
RESIDENTIAL AEI (Refr. & Lighting)	Protocols to be determined in statewide studies
COMMERCIAL / INDUSTRIAL / AGRICULTURAL EEI	Top 10 measures*
FUEL SUBSTITUTION	Top 10 measures*
RESIDENTIAL NEW CONSTRUCTION	Top 10 measures*
NONRESIDENTIAL NEW CONSTRUCTION	Top 10 measures*
RESIDENTIAL & AGRICULTURAL EMS	Not applicable
COMMERCIAL & INDUSTRIAL EMS.	Not applicable
RESIDENTIAL DIRECT ASSISTANCE	Not applicable

GENERAL:

* Top ten measures – The utility should select the top ten measures, excluding measures that have been identified as miscellaneous (per Table C-9), ranked by net resource value or the number of measures that constitutes the first 50% of the estimated resource value, whichever number of measures is less. After the final decision on the first year's earnings claim, each utility should notify the CADMAC in writing which measures have been selected to ensure coordination with the statewide studies. Utilities will perform individual retention studies for any of the top 10 measures or the number of measures that constitutes the first 50% of the estimated resource value, whichever number of measures is less, not covered by the statewide studies. The procedures for linking the results from the persistence studies to earnings are identified in Table 10.

1. Measurement Retention Studies:
   a. Based on the sub-samples for which on-site visits (including the on-site metered / monitored sub-sample) were conducted for the first year impact analyses and annual load impact studies;
   b. The analysis must be conducted at the measure level (or sub-sets of closely-related measures) for the participant group and (when applicable) for the comparison group, with results expressed in terms of a fraction of the measure(s) installed in the program year that are in place and operable in the designated analysis year;
   c. The analysis may be supplemented with an assessment of technical degradation (measure performance) for a sub-sample of the retention study, with results expressed in terms of a technical degradation factor.
   d. There is no performance study requirement for any measure within the industrial end use element.

(7) Relationships Between Required Impact Studies, Earnings Claims, and Earnings Recovery

The following protocols apply to the relationship between "required measurement studies" (Tables 8A, 8B, 9A, and 9B) and the year of an earnings claim:

1. An earnings claim for the recovery of first year earnings must be made in the year following the program year, according to the schedule in Table 1.
2. The first year earnings claim represents: (a) the year prior to the measurement period in Tables 8A and 8B and (b) the first portion of the lifecycle earnings expected for full recovery over the measurement period.
3. The verification of earnings for the first year earnings claim will be based on the verification of: (a) recorded utility program costs (administration and financial assistance); (b) the recorded participation levels for the program and/or program element; (c) the estimated first year average load impacts per unit (net and gross) and measure costs per unit (net and gross) from the adopted forecasts of costs, benefits, and earnings; (d) and the estimated average effective useful lives established by Commission resolution on utility target earnings advice letter filings, or in the AEAP (as appropriate).
4. The second earnings claim will be based on: (a) the first earnings claim values for program costs,[19] participation levels, and effective useful lives; and (b) the results of the completed impact study of first year load impacts (Tables 6 and 7), per Appendix C protocols.
5. Earnings claims after the second claim, when conditioned on the completion of required impact and persistence studies per Tables 8A, 8B, 9A, and 9B, will be based on: (a) the first earnings claim values for program costs,[19] participation levels, and effective useful lives;[20] (b) the load impacts from the second earnings claim; and (c) the results of the completed persistence studies.The level (amount) of earnings for each earnings claim for which an impact study is required will be based on the distribution of earnings payments identified in Table 10.
6. Earnings claims for a program year in which a first year load impact study is not required per Tables 8A and 8B, will be based on: (a) recorded utility program costs

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19 Substantial and discrete program administrative or incremental measure costs associated with an initial program year, but incurred in subsequent years, shall be identified by the utility in its annual report for the year in which the costs were incurred. These costs will not be treated any differently than any other costs incurred in that year (except program evaluation costs) unless the utility has specifically requested different treatment in its October 1 DSM forecast filing.

20 The effective useful lives may be revised based on the results of the retention studies.

(administration and financial assistance)[19]; (b) the recorded participation levels for the program and/or program element; (c) the estimated first year average load impacts per unit (net and gross) and measure costs per unit (net and gross) from the most recently completed impact study for the program; (d) the estimated average effective useful lives adopted in the AEAP; (e) the recovery of earnings according to the earnings distribution schedule for the applicable program, as shown in Table 10.

7. Earnings authorized in an AEAP will be recovered in rates in the year following authorization.

8. Earnings claimed for the duration of earnings recovery for a given program year shall be based on the avoided costs adopted by the CPUC at the time of the forecast filing for that program year.

TABLE 10
EARNINGS DISTRIBUTION SCHEDULE

PROGRAM	1st	2nd	3rd	4th	5th	6th	7th	10th
Residential and Nonresidential Shared Savings Portfolios	25%	25%			25%			25%
Residential and Nonresidential Performance Adder Programs	25%	25%			25%			25%

NOTES:

A. **Residential and Nonresidential Shared Savings Programs**: All shared savings earnings claims are subject to the respective portfolios qualifying for earnings**.**

1. First Earnings Claim: The first earnings claim is based on actual, verified program costs and participation levels and forecasted net impacts per unit, and is equal to 25% of the utility's share of the savings.

2. Second Earnings Claim: The second earnings claim is based on the estimates of net savings produced by the utility's filed first year load impact study. It amounts to 50% of the new estimate of the utility's share of savings, minus the amount already paid. This first year load impact estimate would be used to prospectively adjust pre-specified, *ex ante* load impact estimates for future program years as appropriate.

3. Third Earnings Claim: The third earnings claim will be made in the fifth year after the program. It will be based on the lifecycle savings estimate developed from the retention and performance studies completed in the first follow-up year specified in Tables 8A and 8B. It amounts to 75% of the new estimate of the utility's share of the savings, minus the amount already paid. The results of the retention and performance studies will be used to revise lifecycle savings estimates as follows:

a. Retention Studies:

1) For measures selected for 3rd / 4th year retention studies: The estimated *ex post* measure effective useful life that results from the retention study will be compared to the *ex ante* (i.e., forecast) effective useful life estimates. Hypothesis testing procedures will be used to determine if the estimated *ex post* measure effective useful life is statistically significantly different from the *ex ante* measure effective useful life. If the estimated *ex post* measure effective useful life is significantly different than the *ex ante* measure effective useful life, the estimated *ex post* measure effective useful life will be used to recalculate the Resource Benefits, net. Otherwise, the Resource Benefits, net estimate will continue to use the *ex ante* measure effective useful life. Hypothesis testing will be conducted at the 20% significance level.

An equivalent representation is to construct 80% confidence intervals around the estimated *ex post* measure effective useful life. If the *ex ante* measure effective useful life estimate is within the constructed confidence interval, then the Resource Benefits, net calculation will continue to use the *ex ante* measure effective useful life. If the *ex ante* measure effective useful life estimate is outside the constructed confidence interval, the estimated *ex post* measure effective useful life will be used to recalculate the Resource Benefits, net.

2) For measures not included in the 3rd / 4th year retention studies: Measures not included in the 3rd / 4th year retention studies will be divided into two groups: "like measures" and "other measures." "Like measures" are defined to be measures that are believed to be similar to measures included in the 3rd / 4th year retention studies. "Like measures" will adopt the same percent adjustment (if any) for the measure effective useful lives of the similar studied measures as determined in 3.a.1) to adjust their *ex ante* measure effective useful lives.[21]

"Other measures" are measures that are different from the measures included in the 3rd / 4th year retention studies. For "other measures" that are different from the measures included in the 3rd / 4th year retention studies, but within a studied end use, the *ex ante* measure effective useful life will be adjusted by the average percentage adjustment of all the studied measures within that end use as calculated in 3.a.1). For "other measures" that are in end uses not represented in the 3rd / 4th year retention studies, the measures will continue to use their *ex ante* measure effective useful live values for purposes of calculating the Resource Benefits, net.

b. Technical Performance Studies: Any relative technical degradation in the efficiency or performance of these measures should be included in a revised calculation of the lifecycle benefits for a given program year.

1) For measures selected for the statewide technical performance studies, the revised Resource Benefits, net will be calculated as follows:

$$\text{Resource Benefits, net} = \sum_{i=1}^{k} \left(\text{Net Load Impacts}_i \times \text{Technical Degradation Factor}_i \right)$$

where: k is the estimated effective useful life

Net Load Impacts are determined in the second earnings claim AEAP

2) For measures not included in the statewide technical performance studies, no adjustment will be made.

4. Fourth Earnings Claim: The fourth earnings claim will be made in the tenth year after the program, as indicated above. It will be based on the new lifecycle savings estimate developed from the retention studies completed in the second follow-up year specified in Tables 8A and 8B. It amounts to 100% of the new estimate of the utility's share of the savings, minus the amount already paid. The results of the retention studies will be used to revise lifecycle savings as follows:

a. For measures selected for 6th / 9th year retention studies: The estimated *ex post* measure effective useful life that results from the retention study will be compared to the third earnings claim effective useful life estimates. Hypothesis testing procedures will be used to determine if the estimated 6th / 9th year *ex post* measure effective useful life is statistically significantly different from the third earnings claim measure effective useful life. If the estimated 6th / 9th year *ex post* measure effective useful life is significantly different than the third earnings claim measure effective useful life, the estimated 6th / 9th year *ex post* measure effective useful life will be used to recalculate the Resource Benefits, net. Otherwise, the Resource Benefits, net estimate will continue to use the third earnings claim measure effective useful life. Hypothesis testing will be conducted at the 20% significance level.

An equivalent representation is to construct 80% confidence intervals around the estimated 6th / 9th year *ex post* measure effective useful life. If the third earnings claim measure effective useful life estimate is within the constructed confidence interval, then the Resource

[21] Lists of "like measures" are developed by utilities based upon expected similarities in technology, operating hours, operating loads, and operating factors. Final recommended lists of "like measures" are agreed upon by the Persistence Subcommittee and recommended to CADMAC for approval.

Benefits, net calculation will continue to use the third earnings claim measure effective useful life. If the third earnings claim measure effective useful life estimate is outside the constructed confidence interval, the estimated 6th/9th year *ex post* measure effective useful life will be used to recalculate the Resource Benefits, net.

b. For measures not included in the 6th/9th year retention studies: Measures not included in the 6th/9th year retention studies will be divided into two groups: "like measures" and "other measures." "Like measures" are defined to be measures that are believed to be similar to measures included in the 6th/9th year retention studies. "Like measures" will adopt the same percent adjustment (if any) for the measure effective useful lives of the similar studied measures as determined in 4.a. to adjust their fourth earnings claim measure effective useful lives.

"Other measures" are measures that are different from the measures included in the 6th/9th year retention studies. For "other measures" that are different from the measures included in the 6th/9th year retention studies, but within a studied end use, the third earnings claim measure effective useful life will be adjusted by the average percentage adjustment of all the studied measures within that end use, as calculated in 4.a. For "other measures" that are in end uses not represented in the 6th/9th year retention studies, the measures will continue to use their third earnings claim measure effective useful life values for purposes of calculating the Resource Benefits, net.

5. Miscellaneous end uses, as identified per Table C-9: The total earnings claim is based on actual, verified program costs and participation levels and forecasted or *ex ante* net impacts per unit. The total earnings claim for these end uses shall not exceed 15% of each program's net benefits. The earnings will be divided equally among the four earnings claims.

B. Residential and Nonresidential Performance Adder Programs:

1. Shareholder earnings are based on actual, verified program performance based on verified program costs and forecasted net impacts per unit relative to the previous program year costs and forecasted net impacts per unit. The earnings will be divided equally among the four earnings claims.

2. The first year load impact study is required to be completed, but the results will not be used to adjust any of the earnings claims. The results of the study will be used prospectively to adjust pre-specified *ex ante* load impact estimates for future program years as appropriate.

(8) Terms and Conditions for Reduced Earnings Due to Noncompliance

Failure to comply with the protocols for the AEAP schedule (Table 1), reporting requirements (Tables 3 and 4 and Appendices D and E), impact measurement studies protocols (Appendix C or authorized modifications in Appendix Z), or verification and documentation protocols for impact measurement studies (Tables 6 and 7) will be considered an appropriate basis for partial or full denial of earnings claims for the year and the program(s) associated with the deficiency.

Failure to meet filing dates and/or provide the data required by the protocols will be considered a basis for denial of earnings. Utilities will bear the burden of proof to show why the data could not be produced in a timely manner. Earnings claims will not be denied in the case of limited or minor calculation errors, if corrected in a timely fashion. Late filings of required reports such as the impact studies, Chapter 8 of the DSM Annual Summary Report, or the earnings claim, will not be considered a legitimate basis for the denial of earnings if: (a) the lateness occurs only for a limited number of studies; and (b) the lateness does not jeopardize the verification process of non-utility parties in the AEAP.

Failure to conform with the specific measurement protocols identified in Appendix C, Tables 6, 7, 8, or 9 will not be considered a legitimate basis for a denial or reduction in earnings if:

- the utility made a good faith effort to rigorously apply the protocol; and,
- the effort failed to produce meaningful results; and,
- the utility notified, in writing and in a timely fashion, all members of the CADMAC of the failure, the reasons for the failure, and one or more suggested alternatives for a one-time substitute technique; and,
- the utility receives unanimous approval from all of the members of the CADMAC that the proposed substitute method or technique is reasonable. If unanimous approval of the utility proposal is not obtained, the utility must seek a retroactive waiver from the CPUC by filing an Advice Letter.

The preceding terms and conditions apply to conformance problems associated with specific protocols and specific portions of an earnings claim in a given year. Over time, a pattern of noncompliance in any or all of the forms identified above may be considered a legitimate basis for a more general denial or reduction DSM earnings claims.

PART II: MEASUREMENT AGREEMENTS FOR RESOURCE PLANNING PURPOSES

This section describes how results of measurement studies mandated by these Protocols will be made available for use in CPUC and CEC resource planning processes. Its intent is to emphasize the importance of using the load impact and other information derived from these studies, as appropriate, to improve long-run energy demand forecasts and supply plans. It is not intended to replace policy directions or more detailed reporting requirements that may be provided by the regulatory agencies in their long-run planning proceedings.

SECTION II.A: REPORTING AND DOCUMENTING THE RESULTS FROM COMPLETED IMPACT STUDIES FOR INCLUSION IN THE STATEWIDE INVENTORY

The utilities will assist the CEC in maintaining the Statewide DSM Inventory, as described in Public Resources Code, 25401.2, Sections A, B and C. The DSM Inventory will serve as a common, statewide public domain database of the most current estimates of DSM costs and load impacts of each gas and electric utility.

Basic information about DSM measure impacts and costs, based on the latest measurement study results, will be developed as supplementary backup tables to the tables specified in Appendices D (forecasts) and E (earnings claims) that utilities file in accordance with Table 1. The precise content of these tables will be worked out in agreements between CEC and utility staff. These tables will be provided to the CEC in electronic format.

Table 11, below, identifies supplementary information that should be included when transferring the results from completed impact studies for inclusion in the Inventory. For each first-year load impact study filed in an Annual Earnings Assessment Proceeding, a separate Table 11 analysis will be filed on or before October 1 of that same year. These tables may be integrated with the utility's annual DSM forecast filing.

In addition to the transmittal of results of completed measurement studies to the Inventory, the utilities will continue their financial and technical support of the Statewide DSM Inventory. This support includes the following types of activities:

- provide data on historic and current saturation levels of specified DSM measures, based primarily on utility program records of participation;
- provide supplemental information on measure saturation beyond information available from utility program participation records;
- provide supplemental measure cost estimates for new measures (i.e., measures which are currently not promoted by the utility program, but may be in the future);
- provide data comparable to the above for measures and programs not covered by Table 6 reporting requirements; and
- perform the requisite work identified above by either: (a) continuing to provide the support of necessary utility personnel; or (b) by acquiring the services of consulting firms, using authorized utility funds from the Measurement, Forecasting and Regulatory Reporting portion of the utility DSM budgets.

TABLE 11
REPORTING OF LOAD IMPACT RESULTS FOR USE IN PLANNING AND FORECASTING

Scope and Filing Requirements: The data and analysis requested on this table must be filed on or before October 1 by all investor owned utilities who have completed a load impact analysis of a DSM program as part of the CPUC requirement to qualify for shareholder earnings. A separate Table 11 analysis must be filed annually as a follow up to each first year load impact study completed in accordance with Tables 8A and 8B and filed in accordance with Table 1. The Table 11 filing must be made on or before October 1 and could be integrated as part of each utility's forecast of next year program activity. The analysis topics listed below must be addressed for each end use addressed in the M&E study, but the utility is free to choose to group end uses by program category when filling out the table for ease of presentation.

Purpose: To identify and discuss information gathered during utility impact studies that could be useful in resource planning and demand forecasting and in assessing the potential load impacts and benefits of future DSM programs.

Base Energy Usage: Each utility is expected to file a written analysis that provides any estimates of base energy usage (at the end use level) that were completed as part of the load impact study. The analysis should also discuss the reasons why these estimates may or may not be comparable to estimates of base energy usage used for the general population. Factors that could be discussed include differences in the demographic characteristics of customers, weather, building types, or building vintage between program participants and the general customer population.

Determination of Net Program impacts: This analysis should discuss the applicability of net to gross estimates derived in the M&E study for use in separating gross from net program impacts in forecasts of future program load impacts. Factors that could be included in the discussion of applicability include differences in the characteristics of the M&E study sample versus the general population, estimates of spillover or free ridership levels in the study versus what is assumed in forecasting models, and any information on expected changes in the market that might influence net to gross ratios in the future.

Load impacts: Identify the estimates of load impacts produced at the measure level, end use level, or both within the M&E study. Discuss the applicability of load impact estimates at the end use or measure level for forecasting program load impacts for the relevant or remaining population. Are these results generalizable at either the end use or measure level for use in energy demand forecasting? If not, what are the factors that suggest the load impact estimates are not useful for future forecasting or market assessment applications?

SECTION II.B: ELECTRIC UTILITY LONG-TERM FORECASTS OF COSTS AND BENEFITS FROM DSM PROGRAMS

At the time of utility filings at the CEC which identify the estimated impacts of utility committed and uncommitted DSM programs,[22] the electric utility will revise and update the annual long-term forecasts of electric capacity and energy impacts from programs implemented since the year 1990 (and for previous years, when feasible).

Until 1996, the primary reference for average load impacts from future year participants should be the results of impact measurement studies completed under the terms and conditions of the 1990 Settlement Agreements and associated utility Measurement Plans. The primary means of transmitting this information will be the DSM Annual Summaries and the data supplied by the utilities to the CEC Inventory.

After 1996, utility forecasts of committed DSM will rely on, to the extent feasible, the results of completed impact studies, as reported in Table 6 and supplemented with information identified in Table 11, and provided for inclusion in the CEC Inventory.

Forecasts of committed and uncommitted DSM should also incorporate the latest information on the effective useful life of measures, consistent with Appendix F.

The CEC Forms and Instructions will continue to provide the primary basis for the form and documentation of forecast filings of committed and uncommitted DSM. Issues associated with the use of load impact estimates used to support an earnings claim, as reported in Table 6 and filed for inclusion in the Inventory for resource planning, will be addressed in the context of resource planning activities at the CEC and the CPUC. Additional guidance on the documentation, forecasting protocols, and policy direction will be provided by the CEC and the CPUC prior to or at the time of the resource planning proceedings of each respective agency.

[22] Programs and program activities which have been authorized by the CPUC for implementation are referred to as committed DSM programs. Programs and program activities which are planned for implementation during a time period beyond the extant authorization period are referred to as uncommitted DSM programs.

SECTION II.C: NATURAL GAS UTILITY LONG-TERM FORECASTS OF COSTS AND BENEFITS FROM DSM PROGRAMS

Natural gas utilities (including combined gas and electric utilities) will develop estimates of the effects on long-term demand of committed and uncommitted utility DSM programs in the California Gas Report (CGR). At the time of every Biennial Fuels Report proceeding at the CEC, the utilities will provide full documentation of these estimates from the CGR. The filing will include:

- separate estimates for the load impacts from committed and uncommitted DSM;
- separate impacts over time from each utility DSM program; and
- a demonstration of how the results of completed impact studies are used in the forecast, in a manner consistent with the protocols identified in Sections A and B, above, for electric utilities.