

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the Matter of the Application of Southern California Gas Company (U 904 G) for Approval of Program Year 2003 Low-Income Assistance Programs and Funding	Application 02-07-001 (Filed July 1, 2002)
Application of San Diego Gas & Electric Company (U 902 E) for Approval of Program Year 2003 Low-Income Assistance Programs and Funding.	Application 02-07-002 (Filed July 1, 2002)
Application Of Pacific Gas And Electric Company (U 39 M) For Approval Of The 2003 California Alternate Rates For Energy and Low-Income Energy Efficiency Programs and Budget.	Application 02-07-003 (Filed July 1, 2002)
Southern California Edison Company's (U 338-E) Application Regarding Low-Income Assistance Programs for Program Year 2003.	Application 02-07-004 (Filed July 1, 2002)
Order Instituting Rulemaking on the Commission's Proposed Policies and Programs Governing Low-Income Assistance Programs.	Rulemaking 01-08-027 (Filed August 23, 2001)

**ASSIGNED COMMISSIONER'S RULING REVISING
PHASE 4 OF THE LOW INCOME ENERGY
EFFICIENCY STANDARDIZATION PROJECT**

This ruling approves an augmentation of the budget for Phase 4 of the Low Income Energy Efficiency (LIEE) Standardization Project and additions to the Phase 4 work plan, as proposed by the joint utilities. The joint utilities are: Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Southern California Gas Company. These revisions are described in Attachment 1.

In Decision (D.) 01-03-028, the Commission determined that natural gas appliance testing procedures should be further examined as part of ongoing efforts to standardize the policies and procedures of low-income energy efficiency programs. For this purpose, the Commission directed the Standardization Project Team to conduct a study of natural gas appliance safety conditions and alternative natural gas appliance safety testing procedures during Phase 4 of the Standardization Project.¹ The Commission authorized the utilities to augment the team with additional project consultants, as needed. The goal is to have Phase 4 completed in time so that the Commission can further consider natural gas appliance testing issues during the program year 2004 program planning cycle.²

Pursuant to D.01-03-028 and D.01-05-033, the Phase 4 work plan and budget has been developed under my direction in consultation with Energy

¹ The Standardization Project Team consists of the joint utilities and their technical consultants. Energy Division assists in coordinating the effort. Per Commission direction, the project team obtains input from the public before submitting final recommendations to the Commission.

² *See* D.01-03-028, *mimeo.*, pp. 30-34.

Division.³ By ruling dated February 19, 2002, I approved the current version of the Phase 4 work plan, including a preliminary budget, which is appended to this ruling as Attachment 2. In that ruling I noted that the schedule and budget for Task 10 was approved in concept only, pending the Commission's final ruling on a LIEE program assessment methodology. In D.02-12-019, the Commission directed the Standardization Project Team to submit updated budgets for the LIEE measure assessment, as well as for any other Phase 4 standardization tasks.⁴

On behalf of the LIEE Standardization Project Team, the joint utilities filed a request for augmentation to the Phase 4 budget on January 8, 2003. No comments were filed in response. The request is presented in Attachment 1.

I have reviewed the request in consultation with Energy Division, and find it to be reasonable. As described in Attachment 1, the inadequacy of the preliminary Phase 4 budget is attributable to unanticipated expansions of the Phase 4 scope of work, as well as unforeseen difficulties in the completion of several Phase 4 tasks. The Standardization Project Team has clearly described those factors, and the associated cost overruns, in Attachment 1. They have also identified four additional tasks (13, 14, 15 and 16) that are necessary to implement LIEE program revisions resulting from Phase 4, and presented a reasonable budget for each task. At my request, the Standardization Project

³ "The Assigned Commissioner shall direct the project with respect to the scope of work, budget and schedule." *Ibid.*, Ordering Paragraph 8. See also D.01-05-033, Ordering Paragraph 18, which states in reference to a Standardization Project Team evaluation: "The Assigned Commissioner is authorized to establish the scope, schedule and budget for this evaluation process, in consultation with the Energy Division.

⁴ D.01-12-019, p. 20 and Ordering Paragraph 5.

Team submitted a revised schedule that includes the completion dates for tasks 13-16, which is presented under Section IV of Attachment 1.

Accordingly, the augmented work plan, budget and schedule for Phase 4, as presented in Attachment 1, are adopted.

Dated January 28, 2003, at San Francisco, California.

/s/ Carl W. Wood

Carl W. Wood
Assigned Commissioner

Attachment 1
Requested Augmentation of the
Low Income Standardization Project Phase 4 Budget

I. Overview

In its recent decision which established the four major California investor owned utilities' (IOUs') PY2003 Low Income Energy Efficiency (LIEE) Programs and Budgets, the Commission ordered the LIEE Program Standardization Project Team to "file a detailed update describing actual Phase 4 project costs realized to date, along with estimates of how much additional Phase 4 funding will be needed to complete all Phase 4 tasks." (D.02-12-019, Ordering Paragraph 5). The purpose of this compliance filing is to respond to the Commission's instructions.

As discussed below, the Team expects to incur Phase 4 project costs substantially beyond those covered by the original Phase 4 budget adopted by the Commission in February, 2002.⁵ The original Phase 4 project budget was based on a specified work scope, and reflected the Team's best estimates at the time of what it would cost to meet Commission mandates adopted in D.01-03-028 and R.01-08-027. As the Team has engaged in Phase 4 related tasks, it has become apparent that additional resources will be needed in order for the project team to fulfill all the Commission's directives.

In general terms, the inadequacy of the estimated Phase 4 budget initially adopted by the Commission is attributable to two factors:

- Unforeseen difficulties in the completion of several tasks called for in the initial Phase 4 work scope and budget; and
- Unanticipated expansions of the Phase 4 scope of work.

These factors are outlined in more detail below.

II. Overruns on Existing Tasks

Overruns associated with existing Phase 4 tasks are described below by task.

⁵ Assigned Commissioner's Ruling Augmentation of the Budget for Phase 3 of the Low Income Energy Efficiency Standardization Project and revised Phase 4 Standardization Project Workplan" dated February 19, 2002.

Task 4. Prepare On-Site Carbon Monoxide Testing Field Survey Plan.

Task 4 required the development of a specific set of protocols for the statewide Natural Gas Appliance CO Testing Practices (NGAT) survey. Cost overruns on this task were caused by two issues:

- First, the Project Team and its support consultants spent far more time than originally anticipated in developing statewide NGAT field survey protocols. In order to satisfy a variety of concerns by team member utilities and Commission Energy Division staff, a large number of Project Team technical committee meetings, refinements and revisions to the draft testing protocols were required. While this process was fruitful and necessary, it nonetheless required both RER and RHA staff to invest far more hours on this task than originally projected in the original Phase 4 work plan and budget estimates. We estimate that the cost overrun on this aspect of Task 4 was \$12,500.
- Second, the cost of sophisticated carbon monoxide alarm data loggers purchased by RHA for the NGAT field survey exceeded original cost estimates in the initial Phase 4 budget. The excess cost was \$1,631.

The total overrun on Task 4 was \$14,131.

Task 5. Conduct Statewide NGAT Field Surveys

Task 5, which is still in progress, entails conducting the actual NGAT field surveys. Significant time and cost overruns are being experienced on this task. The primary causes of these overages are:

- The original sample design for the survey had to be refined three times. The selection of sample customer survey lists involved taking utility customer data, assigning customers to Census block groups, screening out customers who had already participated in the LIEE program in recent years, and drawing up primary and secondary sample survey site lists. The process of screening out recent LIEE participants proved far more difficult than initially anticipated, given the different processes used for this purpose across the utilities, and the sample design had to be revised twice as a result. The additional cost of repeating the sample design and outreach list development process was approximately \$12,000.
- The Phase 4 customer outreach process has proven significantly more difficult than anticipated. Outreach workers have experienced difficulty in meeting initial targets, and it has become necessary to

augment the survey sample customer lists several times in specific geographic block groups. Additional RER staff time also was spent communicating with utility staff and the outreach contractors on ways of facilitating the outreach process. As a result of an attempt to develop a statistically representative sample, the outreach process differed significantly from the one traditionally used by outreach staff. The additional cost incurred by RER was approximately \$9,000. RHA incurred additional costs of roughly \$7,360 updating customer lists used for survey test scheduling and survey databases, and communicating with utilities and RER about list issues.

- Outreach and scheduling problems, along with customer no-shows, finding previously weatherization of some outreached customers units, tests disrupted by delays in weatherization and inability to do gas appliance tests on all electric customer homes have caused major delays and down time for RHA's CO testing technicians. In order to maintain the original survey schedule, RHA has had to hire and train five more field survey technicians than were identified in the original Phase 4 budget. These ten technicians provided the additional capacity needed to conduct CO tests in roughly 100 homes per week. Over the first several weeks of the survey, far fewer field surveys than projected in the original work plan were scheduled, due to initial outreach problems and delays, resulting in significant down time for RHA staff. The estimated additional project cost associated with this problem is \$198,000 to date.
- RHA's NGAT field testing teams experienced an inordinate number of customer no-shows, customer refusals, and customer rescheduling requests when testers showed up to conduct NGAT field survey tests. These problems were far more serious for the NGAT survey than is typical for on-site surveys of this sort. In hindsight, this is to be expected. Low-income customers are probably more likely to have inflexible work schedules, child care related problems, family emergencies, and other problems that make their participation in this kind of a survey more difficult than it would be for middle or upper income customers. These problems occurred roughly 10% of the time, leading to extra scheduling and field test costs of roughly \$47,760.
- As outlined above, the need to hire additional RHA testing technicians to maintain the survey schedule caused RHA to have to purchase additional equipment for the extra testing staff. This led to an increase of approximately \$10,000 above RHA's original equipment cost estimates.

- Scheduling problems and delays forced the Project Team to extend the NGAT Survey through the first two weeks of December, to complete scheduled surveys. In turn, this required RHA to retain office staff and field technicians of an additional two weeks, at a cost of \$79,600.
- CO alarms data loggers proved to have serious electric battery storage limitations that were unknown at the time of the preparation of the Phase 4 work plan and budget. This required RHA technicians to download data logger time series information every three weeks (rather than every four to five weeks, as initially anticipated). The cost of extra customer site visits to do more frequent downloads was roughly \$7,500.

The total additional cost of these problems experienced in the NGAT survey was \$371,220.

Task 6. Analyze On-Site Data

Given the wide range of CO testing options that need to be considered under Phase 4, the CO testing protocols incorporated into the study design are relatively complex. A total of six procedures will be tested in the course of the NGAT survey, and the results of these six protocols will have to be analyzed as part of the study. Given this, the level of data analysis required to support the Team's decisions and recommendations will be more extensive than initially expected. This will add \$30,000 to the cost of the study.

Task 10. Assess the Cost Effectiveness of Current LIEE Program Measures

The original Phase 4 work scope called for the LIEE Project Team and its consultants to assess existing measures using an updated LIEE program and measure benefit-cost framework approved by the Commission. Three primary factors have contributed or will contribute to cost overruns associated with this task.

- First, the Commission instructed the Reporting Requirements Manual Working Group and the Standardization Team to develop specific means of implementing two new cost effectiveness tests for LIEE programs and measures: the Utility Test and the Modified Participant Test. RER was assigned by the Standardization Team to participate on a joint RRM Working Group/Standardization Project Team subcommittee as a technical consultant. The cost of this additional RER effort, which was not reflected in the initial Phase 4 work plan or budget, was approximately \$28,000.
- Second, the individual utilities were ordered to submit cost-effectiveness analyses of their LIEE program measures, and it was determined that these

analyses should be done in a manner consistent with the approach used in the Project Team's measure analysis. As a result, RER was directed by the joint subcommittee to standardize the specific way the new cost effectiveness tests are applied to measures in each of the four IOUs LIEE programs. RER spent considerable time reviewing utility estimates of measure costs and energy savings for consistency, then conducting the approved measure and program cost-effectiveness tests for each of the four IOUs programs in a consistent manner. This necessitated several rounds of data input and analysis. A particularly large amount of time had to be devoted to the incorporation of non-energy benefits (NEBs) in utility program measure analyses. It became apparent early in this process that the workbook developed by the joint subcommittee of the RRM Working Group and the LIEE Standardization team to facilitate the incorporation of NEBs were being used by the utilities in very different ways. While these specific approaches used to run the workbooks were reasonable when looked at on a stand-alone basis, they entailed considerably different applications of NEBs and lead to inconsistent results. Resolving these inconsistencies took a considerable amount of RER staff time. The additional cost associated with developing consistent approaches, assumptions and a consistent statewide test application methodology was approximately \$37,000.

- Third, the measure impacts used in the September 30, 2002 report filed by the Standardization Team were based partly on the impact evaluation of the 2000 LIEE Program. Given the importance of these measure-level impacts in the selection of measures, the Team has directed RER to use new estimates expected to be available around the end of February 2003, in developing its final measure recommendations. These estimates will be based on Xenergy's pending evaluation of the 2001 programs, and will incorporate several refinements relative to the earlier estimates. While the Team initially intended to revise its cost-effectiveness analysis based on input from the public, the use of this completely new set of measure savings estimates will add roughly \$15,000 to the cost of this process.
- On December 5, 2002, the Commission adopted a final decision on the IOUs' proposed 2003 LIEE program applications. The decision calls for significant increases in several of the IOUs annual program budgets. The program and measure cost effectiveness results reflected in the September 30, 2002 measure assessment report were based on runs, which used the IOUs smaller initial 2003 program budgets. In Decision (D.) 02-12-019, the Commission instructed the LIEE Standardization Team to "file any significant changes to the cost-effectiveness assessment that result from this decision...." (Ordering Paragraph 4). The Commission further ordered the Team to "file...all data, assumptions and methods used to calculate per home installation costs in the cost-effectiveness assessment, including the measure mix." Two of the

utilities (PG&E and SCE) expect to accommodate their increased budgets through proportional expansions of measure installations; as a result, no change in either program-level or measure-level cost-effectiveness was expected. For these utilities, it was not necessary to rerun the cost-effectiveness analysis. However, both SoCal Gas and SDG&E do anticipate changes in their measure mixes as a result of the increased budgets, so these cost effectiveness analyses have been redone.⁶ The estimated cost of this task was \$15,000, including the analysis, the preparation of a filing and reply comments.

The total additional cost for this task is \$95,000.

Task 12. Additional Meetings, Workshops and Reply Comments

The process of presenting program and measure cost-effectiveness results has become somewhat more complicated than originally projected when the Commission approved the Project Team's original work plan. It was originally envisioned that RER would present preliminary results at two public workshops, and then prepare a report with final measure cost effectiveness estimates. The original project envisioned was modified by the ALJ at the 2003 LIEE programs application proceeding July 22, 2002 prehearing conference. The public review and approval process now being followed entails a preliminary project team report to the Commission (filed September 30, 2002), a round of public comments and reply comments, two statewide public input workshops to be held in January, 2003, a final Project Team report, a proposed Commission decision on the report recommendations, and a second round of public comments and reply comments. This new extended public review and input process essentially adds another project team report and an additional set of reply comments to RER's original scope of work. The estimated cost of adding this Phase 4 public review and input process to the original Task 12 work scope is \$18,000.

III. Additional Tasks

In the course of Phase 4, the Team has identified a number of additional consultant team tasks that will be necessary to implement LIEE program revisions resulting from Phase 4. These are described below.

⁶ The Revised Results of Measure Cost-Effectiveness was filed on January 6, 2003.

Task 13. Revise the WIS and Policy & Procedures Manuals for Use in the 2003 Program Year

The CPUC Rapid Deployment decision (D. 01-05-033) adopted in May of 2001 included several program rules changes that conflict with the original LIEE Program Weatherization Installation Standards (WIS) Manual language adopted in February, 2001, especially those set forth in the non-feasibility section of the document. D.02-12-019 rolls the Commission's Rapid Deployment measures and policies into the utilities' base LIEE programs beginning in PY2003. Additionally, changes in the California Uniform Mechanical Code codes may necessitate revisions in the WIS Manual. RER and RHA have been directed to review the current WIS and P&P Manuals and the decisions, identify edits needed to bring the WIS and P&P manuals into compliance with the requirements in D.01-05-033 and D.02-12-019, as well as applicable codes and standards, and print new camera ready copy for the applicable manual pages. These manual updates will have to be adopted in time for the updated manuals to be used in 2003. The cost of this review will be \$15,000.

Task 14. Complete Final Gas Appliance Testing Standards and Procedures

The Project Team's original Phase 3 work plan included a budget allocation for the development of Commission standards to be used when testing gas appliances prior to weatherization activities. It was subsequently removed from the budget when the Commission decided to conduct the statewide NGAT survey study, and was not carried over into the Phase 4 workplan and budget. If the Phase 4 study results in the Commission adopting any changes in its currently adopted minimum standard for natural gas appliance CO testing, updated field testing protocols or standards will need to be developed. The additional Phase 4 cost of RHA developing these standards is estimated to be \$77,000. This amount can be added to the overall Phase 4 budget on an interim basis now, and trued up after a final decision on modifications to existing testing standards is adopted, or deferred until a final decision is adopted and it's known how extensive the modifications will be.

Task 15. Develop a Statewide User Guide for Cost Effectiveness Workbook

As noted earlier, there were a large number of differences in the ways in which the utilities initially applied the NEB workbook to do program and measure cost effectiveness analysis. For future reference, it would seem useful to develop a standardized user's guide specifying a consistent approach to the use of the workbook.

The estimated cost of RER developing this standardized test user guide and providing training to utility staff is \$20,000.

Task 16. CPUC Staff Project Briefings and Orientation

During the course of the Standardization project, the Project Team and its consultants have been working closely with CPUC staff from both ORA and the Energy Division. In order to facilitate this interaction, it has proved necessary for the Team's consultants to provide orientation and briefings to existing staff members, and new ORA and ED employees assigned to oversee the project. These orientation sessions and briefings are designed to familiarize CPUC staff with technical issues relating to LIEE weatherization program installation standards, policies and procedures, and LIEE program and measure cost-effectiveness analyses. The estimated cost of providing these Phase 4 orientation and briefing sessions is \$32,000.

IV. Schedule for Additional Tasks

Task 13. Revise the WIS and P&P Manuals for Use in the 2003 Program Year

Revisions are currently being finalized. We anticipate filing these revisions by January 31, 2003.

Task 14. Complete Final Gas Appliance Testing Standards and Procedures

The schedule for this task depends on the Commission's approval of a CO testing policy. The Team's recommendations on CO testing are due April 1, 2003, and it is unclear how long the process of comments, reply comments and the issuance of a final decision will take. Formal standards and procedures will be filed with the Commission within 45 days after the Commission's decision relating to CO testing.

Task 15. Develop a Statewide User Guide for Cost Effectiveness Workbook

Within 45 days of the Commission's approval of the budget augmentation request.

Task 16. CPUC Staff Project Briefings and Orientation

Since this service will be provided partly at the convenience of Commission staff, the schedule is somewhat open. Our intent is that briefings/orientations will be held throughout the year in 2003, and that several sessions will be planned, each dealing with a different set of issues. These briefings will be completed by the end of 2003.

V. Budget Summary

Table 1 summarizes the initial Phase 4 budget, the expected cost, and the requested budget augmentation by task. As shown, the total requested budget augmentation is \$672,351.

Table 1. Phase 4 Budget, Expected Costs and Requested Augmentations

Task	Initial Budget	Expected Cost	Requested Augmentation
Task 1. Conduct Literature Review	35,276	35,276	0
Task 2. Survey Practices in Private Industry	12,560	12,560	0
Task 3. Review Data from Other Sources	37,926	37,926	0
Task 4. Prepare On-Site Survey Plan	48,776	62,907	14,131
Task 5. Conduct On-Site Surveys	1,027,560	1,398,780	371,220
Task 6. Analyze On-Site Data	49,220	79,220	30,000
Task 7. Prepare Phase 4 Report	47,475	47,475	0
Task 8. Meetings, Workshops and Reply Comments	52,480	52,480	0
Task 9. Develop Recommendations for Pre-Approval Policies	34,600	34,600	0
Task 10. Assess Current LIEE Measures	54,600	149,600	95,000
Task 11. Prepare Installation Standards for Refrigerator Grounding	6,200	6,200	0
Task 12. Additional Meetings, Workshops and Reply Comments	26,600	44,600	18,000
Task 13. Revise WIS for 2003	0	15,000	15,000
Task 14. Complete Gas Appliance Testing Standard	0	77,000	77,000
Task 15. Develop User Guide for NEBs	0	20,000	20,000
Task 16. Provide Training for CPUC Staff	0	32,000	32,000
Total Phase 4 Budget	1,433,273	2,105,624	672,351

ATTACHMENT 2

PHASE 4 WORKPLAN, SCHEDULE AND BUDGET APPROVED FEBRUARY 19, 2002

Objectives of Phase 4

The general purpose of Phase 4 is to obtain information that will allow the development of a uniform set of recommendations regarding LIEE Program standards, policies and procedures with respect to natural gas appliance testing. This information should allow the Standardization Team to make carefully reasoned and well supported recommendations to the Commission with respect to natural gas appliance testing. The study will assess the impacts, if any, on carbon monoxide (CO) and other combustion-related hazards potentially associated with typical LIEE weatherization services. In this context, the specific objectives of Phase 4 are:

1. To identify the extent to which potentially hazardous carbon monoxide (CO) levels are present in a sample of low-income homes before they are weatherized;
2. To determine the extent to which the installation of LIEE infiltration-reduction measures affects CO levels in participating homes;
3. To assess alternative testing procedures that can be used to identify high CO levels and their sources, and to identify actions that can be taken to mitigate these problems where possible;
4. If appropriate, to use the results of the study to:
 - Refine the recommended LIEE Program minimum standard for natural gas appliance testing;
 - Develop updated recommendations regarding policies and procedures for the detection and mitigation of high CO levels and other combustion-related hazards; and
 - Design recommended statewide standards for LIEE program natural gas appliance testing;
 - Develop or refine related program policy and/or procedural recommendations.
5. To develop recommendations for standardizing measure approval processes across the utilities;
6. To develop and implement the first round of the measure assessment process; pending the Commission's final determination on an assessment methodology and
7. To develop refrigerator outlet grounding standards, as needed.

Specific Research Questions

Associated with the first four of the above objectives (those relating specifically to natural gas appliance testing) are several specific research questions:

1. In low-income homes in California, what are the pre-existing levels of CO in the following locations: a) in indoor ambient air, b) in the proximity of specific appliances, c) in flue gases, and d) in the surrounding outdoor air?
2. What effect does the installation of infiltration-reduction measures have on CO levels within the home?
3. Do pre-existing or post-installation CO levels found in low-income homes represent a potential hazard to the occupants?⁷ What is the frequency and duration of elevated CO levels?
4. Are the existing policies and procedures and Minimum Standard for natural gas appliance testing previously recommended by the Team and adopted on an interim basis by the Commission necessary, and, if so, are they appropriate to identify high levels of CO and other combustion-related hazards in the homes of LIEE weatherization recipients?
5. To what extent would the detection of CO problems be affected by the elimination, reduction, expansion or modification of steps included in the Minimum Standard (including the installation of CO alarms as an alternative or supplement to gas appliance testing)?
6. What modifications, if any, to the current natural gas appliance testing policies and procedures should be adopted for the LIEE Program?

General Methodology

The portion of Phase 4 relating to natural gas appliance testing will entail the following specific research steps:

- A thorough review of existing literature related to indoor carbon monoxide levels, the effects on mortality and morbidity, detection/testing approaches, the impacts of infiltration reduction, and weatherization program policies;
- The acquisition and analysis of existing data relating to current program operations; and
- The use of a detailed on-site survey to assess pre-existing CO levels, evaluate various testing approaches, and assess impacts of program-related infiltration reduction.

⁷ At least partly on the basis of the literature review, the Study Team will recommend an operational definition of hazardous levels and durations of CO.

Tasks 1 through 8 of the overall work scope will be used to implement these steps. These tasks form the basic work scope of Phase 4. Additional Tasks 9 through 12 will address pre-approvals, measure assessment, and refrigerator outlet standards. All twelve research tasks are discussed below.

Task 1. Conduct Literature Review

The first task of Phase 4 will be a review of the literature on natural gas appliance safety and carbon monoxide testing. This literature will include the following types of references:

- Studies of CO levels typically found in low-income residential buildings;
- Standards, policies and practices relating to natural gas appliance testing and CO measurement in other programs;
- Analyses of linkages, if any, between infiltration rates and CO concentrations;
- Studies relating to the relationships between CO concentrations and mortality and morbidity;
- Analyses of CO detection and monitoring procedures and devices; and
- Relevant legislation (e.g., AB 1421) and previous Commission decisions.

Given the voluminous nature of the literature in these areas, the Phase 4 team will rely on existing literature reviews (e.g., Environmental Protection Agency's (EPA) recent review, Department of Health Services (DHS) studies, etc.) to the extent possible. The American Gas Association (AGA) web site will be accessed if possible to identify relevant literature listed on that site. Studies conducted by Gas Technology Institute (GTI) and the Consumer Products Safety Commission on CO alarms and other issues related to gas appliances will also be reviewed. We will also review any salient work conducted by the Wisconsin Energy Center and Affordable Comfort, Inc., as suggested by Bob Burt of the Insulation Contractors Association in his comments on this work plan. Salient literature will be summarized, and, to the extent possible, conclusions will be developed. On the basis of this literature review, the Standardization Team will refine the specific research questions to be addressed in Phase 4.

Task 2. Survey Practices in Private Industry

Under this task, the team will survey current practices in the private appliance repair and energy efficiency services industries. The elements of this task will be:

- a survey of contractor associations on the current practices followed by private contractors in the area of natural gas appliance testing ;
- a review of contractor association policies relating to appliance testing;
- a summary of E 2183 standards on appliance installation and appliance safety; and
- a review of Lawrence Berkeley Laboratory (LBL) materials on commissioning of HVAC systems, when available.

Task 3. Review Existing Data from Other Sources

A considerable amount of data relating to CO testing and impacts of weatherization on CO levels may already have been collected in California and elsewhere. The third task of Phase 4 will entail the acquisition and analysis of this data. Examples of data that may be useful in this step of the analysis are those available from California utility low-income programs⁸, the California State Department of Community Services and Development, and the California Energy Commission.

Task 4. Prepare On-Site Survey Plan

The on-site survey plan will include three elements: the sample design, data collection forms and survey protocols. These aspects of the plan are discussed briefly below.

Task 4.a. Prepare Sample Design.

The on-site survey will be structured to collect information on a representative sample of low-income homes throughout the four joint utilities' service areas in California. The first step of this process is the identification of the sample frame, or the population of households that are eligible for the LIEE Program. Unfortunately, it is impossible to know with certainty which households in the overall population are eligible; as a consequence, indirect information on likely eligibility will have to be used to define an initial frame. Utility billing records do not actually identify customer income, but they can be used, along with other information, to develop an initial set of households likely to be eligible for the Program. One option in this regard is to integrate Census data on income at the Census tract level into billing records to identify low-income areas, and to screen households in these areas for prior participation in the Program. An alternative would be to focus on the CARE designator in the billing records, defining the initial frame as all CARE customers not yet treated through the LIEE Program.

Once the sample frame is developed, a sampling plan will be developed. It is likely that stratification of the sample will be used to improve precision of the estimates. The sampling plan will specify the targeted sample sizes by stratum. Strata will reflect geographic indicators, such as utility service area and weather area, and other data pertaining to structure type and natural gas appliance type. The overall size of the sample will be based on precision requirements. The specific stratification scheme and the definition of precision level will be developed during this stage of the project. For the purposes of developing a preliminary budget,

⁸ In D.01-03-028, the Commission has pointed out that "we lack consistent data from PG&E's own experience with CAS testing. Nor do we have information on the numbers and proportion of testing "fails" captured under other utilities' testing systems." (p. 33.) This task is designed to make use of such data.

we assume a total sample size of 850 sites, stratified by residence type and climate as shown in Table 1.

Table 1: Sample Structure for Mid-Range Budget

Climate	Residence Type			
	Single Family	Multifamily	Mobile Home	All Types
Warm	200	150	75	425
Cold	200	150	75	425
Both Climates	400	300	150	850

Once the overall sample size target and individual stratum targets are determined, an initial sample of households will be drawn. In order to allow for non-response and sample attrition based on ineligibility of some members of the initial sample, the initial sample will be four times as large as the target sample.

The sample design will be submitted to the Standardization Team for its review. After the Team has been given the opportunity to make comments, the project team will revise the sample design as necessary and resubmit it to the Team in final form.

Task 4.b. Prepare Data Collection Forms

Data collection forms will be developed under Task 4. These forms will be used by surveyors to record site information during the course of the survey. The forms will be designed to collect the following types of information:

a. General Assessment

- Housing type;
- Appliance types, fuels used by each appliance, and number of appliances serving each home;
- Adequacy of combustion air venting;
- Condition of heat exchanger, flue, and vent system;
- Inspection for other potential hazards, such as:
 - Presence of gas leaks;
 - Inadequate draft;
 - Spillage;
 - Burner abnormalities;
 - Abnormal ignition/flame;
 - Return system leaks;
 - Inadequate combustion system air;
 - Flue and/or venting system defects;
 - Supply and return air system leaks;
 - Use of unvented appliance as a heater;

- Inoperable mobile home kitchen exhaust fan.
- Depressurization caused by duct system abnormalities.

b. Carbon Monoxide (CO) Assessment

- Levels of CO, measured before and after weatherization measures are installed, at the following locations:
 - Outdoors;
 - Indoor ambient air;
 - Indoors proximate to specific appliances;
 - In flue gases.⁹
- Levels of CO associated with:
 - Type of appliance and type of fuel used by the appliance;
 - Amount of combustion air;
 - Byproducts of combustion;
 - Supply and return duct leakages.

Data collection forms will be submitted to the Standardization Team for review. Once comments have been received from the Team, the project team will revise the forms as necessary and resubmit them in final form.

Task 4.c. Develop Survey Protocols

A set of uniform protocols will be developed to guide the activities of statewide survey personnel. These protocols will include the following:

- Guidelines for assessment of the structure and data related to structural statistics;
- Occupant demographic data collection;
- Natural gas appliance examination and testing procedures;
- Data collection associated with natural gas appliance examination and testing;

These protocols will allow survey personnel to evaluate a matrix of testing procedures and equipment. Six procedures (no testing and various levels of testing) will be evaluated, and two classes of equipment will be compared.

The six test procedures are outlined below. Procedures #1 and #2 include no test, and procedures #4 through #6 include various levels of testing.

⁹ CO will be tested in the flues of all combustion appliances.

Procedure 1: Ambient CO Alarms as an Alternate or Supplement to Testing

This procedure is designed to evaluate the installation of CO alarms as an alternative or supplement to natural gas appliance safety testing. CO alarms will be installed in a subset (100) of the 850 homes included in the Natural Gas Appliance Testing Study. The alarms will be installed during, or immediately after, the outreach and assessment process. Five months later, each home will undergo CO testing using the protocol developed for Procedure #6. Thirty of these 100 homes will also be equipped with data loggers that continuously monitor CO for the five months.

Data obtained from the CO testing, the data loggers, a detailed combustion appliance zone test, and a customer survey will be analyzed and compared to the performance of the CO alarms, to assess the feasibility of CO alarms as an alternative or supplement to testing. This procedure has been divided into these four steps:

1. Draft detailed CO Alarm Study Plan
2. Acquire and install CO alarms
3. Select and install data loggers and download data
4. Draft report

These steps are described below.

Draft Detailed CO Alarm Study Plan. A detailed work plan will be drafted that includes specific details for the implementation and evaluation of the study. Specifically, the following items will be developed: forms, field procedures, installation guidelines, customer survey, data acquisition protocols, procedures for interfacing with the utility gas service department, and CO alarm selection and testing procedures.

Acquire and Install CO Alarms. Consultants shall purchase 150 alarms and test each to ensure they operate prior to their being installed in homes. The goal of the CO Alarm Study is not to test the proper function, accuracy, or reliability of the alarms, but to evaluate the feasibility of CO alarms as an alternative or supplement to gas appliance testing. An attempt will be made during the review of the literature to identify the brand(s) and model(s) of the most reliable CO alarms. The pre-installation testing conducted as part of the study will be used only to ensure that faulty units are not being installed.

From the information ascertained during Task 1 (Review of the literature) and input from four experts in the field, brands and models will be selected for installation during Phase 4. This information will be supplied to the Team with a request to purchase the 150 units. Upon Team approval, the consultant will purchase and test the 150 units. The 100 units that perform best will be installed in houses occupied by low-income clients. The other 50 units will be stored for

the five-month period and tested again. The results from all of the testing performed will be used in drafting the report. The acquisition process will entail the following steps:

- Analyze results from the literature review and seek input from manufacturers and individuals involved in testing CO alarms.
- Select models and brand names to use.
- Acquire team approval to purchase.
- Purchase and test 150 units.
- Deliver units to use for installation.

CO alarms will be installed prior to the installation of weatherization measures.

Installation and Downloading of Data Loggers. In an effort to determine whether the CO alarms produce the correct audible signal when CO exists or when CO does not exist, data loggers will be installed (at the same time as CO alarms are installed) to constantly monitor CO in 30 of the 100 homes. The data loggers to be installed will monitor and record CO levels 24 hours a day for five months. These recorded levels will be compared with information from the following:

- Customer reports of alarms,
- Reports of alarms to the local authorities,
- Information derived from the customers via exit interviews when the units are removed.

Data will be downloaded from the data loggers monthly, at which time the data loggers will be recalibrated and the batteries will be replaced in an effort to ensure accuracy.

Report Findings. Upon the completion of the five-month study, a report will be generated that addresses the feasibility of installing CO alarms as an alternative or supplement to CO testing.

Information used to formulate the report will include:

- Incidence of alarms, as derived from the customer survey form, reports of alarms reported to Richard Health & Associates (RHA) and the utilities, and the related responses to the CO alarm calls.
- A thorough review of the CO alarm related literature will be conducted prior to the selection of alarms to be used in the study. This review will also include input from manufacturers and experts who have tested CO alarms and have published the results of their work.
- Data from the subset of 30 homes will be downloaded from the data loggers installed in the 30 homes to continuously monitor CO for the five month period.
- Each of the 100 homes will undergo a detailed combustion appliance zone (CAZ) test (Procedure #6 below) and data will be collected relating to: the house

A.02-07-001 *et al.* CXW/avs

characteristics, combustion appliance performance, vent systems, and depressurization or spillage caused by exhaust fans and duct abnormalities.

Procedure #2: Visual and Olfactory Checks and Self Reports

This minimal procedure includes a visual and olfactory check of combustion appliances, coupled with a brief interview of the customer. It will include a visual inspection of each combustion appliance for hazards, such as:

- Vent system (missing/damaged vent pipe, multiple draft hoods, etc.);
- Combustible and flammable items stored on or near appliances; and
- Evidence of improper combustion (excessive soot, charring from rollout, etc.).

An olfactory check for aldehydes and gas leaks will be conducted near each appliance. The customer interview will be used to ascertain any self-reported observations and/or symptoms that could be associated with CO.

Procedure #3: Room Ambient Test

This procedure will include the check for potential hazards and gas leaks as in procedure #2, plus an ambient air CO test will be conducted to determine the CO level (ppm) in each room containing a combustion appliance.

Procedure #4: Appliance Ambient CO Test and Staging in Winter Condition:

Procedure #4 will include those procedures outlined in #3 above (check for hazards and gas leaks and room ambient CO) plus the following:

- Appliance Ambient Air CO Test—The ambient air (not flue gas) will be tested near and around each combustion appliance.
- Staged CO Test—After the ambient air around each combustion appliance is tested, the residence will be put in a winter condition (all appliances will be operated simultaneously with all windows closed) and the ambient CO checked again in the same locations.

Procedure #5: Flue Gas CO Test and Staging in Winter Condition with Fans:

This procedure will include those activities outlined in Procedure #4 above plus the following:

- Putting the residence in winter conditions and operating all exhaust devices.
- Testing flue gas for CO: The flue gas in each combustion appliance will be tested to determine the level of CO before dilution with air. The test will be conducted before and after the house is put in the winter condition with fans operating.
- Checking each combustion appliance for adequate draft, back-drafting, and spillage.

Procedure #6: Complete Testing Procedure in Worst Case Condition:

The procedure will include all those activities outlined in Procedure #5 above, plus the following:

- Combustion Appliance Zone (CAZ) test
 - Conduct pressure measurement in three modes of fan/appliance operation
 - Determine “worst case” condition
- An evaluation of combustion air
 - Number and size of vents, or
 - Room/residence volume
- Visual inspection of each appliance (as applicable)
 - Cracked heat exchanger
 - Missing or defective parts
- Inspection of the air distribution system (as applicable)
 - Supply leaks
 - Return leaks
 - Depressurization caused by door closing
- Inspection of flue/vent system
 - Leaks
 - Disconnects and improper terminations
- Draft and spillage test
 - Instrumented draft test
 - Visual draft test
 - Tactile test for spillage

The protocols will be submitted to a team of experts for review and recommendations. This panel will be recruited during the course of the study design process. After the protocols have been reviewed by the team of experts and necessary modifications have been made, survey protocols will be submitted to the Standardization Team. After feedback is received from the Standardization Team, revisions will be made by the project team as necessary. The utility members of the Standardization Team will have utility gas service specialists conduct quality control/quality assurance reviews of the procedures developed by Richard Heath & Associates (RHA).

Task 5. Conduct On-Site Surveys.

One of the central tasks of Phase 4 will be the administration of an on-site survey of low-income homes. These surveys will be conducted before and after the participation of subject homes in the LIEE Program. The objectives of this task will be to accomplish the following:

- Ascertain levels of CO in test homes prior to and after weatherization;
- Determine the effects of installation of infiltration-reduction measures on CO levels and other potential gas appliance related hazards;
- Ascertain the relative accuracy and time costs of various means of detecting CO problems;
- Identify natural gas appliance safety hazards other than high levels of CO; and
- Identify and evaluate alternative means of mitigating hazards detected in the process of testing.

The on-site survey will be conducted by experienced field technicians. The following activities will be conducted as part of the on-site surveys:

- Recording structural, demographic and appliance data;
- Taking CO measurements before and after installation of weatherization measures;
- Checking for gas leaks, missing components, and improper alterations;
- Evaluating combustion air supply and venting;
- Visually inspecting heat exchanger and flue/vent system;
- Examining for dirty and improperly adjusted burners;
- Checking for delayed ignition, abnormal flame characteristics, and other combustion hazards; and
- Evaluating draft (check for inadequate draft, back-drafting, and spillage).

All homes weatherized as part of the study will receive exactly the same treatment as they would typically receive under the LIEE Program, with one exception. In the event that an appliance not currently repaired or replaced under the LIEE Program is found to be faulty in the course of the on-site tests, this appliance will be repaired or replaced prior to the installation of infiltration measures, instead of simply being red tagged and disconnected. By prearrangement with the relevant utility, RHA will call in one of the utility's service providers, and will work with the provider to ensure that the appliance is repaired or replaced in compliance with all codes and regulations. Of course, repair/replacement will require the consent of the appliance owner. Information on the incidence level and costs of such repairs/replacements will be maintained in order to assess incorporating this step into the LIEE Program. *The Team requests that it be able to use utility LIEE Program funds for this purpose for the sample of homes covered by Phase 4.*

Field Simulation. One objective of the study is to determine the effects of infiltration-reduction measures on CO levels. Infiltration measures may affect CO levels by:

- Reducing the amount of available combustion air, thus impeding complete combustion.
- Contributing to back-drafting or excessive spillage, thus creating a potentially hazardous condition.
- Exacerbating the problem if high levels of CO already exist in the home prior to weatherization.

Not all conditions may be found within the relatively small random sample of test homes that will allow each of the hypotheses listed above to be thoroughly tested. However, to the degree possible, the study will test each of these hypotheses.

It is also highly unlikely that very high CO levels will be detected in the test sample homes, and if they are, it may not be prudent to weatherize units before they are abated. There may be potential liability to the project and potential hazards to field survey team members if any homes found to have extremely high levels of CO prior to weatherization are not abated before weatherization. Thus, a vacant home will be used to test the effects of weatherization measures at various (especially extreme) CO levels. The results from the vacant test home will be compared with the other field results in the development of conclusions and recommendations.

Task 6. Analyze On-Site Data

The sixth task will entail the analysis of the data collected through the on-site survey. The following kinds of analysis will be conducted:

- Distributions of structural and household features will be constructed for sampled sites and used to infer population distributions;
- Distributions of CO levels will be developed, before and after the installation of LIEE measures;
- To the extent useful, results of CO tests will be correlated with the age of test homes, number of gas appliances in the homes, structural and other household features;
- Results of various elements of CO tests will be summarized, both before and after installation of measures, and the effectiveness of these elements in detecting problems will be assessed
- Recommendations for testing standards and policies and procedures will be derived, as appropriate;
- Recommendations for mitigating CO-related problems identified by natural gas appliance testing procedures will be prepared.

The preliminary results of the analysis of on-site data will be submitted to the team of experts for review and comment. After comments have been received, the Study Team will modify the analysis as necessary.

Task 7. Prepare Phase 4 Report

Upon the completion of the analysis, the Study Team will prepare a Phase 4 report. This report will be developed in accordance with a standard procedure used throughout the Standardization Project:

- First, Regional Economic Research, Inc. (RER) and RHA will draft a report outlining the objectives, methods, and findings of the study. The draft report will be reviewed by the team of peer experts, and refined based on comments received. This report will then be submitted to the full Standardization Team for review.
- Second, the Standardization Project Team will review the report and assess its methodology and findings. This process may entail the use of other employees of and/or consultants retained by the members of the Standardization Team. The Team will comment on the consultants' report as appropriate. To the extent possible, the Study Team will develop preliminary recommendations based on the findings of the study. If appropriate, the Study Team will also develop recommendations for changes in other policies and procedures based on the study results. If a full consensus of the Standardization Project Team on these recommendations cannot be reached, a majority position and one or more minority positions may be drafted. These positions will be incorporated into the revised report.
- Third, the Standardization Project Team will circulate the revised report to the public and solicit comments. Workshops will be held in both Northern and Southern California to permit members of the public to raise questions and/or comment on the report. Opportunities for the submittal of written comments will also be provided.
- Fourth, the Standardization Team will consider the input submitted by the public and revise the report as appropriate. This report will be filed with the Commission on or before April 4, 2003.

Task 8. Meetings, Workshops and Reply Comments

This task relates to work conducted as part of the normal regulatory process. The Team will conduct a number of meetings to discuss Phase 4. Additionally, public input will be requested through a series of public workshops. Finally, after comments on the Phase 4 report have been filed, the Team will prepare reply comments.

Task 9. Develop Recommendations for Pre-Approval Policies

In the Standardization Team's Phase 3 report, it touched on the pre-approval processes currently used by the utilities. It noted that PG&E requires utility pre-approvals of LIEE measures for all homes, while SDG&E does measure pre-approvals only on large multi-family projects. SCE has a non-utility third party perform measure approvals on all homes, while SoCalGas has the

installing contractor perform measure pre-approval. The Team observed that these different practices are justified partly on the basis of differences in natural gas appliance testing. PG&E currently conducts pre-installation combustion appliance safety (CAS) testing¹⁰ at the same time as it pre-approves measures. Its costs of testing and measure pre-approvals are likely to be lower than would be the case for the other utilities, since the cost of CAS testing and measure pre-approvals are linked, with pre-approvals based on CAS testing results. The results of the Phase 4 study will presumably enable the Standardization Team to make further recommendations on natural gas appliance testing, and should permit reconsideration of policies relating to measure pre-approval. This task was approved by the November 13, 2001 ACR.

Task 10. Assess Current LIEE Program Measures

The Team has already completed initial assessments of the new Rapid Deployment (RD) measures using the Low-Income Public Purpose Test (LIPPT), but has not yet applied this test to standard LIEE Program measures. In the Phase 3 report, the Team indicated that “If authorized by the Commission to spend the necessary time and resources to engage in this process, the Team will apply the methodology ultimately approved by the Commission to assess all of the current LIEE Program measures under a subsequent phase of the standardization effort.” (p. 6-3) This task was approved, in concept only, by the Commission’s November 13, 2001 ACR, pending the Commission’s final determinations on an assessment methodology. The joint utilities may submit modifications to the proposed budget and schedule for these tasks, if needed, when the Commission issues a final decision in Phase 3.

Once the Commission issues its final determinations on an assessment methodology, the Team will be able to begin the process of assessing standard LIEE Program measures. The Team will use the benefit-cost test(s) approved by the Commission to assess current LIEE Program measures. The Team will also report any problems or concerns experienced using these tests to the Commission and the RRM Working Group. This task will involve the following activities:

- Information on measure costs and energy savings will be gathered from the utilities, and will be augmented by other information, if necessary.
- Preliminary estimates of cost-effectiveness will be developed using the LIPPT and/or another (other) framework(s) approved by the Commission.
- The assumptions and results of the analysis will be made available to the public, and two workshops will be held to obtain public comments on the analysis.
- After receiving public input, the Team will make any necessary revisions in the measure assessment.

¹⁰ All three gas utilities currently test for only one combustion byproduct, carbon monoxide, and potential natural gas leaks.

- Based on the results of the analysis, the Team will develop recommendations as to which of the current measures should be offered by the utilities. It is anticipated that these recommendations will be filed within 90 days of the Commission's final determinations on an assessment methodology, and the Team will propose that the recommendations will apply to the subsequent year.

Task 11. Develop Installation Standards for Refrigerator Outlet Grounding

The potential need to develop LIEE program standards for refrigerator grounding was pointed out in the Team's Phase 3 Reply Comments, and the inclusion of this task in the Phase 4 work scope was authorized by the November 13, 2001 ACR. Note that in the past some manufacturers allowed the use of plug adaptors. Recently, however, all the major manufacturers have begun to require that kitchen outlets used for their products be properly grounded. In some older homes served by the LIEE Program, kitchen outlets are not properly grounded. This task will assess the efficacy of grounding these outlets to allow them to receive replacement Energy StarTM refrigerators. In the event that grounding is considered appropriate, grounding standards will be proposed for addition to the LIEE Weatherization Installation Standards Manual. It is the Team's intent to finish this task as quickly as possible, so that appropriate procedures can be implemented under the policy of Rapid Deployment.

Task 12. Additional Meetings, Public Input Workshops and Reply Comments

The expansion of the work scope associated with Tasks 9-11 will necessitate additional meetings, workshops and reply comments. This task was approved by the Commission's November 13, 2001 ACR.

Project Team

The Phase 4 project team will consist of RER and RHA. The project team will work under the supervision of the Standardization Team and its technical advisors.

Schedule

The recommended schedule for the basic Phase 4 work scope (Tasks 1-8) is presented below in Table 1. This schedule assumes that Phase 4 is authorized by December 30, 2001.

Table 1: Phase 4 Schedule

Task and Deliverable	Completion Date
Task 1. Review Literature Submit Draft Literature Review to Standardization Team Submit Final Literature Review to Standardization Team	February 15, 2002 February 28, 2002
Task 2. Survey Practices in Private Industry Submit Draft of Survey Results to Standardization Team Submit Final Survey Results to Standardization Team	March 10, 2002 March 30, 2002
Task 3. Review Existing Data from Other Sources Submit Draft Analysis to Standardization Team Submit Final Analysis to Standardization Team	April 1, 2002 May 1, 2002
Task 4. Prepare On-Site Survey Plan Submit Sampling Plan to Standardization Team Submit Draft Survey Forms to Standardization Team Submit Draft Survey Protocols to Standardization Team Finalize On-Site Survey Plan Train Surveyors	January 15, 2002 January 30, 2002 January 30, 2002 February 15, 2002 February 28, 2002
Task 5. Conduct On-Site Survey Complete 20% of On-Sites Complete Remaining On-Sites	March 30, 2002 November 30, 2002
Task 6. Analyze On-Site Data Submit Interim Survey Results to Standardization Team Submit Draft Survey Report to Standardization Team Submit Final Survey Report	April 30, 2002 November 15, 2002 December 10, 2002
Task 7. Prepare Phase 4 Report Draft Report to Standardization Team Draft Report to Public Final Report to Commission	December 30, 2002 February 15, 2003 April 4, 2003
Task 8. Meetings, Workshops and Reply Comments	Throughout the process

The schedule for the additional work scope authorized by the November 13, 2001 ACR (Tasks 9-12) is presented in Table 2.

Table 2: Phase 4 Schedule (Additional Work Scope)

Task and Deliverable	Completion Date
Task 9. Develop Recommendations for Pre-Approval Policies Develop draft recommendations Distribute draft recommendations to public Submit final recommendations to Commission	December 30, 2002 February 15, 2003 April 4, 2003
Task 10. Assess Current LIEE Measures	Within 90 Days Of The Commission's Final Determinations On An Assessment Methodology
Task 11. Prepare Installation Standards for Refrigerator Grounding Submit final recommendations to Commission	January 15, 2002 As soon as possible thereafter
Task 12. Additional Meetings, Workshops and Reply Comments	throughout the process

Proposed Budget

The proposed budget is presented in Table 3.

Table 3: Phase 4 Preliminary Budget

Task	Budget		
	RER	RHA	Total
Basic Work Scope			
1. Conduct Literature Review	24,480	10,796	35,276
2. Survey Practices in Private Industry	11,560	1,000	12,560
3. Review Data from Other Sources	33,000	4,926	37,926
4. Prepare On-Site Survey Plan	11,000	7,776	18,776
4a. Purchase 30 Data Loggers		30,000	30,000
5. Conduct On-Site Surveys	5,360	1,022,200	1,027,560
6. Analyze On-Site Data	33,600	15,620	49,220
7. Prepare Phase 4 Report	37,200	10,275	47,475
8. Meetings, Workshops and Reply Comments	36,480	16,000	52,480
Additional Work Scope			
9. Develop Recommendations for Pre-Approval Policies	22,600	12,000	34,600
10. Assess Current LIEE Measures	50,600	4,000	54,600
11. Prepare Installation Standards for Refrigerator Grounding	0	6,200	6,200
12. Additional Meetings, Workshops and Reply Comments	22,800	3,800	26,600
Total Phase 4	288,680	1,144,593	\$1,433,273

(END OF ATTACHMENT 2)

CERTIFICATE OF SERVICE

I certify that I have by mail this day served a true copy of the original attached Assigned Commissioner's Ruling Revising Phase 4 of the Low Income Energy Efficiency Standardization Project on all parties of record in this proceeding or their attorneys of record.

Dated January 28, 2003, at San Francisco, California.

/s/ Antonina V. Swansen
Antonina V. Swansen

N O T I C E

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